The influence of a FFS on the shift to a more sustainable coffee cultivation in Huong Hoa, Vietnam

A participatory action research carried out in collaboration with

Tan Lam Pepper Company

&

Private Public Partnership Project
(PRI Section)

-BSc. Thesis-

University for Professional Education Larenstein, the Netherlands

Michiel Kuit,
Khe Sanh, Huong Hoa District,
Quang Tri Province, Vietnam
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I. Foreword

This research would not have been possible without the contributions of many people, both in Vietnam and the Netherlands. In random order I would like to thank them in this section.

Mr. Tran Van Doan, director of TLPC, for his supportive attitude, and Mr. Don Jansen, who in combination with Mr. Doan made the research possible, not to mention his exhaustive revising work.

Mr. Eddy Hesselink, for his interesting comments on sustainability and the abuse of it.

Mr. Nguyen Van Thiet, for sharing his extensive knowledge on coffee and women ("short is better than long, more is better than less").

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Mr. Nguyen Thi Trieu, for the good discussions on coffee.

Mr. Herbert Lempke, for the interesting discussions and the genuine interest shown in my work, thanks again!

Thanks again everybody, and I hope the report can be used by all of you in a beneficial way.

Michiel Kuit
Khe Sanh, August 2002
The influence of a FFS on the shift to a more sustainable coffee cultivation in Huong Hoa, Vietnam

II. Abbreviations

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<th>Description</th>
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<tr>
<td>CBD</td>
<td>Coffee Berry Disease</td>
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<td>CLR</td>
<td>Coffee Leaf Rust</td>
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<td>CPC</td>
<td>Crop Protection Compendium</td>
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<td>DARD</td>
<td>Department of Agriculture and Rural Development</td>
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<td>DED</td>
<td>Deutsche Entwicklungs Dienst</td>
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<td>FAO</td>
<td>Food and Agricultural Organisation</td>
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<td>FFS</td>
<td>Farmers’ Field School</td>
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<td>Gov</td>
<td>Vietnam Government</td>
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<tr>
<td>GTZ</td>
<td>Gesellschaft für Technologische Zusammenarbeit</td>
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<td>ICO</td>
<td>International Coffee Organisation</td>
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<td>IPM</td>
<td>Integrated Pest Management</td>
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<td>IRRI</td>
<td>International Rice Research Institute</td>
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<td>LCM</td>
<td>LCM International</td>
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<td>MARD</td>
<td>Ministry of Agriculture and Rural Development</td>
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<td>NKG</td>
<td>Neumann Kaffee Gruppe</td>
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<tr>
<td>PDR</td>
<td>Peoples Democratic Republic</td>
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<td>PPP</td>
<td>Public Private Partnership</td>
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<td>PRI</td>
<td>Plant Research International</td>
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<tr>
<td>SFDP</td>
<td>Social Forestry Development Project</td>
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<tr>
<td>SOE</td>
<td>State Owned Enterprise</td>
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<td>TLPC</td>
<td>Tan Lam Pepper Company</td>
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<tr>
<td>UK</td>
<td>United Kingdom</td>
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<tr>
<td>US</td>
<td>United States (of America)</td>
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<tr>
<td>USD</td>
<td>US Dollar</td>
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<tr>
<td>Vicofa</td>
<td>Vietnam coffee and cocoa association</td>
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<td>VTA</td>
<td>Visual Tree Assessment</td>
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III. Executive Summary

TLPC is a SOE, presently in the process of equitisation (a Vietnamese form of privatisation), it tasks change from an umbrella organisation involved in the complete agricultural chain from production to export, into a more service oriented company, providing farmers with an outlet for their produce as well as providing extension on coffee and pepper. Part of this process has been to allocate land to farmers in 20 to 50 year leases (so-called blue books). These farmers are contracted to TLPC, TLPC has invested in the establishment of their coffee gardens, the farmers sell part of their produce to the company, whereas the company supplies the farmers with operational credit. Supporting TLPC in this process are a number of development organisations (GTZ, DED and PRI) and private enterprises (DE, Kraft Foods), who purchase the majority of coffee processed by TLPC.

One of the important initiatives supporting the transition and service oriented approach is the starting of FFSs in coffee. A major motivation for both the private partners to participate in this project is found in the increasing pressure to deliver sustainable produced coffee. This research focuses on the influence of the FFS on the shift to a more sustainable coffee cultivation.

Through an approach called action research, a participatory consultation with contracted farmers has taken place. This consultation, as well as informal interviews with experts and FFS facilitators, resulted in a sustainability assessment of coffee cultivation in the Huong Hoa area, and in particular the influence the FFS has had on it so far.

The findings can be divided in two categories: - FFS influence on sustainability; and
- Outside factors constraining enhancement of FFS influence on sustainability

The research demonstrated that the influence of the FFS on the shift to a more sustainable coffee cultivation is considerable. The content of the topics treated in the FFS are, in general, very relevant for increasing sustainability, the farmers' perception of the approach, quite different from what they are used to, is good. In terms of methodology a conceptual background on the facilitators side is lacking but this is more than compensated for with engagement and enthusiasm.

The main constraints in increasing sustainability of the coffee cultivation are found outside the reach of the FFS and are of a political (4 issues) and economical (4 issues) nature:
- Interaction with authorities:
The farmers are consulted in important decisions (e.g. cherry price) but the authorities (TLPC in this case) has a “veto” on all decisions and can reality chart their own course, independent
of the farmers. This creates distrust on both sides, an important characteristic of the relation between TLPC and farmers, and has a negative influence on sustainability.

- Access to information
The farmers have limited access to relevant information to improve their cultivation. Two sources are available, FFS and local extension service, but these do not co-operate. The difference in underlying principles is very big, but co-operation could be fruitful for both parties, the FFS could utilise the extensive network of the extension service to higher governing levels and research facilities, whereas the extension service could incorporate (part of) the FFS approach in their program. This seems viable, because the FFS participants expressed their satisfaction with the setup of the FFS.

- Supportive policy structure
Although MARD has formulated a policy on extension that is highly supportive to initiatives of the FFS kind, this does not seem to have filtered down to provincial and district level (hence the lack of co-operation between FFS and extension service). Furthermore, the policy structure does not allow for incentives to produce sustainable, a possible weak point when the present financial support of the private partners ends.

- Trading position of farmers
The farmers in Huong Hoa are depending on three coffee factories for the buying of their fresh cherries. All three are SOEs in transition and thus face a fragile future. Although TLPC is supported by private partners (DE and Kraft), who pay, temporarily, a better price for green beans, TLPC has to increase quality of their product significantly to compete on the world market. To enhance the trading position of farmers, farmyard processing might be an idea, if this is done properly, it allows farmers to sell their product outside the region if TLPC does not surface from the equitisation process unscathed.

- Income security
The income division of the farmers is erratically divided over the year. Naturally, the income is strongly connected with the world market price, and fluctuates heavily. This can not be altered, but the price that TLPC pays should reflect the investment the farmers make. An example is the negotiations on the cherry price; the price for selectively harvested cherries is 6% higher, whereas the extra investment in labour is around 20%.

- Landownership
TLPC leases land to farmers under the blue book regulation. This contract can not serve as collateral in the local bank where cheaper, subsidised credit is available. Consequently, the farmers are solely dependent on more expensive company credit, which decreases their capital available for investment to deliver the quality cherry that TLPC expects. Red book
distribution seems a way to ensure both increased quality of coffee cherries and farmers who can communicate on equal level with TLPC.

- Access to credit
As mentioned in the previous section, farmers have to borrow from TLPC at a higher interest rate. This constrains their adaptation of FFS practices, because these are often accompanied by slightly higher investment costs, either in inputs or in labour. Lack of cheap working capital clearly constrains the farmers in increasing sustainability.

- Infrastructure
An estimation of the paved roads percentage in Huong Hoa leads to a figure of around 60%. Although seemingly good, the paved roads are concentrated in Khe Sanh, and consequently Huong Phung experiences a lot of problems during the harvest time which coincides with the peak of the rain season. This is a serious constraint on the quality of coffee delivered from Huong Phung, the longer transport intervals lead to pre-fermentation of the cherries.

In conclusion it can be said that the FFS efforts are contributing greatly to the shift to a more sustainable coffee cultivation, but outside constraints are hindering full effectiveness. The solution, though multi-faced and not easily found, should partly be elaborated at higher governing levels, id est provincial and district authorities. If, and when these institutions create a favourable environment for farmers to work in than the practices of the FFS can be adapted at a higher rate than the present 60%, and lead to increased sustainability. Other aspects like credit provision, landownership and especially cherry price should be thoroughly discussed at TLPC and adapted to satisfy both the farmers and the company.

The most important recommendations focus on:

- Deploy field trials through the FFS in close collaboration with the farmers, with a focus on fertiliser applications, organic material and pest and disease control.
- Increase the practical components of the FFS
- Create access to cheaper credit for TLPC contracted farmers
- Devise a cherry buying policy that is mutually agreed upon, this also means that farmers and TLPC should be able to negotiate on a level of mutual respect and understanding.
- Increase infrastructural facilities, especially in Huong Phung
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1. Introduction

Quality improvement of coffee is becoming a more important objective for Vietnamese coffee producers, national organisations and international coffee roasters. With growing consumer pressure in consuming countries the scope of quality has broadened from processing and cup quality to environmental aspects and living conditions of producers. One of the opportunities to improve coffee quality is a shift to alternative and sustainable management practices of coffee plantations, devised through the Farmer Field School (FFS) approach. This approach does not only attempt to facilitate the improvement of coffee quality but, ultimately, also lead to the improvement of the producers’ livelihood. This research will explore to what extent the recently established FFS of coffee farmers in the Huong Hoa area will contribute to the shift to a more sustainable coffee production.

The project under which guidance this research will be carried out is executed by the Tan Lam Pepper Company (TLPC) in collaboration with Gesselschaft fur Technologischen Zusammenarbeit (GTZ), Deutsche Entwikelungs Dienst (DED) and Plant Research International (PRI). As a State Owned Enterprise (SOE), TLPC is responsible not only for buying agricultural products but also growing them. To large extend, this section, growing agricultural products, has been discarded in the current equitisation process. A substantial number of farmers in the Huong Hoa area now have contracts with TLPC. TLPC still owns the land but the farmers have the fruct-use for a period of 50 years. The farmers are obliged to sell at least 50% of their coffee harvest to TLPC, while TLPC is responsible for pre-financing 70% of production related expenses annually, and for providing extension.

The objective of the research described in this report is to assist the extension staff of TLPC to streamline their activities on FFS. While the farmer can utilise the FFS to improve income, productivity and quality, TLPC in turn may benefit from the increased product quality by fetching better prices on the export market.

1.1 Research context

A brief analysis ranging from global to research level will provide the background information needed to comprehend the context in which this research is carried out.

1.1.1 Global and national level

Over the last ten years Vietnam has rapidly expanded its coffee production and presently it is the second largest exporter in the world after Brazil (NKG, 2002). The majority of the coffee produced in Vietnam is Robusta with an estimated share of 99% of total production (www.coffeeresearch.org, 2002). CoffeeResearch (2002) estimates that Robusta consists of less than one-fourth of the world’s coffee production, and describes it as “more robust than the Arabica plants, but it produces an inferior tasting beverage with a higher caffeine content.”
Von Enden (2002, personal communication) however, states that Robusta-Arabica quality differences can largely be attributed to the way processing (dry vs. wet) and that the richness of body of Robusta makes it a vital component of blended coffee. According to ICO (2002) Vietnam’s role in the world coffee market is increasing: “While not the only source of the global market flood, Vietnam’s Robusta explosion has played a role in the increase of global coffee supply, and the markets have taken notice. Prices of Robusta have plummeted, trading at USD 0.54 per pound on the New York market in January 2000 to USD 0.31 per pound in March 2001, and is now relatively stable at USD 0.29 per pound in May 2002.”

The decline of Robusta prices as well as the better prices fetched by Arabica at the world market has urged the Vietnamese government (Gov) to promote the production of Arabica. According to the government plans, the present acreage of Arabica has to be increased tenfold by the year 2004. At the moment, in total some 500,000ha are under coffee cultivation, this is expected to decline to 400,000ha. Of this 400,000ha, 100,000 is to be under Arabica cultivation, up from the actual acreage of 40,000ha (Vicofa, 2002).

1.1.2 Provincial level
Quang Tri used to be the northernmost province of former South Vietnam. In the north it borders the famous 17th parallel, the former demarcation line. In various locations unexploded ordnance still constitute a danger. Quang Tri province is situated on the crossing of National Roads no. 1 (Hanoi-Ho Chi Minh City) and no. 9 (direction of Lao PDR), which is favourable for the economic development of the region. With an area of 4,590 km² and a population of 571,000, Quang Tri province is one of the smallest in the country. It has a population growth of 2.5%, which is slightly above the national average of 2.2%. The population density is 124 inhabitants per square km. In Quang Tri, presently 17% of the population lives below the poverty line (income less than 2 USD per day), whereas, according to the CIA World Factbook (2001), 37% of the total population in Vietnam lives below the poverty line. Of the total population in Quang Tri, 76.5% lives in the rural areas, and depend to a large extend on agriculture or forestry (www.home.netnam.vn/ded/projects/rural/tan_lam, 2001). For the whole country this figure is 67% (CIA World Factbook, 2001)

1.1.3 Regional and project level
Huong Hoa district is situated close to the Vietnam-Laos border. On the east side of Huong Hoa lies Tan Lam, where the TLPC office is located. The Huong Hoa district averages 600-700m altitude, not very suitable for arabica cultivation. The climatic conditions compensate to some extend the sub-optimal altitude, through the reasonably cool weather (Figure 1: Average rainfall & temperature). Two major coffee growing areas can be distinguished in Huong Hoa: Huong Phung and Khe Sanh. Throughout the district approximately 2,500ha of coffee plantations are presently cultivated.
The TLPC is one of over 60 State Owned Enterprises (SOE) in Quang Tri province now in the process of equitisation. With the equitisation new challenges arise: where previously the government would fill any budgetary gaps, TLPC has to actually make sure it makes its own money while facing fierce competition on the (world) market. TLPC has contracts with farmers who cultivate company plantations. These plantations of the company have been divided among farmers, such that the average size of a typical coffee farm now is around 1ha. The farmers are contractually obliged to sell 50% of their harvest to TLPC, which in turn is responsible for pre-financing 70% of production related costs like fertiliser, pesticides and fungicides as well as providing the farmer with technical advice through extension. In Khe Sanh, TLPC has 176ha of coffee under contract, owned by 175 farmers. The Huong Phung area comprises 59ha and about 60 contracted farmers. To improve extension activities, TLPC has, in Huong Phung, established a FFS of 30 farmers with the aid of DED. This initiative started in 2000 and is prolonged until the present day. In Khe Sanh the formation of FFSs started in March 2002, with initially 3 groups of 25 farmers each taking off. Although TLPC is obliged to deliver extension to all the farmers under contract this is as yet not feasible due to personnel shortages.

To support TLPC in the difficult process of changing from an SOE to a private company different initiatives have been deployed. Presently, three different partners work with the company: DED, GTZ and PRI, the latter two under the overall name of Private Public Partnership (PPP).
Although executed by the previously mentioned organisations, finance is put in by two major players from the coffee industry; Kraft foods and Douwe Egberts (Sara Lee). DED is focussing on extension in Tan Lam and Huong Hoa areas, where respectively pepper and coffee are the main cash crops, GTZ serves the company with advice on management and co-ordination, whereas PRI pays attention to the technicalities of cultivating coffee. According to von Enden (2001): “Each private partner has different objectives to be reached in the 3 years that the PPP will take.

Objective 1, financed through Sara Lee:
- *Best agricultural techniques for coffee cultivation have been identified for the Tan Lam area considering sustainability of production, environmental and quality aspects.*
- *Implementation has been supported.*

Objective 2 and 3, financed through Kraft foods:
- *Good manufacturing practices for sustainable coffee processing have been identified considering quality and environmental aspects.*
- *Quality standards for Arabica coffee have been developed and introduced at TLPC as a model for the coffee sector’s quality management on national level.*

Objective 4, financed through Kraft foods and GTZ:
- *Living conditions of small farming households in Huong Phung have been improved.*

1.2 Research level, problem definition

To find out possible target groups for this research, an analysis was made of the interaction between the various actors involved in coffee production for and processing by TLPC (Figure 2). Of these actors, the TLPC extension staff and the farmers under contract with TLPC were chosen as target groups. The reason for this is based on the assumption that when the number of levels involved in the development process are kept to a minimum, maximum results can be reached, especially so when the focus is on field level improvements. This approach is in line with the trend in extension work to decrease top-down structures in favour of grassroots level participation (Reemer et al., 2001). Furthermore, the aim of TLPC is to become a national source of knowledge and experience on Arabica cultivation, on the back of government plans to substantially increase Arabica cultivation (see section 1.1.1), another reason why TLPC should benefit directly from this research.
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Chapter 1. Introduction

Figure 2: Relations of actors

The main problem presently faced by coffee farmers in Huong Hoa is the low financial return of their coffee gardens on investments and inputs. This problem became acute due to the collapse of the price of coffee at the world market. Possible paths for improvement have been identified and focus on:

- The need for farmers to reduce costs and/or increase yield
- Improvement of product quality resulting in a better price

According to Op de laak (2002) the scope for technical improvement is primarily found in adaptation of fertiliser application and timing as well as improvement of crop protection. To fully comprehend the farmers’ conditions numerous initiatives are presently taking place:

- Farmer Field Schools (TLPC, DED)

  Aiming at dissemination of knowledge generated through literature research, farmers’ participation and factorial trials
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- Socio-economic survey and field book records (PRI/GTZ)
  *Aiming at an extensive description of current farmers’ practices and economical aspects of coffee cultivation.*

- Field trials: -factorial trials (DED)
  *Aiming at the identification of improved applications and timing of fertilisers and suitable coffee cultivars*
  -prototyping trials (PRI)
  *Aiming at increased efficiency of coffee cultivation through the integration of social, technical and economical aspects in the trial.*

In light of the activities deployed by the different partners and the situation of both the farmers and TLPC regarding extension in general and FFS specifically the question for this research is:

“*What is the influence of a FFS on the shift to a more sustainable coffee cultivation in terms of economics, environment and production techniques, and what are the constraints beyond farm level hindering this.*

1.3 Research objectives

This research focuses on

1. A theoretical framework for assessing the influence of FFS on sustainability;
2. methods of knowledge generation; and
3. approaches to enhance the diffusion of knowledge among farmers and the role of TLPC in this process.

Through the research it is hoped to contribute to the following objectives:

- To devise a theoretical framework that allows FFS and related activities like field trials (both factorial and prototyping), to be assessed by their impact on sustainable coffee production
- To formulate recommendations on how to maintain or improve the effectiveness of FFS in facilitating sustainable cultivation
- To contribute to the shift to a more sustainable coffee production through the assessment of the impact that the FFS has on this.

To facilitate the analysis of the situation and to allow conclusions about the role of FFS, the following questions need to be answered:

1. Are there any precedents in establishing a FFS in relation to sustainable coffee production in this area?
2. Where should the focus of the FFS be directed at in order to result in a more sustainable production of coffee?
3. What are suitable indicators of increased sustainability, related to productive, social and environmental aspects of coffee production in the Huong Hoa area?

4. Which sustainability indicators are directly influenced by the deployed activities of the FFS, and to what extend?

5. How can the effect of the FFS on sustainability be sustained or increased in relation to the curriculum contents & setup and teaching methodology?

6. What is the role of TLPC in providing extension and how does this role fit in the FFS approach?

1.4 Definitions

The main terms used throughout this report are FFS, sustainability in coffee cultivation and action research. Following this order, section 2 will discuss the meaning of these terms in the context of the situation in Huong Hoa.

1.4.1 Farmer Field School

The FFS is an approach devised by the FAO to counteract declining results in agricultural research and dissemination of technologies at the end of the Green Revolution. Numerous definitions can be found but the main idea is summarised by FAO (2000): Field Schools are organised by community-based groups of 25-30 farmers who share common interests and who can provide support to one another. Rolling and van de Fliert (199?) explain the basic approach of the FFS by stating that: “the basis for the training approach . . . is non-formal education, itself a ‘learner-centred’ discovery process. It seeks to empower people to solve ‘living problems actively by fostering participation, self-confidence, dialogue, joint decision making and self-determination.

. . . the ‘discovery learning’ by farmers on the basis of ‘agro-ecosystem analysis’, which uses their own field observation, is science informed. Hence this participatory approach does not represent a violation of the ‘integrity of science’, but rather a new interactive way of deploying science.”

1.4.2 Sustainability in coffee cultivation

Since the Brundtland commission popularised the term sustainability in the previous decade no common agreement has been reached on its’ definition. Generally speaking it is referred to as producing in such a way that the capacity for our future generations to produce does not decrease. A practical way to measure this has to be through indicators, as the definition it self leaves too many loopholes. Sustainability in coffee production can be divided in 3 groups or categories reflecting the areas where assessment is needed to make judgements on the influence of FFS activities on sustainability:

- Socio-economic sustainability:
- Political sustainability
- Cultural sustainability
- Economical sustainability

Since the Brundtland commission popularised the term sustainability in the previous decade no common agreement has been reached on its’ definition. Generally speaking it is referred to as producing in such a way that the capacity for our future generations to produce does not decrease. A practical way to measure this has to be through indicators, as the definition it self leaves too many loopholes. Sustainability in coffee production can be divided in 3 groups or categories reflecting the areas where assessment is needed to make judgements on the influence of FFS activities on sustainability:
The influence of a FFS on the shift to a more sustainable coffee cultivation in Huong Hoa, Vietnam

1.4.3 Action research

The kind of research applied here is known as action research. Unlike conventional qualitative research, action research is thought highly suitable for the analysis of social issues (Dick, 1993). Since the impact of a FFS depends largely on social interaction, be it through lectures or farmers or extension staff, action research is a suitable approach. In action research the researcher is part of the research group, this in contrast to conventional research where the individual researcher, in his quest for knowledge, is considered to be an objective observer. Science, they say, progresses by rigorously and ruthlessly testing, and attempting to falsify, speculative theories, by observation and experiment. It can never be said that a theory is true but that it is the best available (Chalmers, 1976). In contrast, action research follows a cyclic path to allow for a least one stage of critical reflection on the outcomes and the process. This stage of critical reflection searches for both confirming and disconfirming evidence. Action research tends, but is not necessarily, participative and dealing with qualitative data (Inglis, 1994).

1.5 Methodology

The approach that will be used to execute this research will consist of a literature study aimed at drawing up a theoretical framework for the assessment of the influence of a FFS on the sustainability of coffee production. To define sustainability in this particular area the literature resources will be used as a basis to which field observations, group discussions and interviews with actors will be added.

Activities of the FFS consist of a participatory approach to devising management alternatives that should lead to a more sustainable production. To test these alternatives, on-farm trials are implemented at farms of participants in the FFS, both as a learning tool and as a source of discussion topics. The farmers themselves are responsible for these trials, but they will receive guidance from the researcher. Experiences from the past have shown these trials not to be too reliable from a scientific point of view (FAO, 1995). The role of the researcher is to guide these trials and supply farmers with advice on a demand driven basis, although the monthly FFS meetings will also pay attention to progress and specific problems encountered during the trials.

After two months an assessment will be made of the results thus far achieved by the FFS in general and also this initiative. The list of indicators should help to shed light on the influence of the FFS on the sustainability of the coffee production. Naturally, a complete assessment...
will not be possible, as the harvest will take place in December/January, while this research will be ended in August. Therefore assumptions will have to be made, to ensure the validity of these, both farmers, project staff and TLPC employees will be consulted when necessary. Also refer to chapter 3 Methodology for a more detailed description of methods.
2. Literature study

The literature study was undertaken to enable the formulation of a theoretical framework for assessing the FFS influence on the shift to a more sustainable coffee production. Firstly, a brief analysis introduces the extension practices so far applied in Vietnam from a historical perspective, resulting in a description of present trends and how FFSs fit into this. Following is an analysis of the FFS approach including teaching techniques for educating adults and management and evaluation methods that can be applied to enhance effectiveness. The theoretical framework derived from this data can be divided in two, interconnected, aspects, one focussing on the inputs in the group in the form of incentives, techniques, participatory approaches and, the other on how these relate to the objective of stimulating a more sustainable production. The latter aspect will be clarified and hopefully institutionalised through a sub-framework aimed at monitoring impacts.

2.1 Government extension in Vietnam

After the American war ended in 1975 the country’s agricultural productive basis was largely devastated. Large swats of agricultural land were rendered useless in a landscape pockmarked by bomb craters and contaminated by defoliants such as agent orange, blue and white. In addition to this, substantial numbers of farmers, both male and female, died during the conflict. After the war extensive land reforms, which had already been carried out in the north, were now executed in the south. In this process “bourgeois” landowners were removed from their holdings, which were divided among (would-be) peasants, organised in Soviet-style agricultural collectives. In this process agricultural knowledge was not utilised to its full extend by the often inexperienced and dogmatic managers of the collectives. In the firmly established top-down structure central decisions regulated management, production allocation and input supply. Despite Vietnam’s fertile rice growing areas, potentially able to feed the country’s growing population and to generate sizeable export earnings, the country had to import rice from neighbouring China. In 1986, shortly before the collapse of the Soviet Union, on which Vietnam was heavily relying for financial and technical support, a new policy was issued, called Doi Moi (“renovation”). This Vietnamese version of Perestroika aimed at reforming the country’s economy to a controlled form of capitalism. It was then that extension service came off the ground, especially in the fertile rice growing delta’s. The new policy proved an excellent incentive for farmers to increase production as they were allowed to own pieces of land and sell their harvest, at least partially, to traders. From an importing country, Vietnam became gradually the world’s third exporter in 1998 after the USA and Thailand. The role of extension in this should not be underestimated, although it followed, and still is following a top-down approach, its promotion of new rice strains and inputs is, up to now, highly successful. The success of this transfer of technology was made possible by large groups of farmers working with the same crop under rather similar conditions.
The mountainous areas, however, lagged behind in their development. In view of highly differentiating circumstances like soil fertility, sloping lands, weather extremes and variations within small geographic areas the top-down extension method did not reach the good results it did in the deltas (Kuit, 2001)

2.1.1 Organisation
The current extension in Vietnam has a very complex organisational structure, (Figure 3) often resulting in shared responsibilities, or worse, unclarity about responsibilities. The directors of the Extension Centres have several superiors (MARD-Extension Deep., DARD Director, People’s Committee, Financial Dep.). Despite the organisational confusion at higher levels, Werner (2001) states that: “...at the lowest level of the organisational structure, field implementation, there is a very active search for the best and most efficient way to carry out the work.”

Werner (2001) finally concludes that: “The present government extension programs are launched in a very top-down structure with centralised (sic) target setting and budget
allocation. There is not much room for local flexibility.” Beckman (2001) has a slightly more optimistic view:

“Extension is organisationally highly diverse, with many government branches, community organisations and farmer groups.” He continues to address the possibilities for participatory extension: “The role of government is strong; it has an overall role of coordination between the various organisations involved in extension activities. The possibilities for the rural population to articulate their demand for rural services are often enhanced by the high level of organisation and the close links between community organisations and the government. The lack of independent civil society can, however, be a constraint if the community organisations concentrate on implementing national government directives rather than stimulating the communication of local interests.”

2.1.2 Strategy

Gradually, the focus of extension is becoming more demand-based. According to the Vietnamese-German Technical Cooperation Social Forestry Development Project (SFDP) Song Da (2000) “it (state and provincial extension) focuses on extension workers facilitating identification of suitable options for each individual farmer by giving him decision tools rather than prescribing technical solutions.” The World bank (2001) in its presentation of the MARD strategy from 2001-2010 confirms this: “Making extension services truly effective in promoting the intensification and diversification of agriculture will require a reorientation towards responding to farmers’ needs rather than fulfilling production targets. Training in participatory techniques and communication skills is important.”

After evaluation of the previous planning period for extension MARD (2001) acknowledged that: “...some programmes had not been realistic and appropriate according to farmer demand, their implementation was still mainly top-down, and there were still no good methods of evaluating them.” As a result of the evaluation a new policy strategy was drafted which MARD (2001) recommends:

- “To formally give extension the role of link between research, policy, markets, environment and production. Extension is the last stage before reaching the farmers with production advice, and should combine all aspects and considerations. Extension should also have the role of recommending the appropriate direction for future research.
- To direct the provinces to establish extension stations in all districts (40% still outstanding) and that the extension stations should be managed directly by the district People’s Committees. To make sure that there is enough staff capacity at all levels.
- To establish extension organisations for groups of communes in the mountain areas.
- To increase incentives for staff to work in the remote and difficult areas and to allow them to move to other positions after a certain period of work.
- To arrange training opportunities for all extension staff. To support the development of
extension education at all universities and colleges.

- To allocate responsibility to the provincial People's Committees to arrange for contracting commune extension workers, with the target of 1 extension worker per 500 households, (World bank (1999) figures indicate a 1 to 3.883 ratio) and to arrange allowances for the village extension workers.
- To encourage local farmer extension groups.
- To establish clear regulations allowing individual staff to sign economic contracts for the provision of advisory services.
- To establish clear regulations about the use of extension funds for the encouragement of extension initiatives on the part of voluntary organisations, mass organisations, research centres, etc.
- To establish consultative councils of all stakeholders and organisations involved in extension to plan the use of extension funds and to co-ordinate activities and avoid overlap.
- To establish extension funds under the extension organisations at all levels, where different people and organisations can apply for interest-free credit for extension activities."

2.2 Farmer Field School
Because of the participative nature of the FFS this approach fits in nicely with the present strategy of MARD to increase involvement of farmers in their extension programme.

2.2.1 Historical context
FFS originated as a result of Green Revolution strategies. The social approaches used in that era were at best de-humanising, assuming that farmers were often the limiting factor in agricultural production (FAO, 2001). The way to overcome this limitation of production was by providing farmers with input packages and clear instructions on how to implement them. In Vietnam this approach was also utilised and had initial success in the fertile rice deltas where growing conditions often are homogenous (FAO, 2000). However, the approach has lead to some unexpected and sometimes devastating effects, such as massive outbreaks of pests following the massive use of broad spectrum insecticides prompted massive outbreaks of pests, e.g. in Indonesia (Soehardjan, 1972). It took until the early eighties when a new approach was defined labelled the Integrated Pest Management Farmers Field School (FAO, 2001).

The FFS was the answer to many of the mistakes made in the Green Revolution. During IRRI research it became clear that farmers, as opposed to general knowledge during the Green Revolution, were very well capable of devising appropriate technologies adapted to site
specific circumstances (FAO, 2001). This was demonstrated by the fact that in the Philippines a number of farmers were outdoing IRRI researchers in yield levels of rice.

While the researcher used standard management procedures on their test plots, the farmers had utilised useful elements of the technology packages disseminated to them and discarded aspects that did not fit their circumstances, thus gaining advantage over the researchers in terms of yield levels. With the insight that farmers could very well be experts at farming, the need to establish training programs became evident after analysing yield levels of farmers, where it turned out that although some farmers out did the research stations, other were lagging behind. According to Pingali (1990): “The gap between the average of the top one-third of yields and the average of the rest of the yields, was actually wider than that between IRRI and all farmers.”

The researchers further suggested that training of farmers would be increasingly important. “Training programs become particularly important as the incremental gains in productivity are achieved by adopting …‘second generation technologies’ (such as better fertilizer incorporation technologies, integrated pest management, etc.)… more knowledge-intensive and location specific than the modern seed-fertiliser technology that was characteristic of the green revolution.” (Pingali et al., 1990)

Further, the IRRI researchers found that:
“Farmers who have the ability to learn about the new technologies discriminate among technologies offered to them by the research system, adapt the technologies to their particular environmental conditions, and provide supervision of inputs to ensure the appropriate application of the technology.” (Pingali et al., 1990)

These findings, in combinations with the heavy problems the centralized extension and promotion of production packages during the Green Revolution promoted the initiation of the FFS, starting in the Philippines.

2.2.2 Guiding principles

With the new vision that farmers are very capable of implementing techniques adapted to their circumstances 4 guiding principles for the FFS as a result of the experiences in the Philippines were drafted. Although the original FFSs focused on rice, the same principles should underlie any FFS, with the subjects changing according to crop growing stages, cropping patterns and other local circumstances. The four principles, of course, underpinning any FFS are:

- Grow a healthy crop;
- Conserve natural enemies;
- Conduct regular field observations;
Farmers become experts.

In general, to stimulate and enhance the farmers' knowledge and input in the FFS several conditions should be met according to FAO (2000):

- The FFS is field based and lasts for a full cropping season.
- A coffee FFS meets once or twice a month with a total number of meetings that might range from at least 10 up to 16 meetings.
- The primary learning material at a FFS is the coffee field.
- The Field School meeting place is close to the learning plots often in a farmer's home and sometimes beneath a convenient tree.
- FFS educational methods are experiential, participatory, and learner centred.
- Each FFS meeting includes at least three activities: the agro-ecosystem analysis, a “special topic”, and a group dynamics activity.
- In every FFS participants conduct a study comparing “old” practices with new insights.
- An FFS often includes several additional field studies depending on local field problems.
- Between 20 and 30 farmers participate in a FFS. Participants learn together in small groups of five to maximise participation.
- All FFS's include a Field Day in which farmers make presentations about the results of their studies.
- A pre- and post-test is conducted as part of every Field School for diagnostic purposes and for determining follow-up activities.
- The facilitators of FFS's undergo intensive season long residential training to prepare them for organising and conducting Field Schools.
- Preparation meetings precede an FFS to determine needs, recruit participants, and develop a learning contract.
- Final meetings of the FFS often include planning for follow-up activities."

The guiding principles and on a more practical level, the conditions, already give a clear vision on how FFS have and should be organized.

2.2.3 Educational principles

The educational principles that form the foundation of any FFS are drawn from informal adult education. As opposed to "college" teaching, informal adult education changes the role of the teacher to that of a facilitator who guides the learning process of the “students”. Throughout the professional educational literature many definitions of learning have been stated. Kolb (1984) proposed a definition of learning that is highly appropriate in the FFS approach: “Learning is the process whereby knowledge is created through the transformation of
experience.” Kolb introduced the learning cycle (Figure 4: Kolbs learning cycle), in which the process of learning is reduced to 4 elements:

- Concrete experience
- Observation and reflection
- Generalisation and abstract conceptualisation
- Active experimentation

Kolbs learning cycle is used commonly to describe the way adults learn. All FFS activities apply the learning cycle. For example, participants go into the field to engage in a Visual Tree Assessment (VTA) practice (concrete experience), after which a analysis of the collected data is conducted (observation and reflection). Following is a discussion where the analysed data is compared with precedents available in literature or other resources and used to formulate concrete actions (Generalisation and abstract conceptualisation). The implementation of the concrete action (e.g. the VTA pointed towards a possible nitrogen deficiency demonstrated by poor leaf development) leads to active experimentation in possibly a small field trial.

Knowles (1968) differentiated therefore pedagogy being the art of teaching children, from andragogy was the art of teaching adults with basic differences in roles, expectations and attitudes of students.
### Key assumptions in pedagogy and andragogy

<table>
<thead>
<tr>
<th>Key assumptions</th>
<th>Pedagogy</th>
<th>Andragogy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept of the learner</td>
<td>The role of the learner is by nature a dependent one. The teacher is expected to take full responsibility for determining what is to be learned, when it is to be learned, how it is to be learned, and if it has to be learned.</td>
<td>Because of the process of maturation a person moves from dependency towards increasing self-directedness, but at different rates for different people and in different dimensions of life. Adults have a psychological need to be self-directing.</td>
</tr>
<tr>
<td>Role of learners' experience</td>
<td>The experience learners bring to a learning situation is of little worth. It may be used as a starting point. The experience from which learners learn is that of the teacher, the textbook writer, etc. The primary techniques of teaching, accordingly, transmitted technique, lectures, reading, etc.</td>
<td>As people mature they acquire an increasing reservoir of experience that is a rich source for learning-for themselves and others. Adults attach more meaning to learning they gain from experience than what they gain from passive methods. The primary methods for adult learning are experiential.</td>
</tr>
<tr>
<td>Readiness to learn</td>
<td>People are ready to learn what society says they should learn, provided the pressure put on them (i.e. fear of failure) are great enough. Most people of the same age are ready to learn the same things. Thus, learning is to follow a standard curricula with a uniform progression.</td>
<td>People become ready to learn something when they experience a need to learn it in order to cope more satisfyingly with real life tasks or problems. The educator has a responsibility to help them discover their &quot;needs to know&quot;.</td>
</tr>
<tr>
<td>Orientation to learning</td>
<td>Learners see education as a process of acquiring subject-matter content, most of which they understand will be useful only at a later time in life. Thus the curriculum should be organised into subject-matter units which follow the logic of the subject. People are subject-centred in their approach to learning.</td>
<td>Learners see education as a process of developing increased competence to achieve their full potential in life. They want to be able to apply what they learn today to living more effectively tomorrow. Thus learning experience should be organised around capacity development categories.</td>
</tr>
</tbody>
</table>

Table 1: Key assumptions in pedagogy and andragogy (after Jarvis, 1987)

#### 2.2.4 Management and evaluation

The FFS model encourages an “adaptive management” approach by farmers to sustainably engage with the complex systems in which they live and work. The model is based on incremental, experiential learning and decision-making at the community level. To support this model continuous monitoring and feedback processes are required at the community level (Jiggins and Roling, 1999). The model encourages multi-stakeholder participation and is focused on developing more sustainable relations between people and their environment.
Analysis of agriculture biodiversity management paradigms leads to two management models based on a set of key institutional attitudes or patterns of behaviour (Pimbert, 1999). The first model is the “Conventional” approach to management, generally found among, or aspired to by the centralised agriculture services developed during the Green Revolution. The second model describes a management system that can effectively support farmer led Community IPM field activities. This second model has been termed the “Community IPM Model”.

<table>
<thead>
<tr>
<th>Management aspect</th>
<th>Conventional</th>
<th>Community IPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting point</td>
<td>Resources valued extrinsically based on the market place</td>
<td>Recognition of the inherent value in the diversity of resources and people</td>
</tr>
<tr>
<td>Key word</td>
<td>Development</td>
<td>Empowerment</td>
</tr>
<tr>
<td>Locus of decision making</td>
<td>Centralised, ideas originate in capital city, professional/expert based</td>
<td>Decentralised, ideas originate at village level, people based</td>
</tr>
<tr>
<td>First steps</td>
<td>Data collection and plan</td>
<td>Awareness, knowledge creation and action</td>
</tr>
<tr>
<td>Design</td>
<td>Static, professional based</td>
<td>Evolutionary, people based</td>
</tr>
<tr>
<td>Main resources</td>
<td>Central funds, professionals and technicians</td>
<td>Diverse, includes villages, their people and assets</td>
</tr>
<tr>
<td>Analytical assumptions</td>
<td>Reductionist (natural science bias)</td>
<td>Systems, holistic</td>
</tr>
<tr>
<td>Management focus</td>
<td>Budgetary, project meets deadlines, targets</td>
<td>Sustainable improvement and performance</td>
</tr>
<tr>
<td>Communication</td>
<td>Vertical, orders go down, reports come up</td>
<td>Lateral, mutual learning, sharing of learning and experience</td>
</tr>
<tr>
<td>Evaluation</td>
<td>External, intermittent</td>
<td>Internal, continuous, interactive and participatory</td>
</tr>
<tr>
<td>Error</td>
<td>Covered up, explained away</td>
<td>A basis of learning</td>
</tr>
<tr>
<td>Outputs</td>
<td>The empowerment of professionals. A uniform reactive agricultural “system”.</td>
<td>The empowerment of rural people. A diverse and interactive local approach to agro-ecological management</td>
</tr>
</tbody>
</table>

Table 2: Differences in management approaches (after Pimbert, 1999)

According to FAO (2001): “The starting point describes the philosophical perspective of a management system regarding the resources, natural or human, involved in an agro-ecological system. The Conventional model takes an extractive perspective, resources are valued in terms of what they will yield or can be processed to yield on the market, national or international. Humans in this approach are important because they either produce for the market or consume products. The Community IPM model values natural resources and the humans involved in working with those resources. This implies that the people involved in the FFS at community level are stimulated through the learning experiences to develop themselves and their talents. On the other hand it also implies that nobody should be left out, everybody engaged in agriculture or related activities can participate, being a women, child, illiterate or disabled is not of influence in participation. Although it must be noted that cultural perceptions may call for different meetings to include a wide spectrum of different people.
Key word describes the intention of the management model concerning the people and resources connected to an agro-ecological system. The Conventional system intends to develop humans as objects to be manipulated so that resources can be extracted or processed for the market. The human factor in this system is neither intelligent nor endowed with the right to control what he or she does or “owns”. The Community IPM model takes the position of empowering humans to control and decide about the processes and resources that they own.

Locus of decision making refers to whom is making the decisions and where they are located. Conventional systems are heavily centralised, where relatively few people are involved in taking decisions. These people are the senior professionals/bureaucrats, who often have the added cachet of being “expert”. The Community IPM model employs a decentralised approach to decision making. Consistent with the basic principle of Community IPM that, “farmers as experts”, farmers are involved in the management process. Farmers conduct participatory strategic planning exercises to develop goals, strategies and plans and take decisions regarding activities that they want to conduct to achieve their goals. Facilitators and Farmer IPM Trainers regularly hold management meetings together to decide about resource allocations to support field activities. In Vietnam Farmer IPM Trainers have participated in national level Community IPM planning sessions as well as in the designing of evaluation systems (FAO, 2001).

Management focus describes the concerns of the system. For the conventional are budgetary, deadlines, and targets (e.g. numbers of farmers “contacted”, tons of coffee harvested). The Community IPM model is concerned about the quality of its activities. The model seeks to enhance the capacities of people, both those involved in the system and those touched by the activities conducted by facilitators and alumni. The Community IPM model seeks sustainability. A concern of management within the Community IPM model is that participants in the model continue to learn. Training is regularly available for FFS facilitators and Farmer IPM Trainers. Regular technical meetings are held for alumni to exchange information regarding field studies, village IPM programme development strategies, and successful alumni created farming innovations.

Error in the conventional model is either covered up, explained away, or avoided by risk averse decisions. The model shifts responsibility for mistaken decisions from the professionals who made them to the farmers who were the victims of the mistakes. In the Community IPM model, mistakes are used as a basis for learning. If activities fail to achieve hoped for results, the implementation of the activities is examined to determine whether changes can be made to improve a given situation or whether something entirely different needs to be done.
Outputs describes what the management system hopes to achieve. In the case of the Conventional model, it is obvious that it hopes to be recognised for its professionalism, that targets are met. The model empowers the professionals within the system. As the system is risk averse, it becomes reactive rather than dynamic.”

In order to analyse later on the influence of the FFS on sustainable coffee cultivation the following paragraphs discuss literature on different aspects of coffee production ranging from cultivation to international trade.

2.3 Coffee cultivation

Coffee is a major genus of the family Rubiaceae and was classified as such by Linneaus in 1737. Chevalier distinguished four main sections in his classification for nomenclature: Eucoffea, Argocoffea, Mascarocoffea and Paracoffea. The latter is native to southeast Asia, whereas the first three are indigenous to Africa. The section Eucoffea includes the most economically important species:

- \( C. \ arabica \), in trade referred to as arabica and accounting for 76% of the world’s commercial coffee.
- \( C. \ canephora \) Froehner, in the trade referred to as robusta and accounting for 23% of the world’s production
- \( C. \ liberica \) Hiern, with 1% of the world’s production.

Well known varieties of \( C. \ arabica \) are “Typica” and “Bourbon”. Most of the commercial strains have been derived from the above, such as Cattura in Brazil and Colombia, Mundo novo in Brazil, Blue Mountain in Jamaica and Catimor in Portugal. The main selection criteria was often resistance to leaf-rust or coffee berry disease (de Graaff, 1986).

2.3.1 Origin and distribution

The origin of arabica coffee is the Ethiopian Massif, where it occurs naturally in forests between 1500 and 2000m above sealevel. The Arabs introduced it to countries in the middle-east and Sri Lanka before the Dutch, probably from Yemen, brought it to Java. The story goes that the Burgomaster of Amsterdam sent vigorous progeny from one tree (\( C. \ arabica \) var. \( typica \)) originally from Java, to Louis XIV, who asked in his will that the seeds from this tree be distributed to all his tropical empire. This indeed happened, through French Guyana, it reached Brazil in 1729; through Haiti and Martinique it reached other Latin American and Caribbean countries. The French also introduced coffee to their African and Asian territories, from where missionaries spread it further inland (Pendergrass, 1999). Coffee reached Vietnam in the 19th century and was grown on a modest scale by French plantation owners (Kuit, 2001).
2.3.2 Morphology

Coffee often grows into a multi-stemmed shrub-like tree, averaging 4-5m in height but may reach up to 10m in the wild. A taproot forming cluster-like ramifications can extend several meters into the soil. An important botanical feature for pruning is its two-types of stem growth. The tree has orthotropic (vertical) and plagiotropic (horizontal) parts, the trunk and main axis are orthotropic as well as some shoots originating from auxiliary buds that normally remain dormant. The wood on which the fruit grows extends more or less horizontal. *C. arabica* is tetraploid (2n=44) and self-pollinating. The ovary develops into a globular or oval drupe, normally containing two seeds inside a sweet mucilaginous pulp, which is covered by a rather thick skin. Although it is usually called a cherry or berry this is botanically incorrect (www.ico.org, 2002). The fruits take 7-9 months to mature. When mature the berries turn red, and for some varieties yellow, the skin covers a sweet mucilaginous pulp. Inside the fruit, the two seeds (coffee beans) lie with their flat sides together. The beans are covered by a thin and yellowish skin, the parchment. Underneath that skin is a thin and closely fitting membranous tegument, known as the silver skin. These layers have to be removed before roasting by a de-hulling operation (de Graaff, 1986).

2.3.3 Ecology

A clear distinction has to be made between *C. arabica* and *C. robusta*. The first is an upland species, growing best at an annual average temperature of 18-25°C with minimum temperatures of around 13°C and maximum temperatures not exceeding 30°C. Because of these temperatures, the elevation at which coffee is grown actually depends on the latitude. Between latitudes 25°N and 25°S, the upper limits are determined by frost. Though on the equator arabica coffee may be found at 2500m, whereas in Parana (Brazil) at a latitude of 24°S, it is grown at 100-200m. Ideally, 1500-2500 mm of rain will fall over a nine month period with a three month dry season coinciding with the harvest (de Graaff, 1986). Areas with less rainfall can use irrigation to compensate. A period of moisture stress (rain after a dry spell) helps cause a homogenous flowering and therefore promotes a clearly defined harvesting season. Locations with more than one wet season will have more than one harvesting season. There is a direct relationship between extremes of day and night time temperatures and coffee quality. Experimental evidence has indicated that a large gap between day and night time temperatures is beneficial to the flavour of fruits.

2.3.4 Pests and diseases

Of the pests and diseases found in coffee, coffee leaf rust (CLR) (*Hemileia vastarix*) is by far the most destructive (CPC, 2000) The first documentation of this agent appeared in 1861. In 1869, the fungus appeared in Ceylon (now Sri Lanka) and within ten years it devastated the country's entire coffee industry. In the years since, coffee leaf rust has appeared in every coffee producing region except Hawaii (de Graaff, 1986). This fungus is largely responsible for the modernisation of coffee plantations in South America.
Coffee rust is characterised by yellow-orange powdery lesions on the abaxial surface of leaves where it attacks through stomata; it rarely occurs on stems or fruit. All *Coffea* genotypes are susceptible to some degree, though cultivars such as Timor and Icatu exhibit a high resistance (Ferreira and Boley, 1991). Control using fungicidal sprays is more effective with copper-based than systemic fungicides. A new development is the application of granular systemic fungicides to the soil.

The very destructive coffee berry disease (CBD) (caused by *Colletotrichum kahawae*) of arabica coffee is still restricted to Africa, although climatic conditions in certain high-altitude areas of Latin America and Asia are considered favourable to epidemic outbreaks. Coffee berry disease was first discovered in Kenya in 1920 (CPC, 2000). The fungus lives in the bark of the coffee tree and produces spores which attack the coffee cherries. Spraying has been determined to be the best way to avoid the coffee berry disease. Captafol and copper-based fungicides have been effective.

Robusta coffee is resistant to both CLR and CBD (de Graaff, 1986). Diseases of both coffee species include: brown eye spot (*Cercospora coffeicola [Mycosphaerella coffeicola]*) on leaves of young coffee; tip dieback caused by *Rhizoctonia spp.*; wilt disease caused by *Fusarium solani*; root diseases caused by *Armillaria mellea, Fomes noxius [Phellinus noxius]* and *Rosellinia spp.*, particularly on recently cleared land or where shade trees have been removed; and damping-off in coffee nurseries caused by *Rhizoctonia solani* (CPC, 2000).

Important nematodes attacking both arabica and robusta coffee are *Meloidogyne spp.*, causing root knots and galls, *Pratylenchus coffeae, Radopholus similis* and *Rotylenchus spp.* (CPC, 2000).

Over 900 insect species are known to infest coffee. Major pests are coffee berry-borer (*Hypothenemus hampei*) particularly in robusta coffee, various stem-borers (*Xyleborus spp., Xylotrechus quadripes, Zeuzera coffeae*), green scale (*Coccus viridis*) and mealybug (*Planococcus citri*). Integrated pest management in coffee, based on early-warning systems in combination with chemical, cultural and biological control, is more effective than frequent application of broad-spectrum and persistent insecticides (CPC, 2000).

2.4 World coffee production and trade

2.4.1 Production

There are basically four main production regions: South America, Central America, Africa and Asia & Oceania. South American coffee production is heavily dominated by Brazil, the world’s largest exporter, and Columbia. Over the last decade they accounted for 40% of world production. Brazilian output has shown wide annual fluctuations leading to sizeable variations in global production and prices.
Central American countries predominantly produce washed arabicas. Following higher coffee prices since mid-1990, rehabilitation, replanting and improvements in maintenance have led to an increase of production capacity (LCM, 1999). Africa accounts for between 15-20% of global production. With lower prices in the late 1980s and early 1990s African production fell. However, higher prices and the effects of economic liberalisation policies (which have increased the proportion of the export price received by growers), have led to an increase in interest in coffee production throughout Africa (de Graaff, 1986). Since the mid-1980s, Asia & Oceania have increased coffee production quickly, and in 1997/98 produced 21.1 million bags, of which 3.8 million bags were arabica (NKG, 2002). The large rise in production was largely the result of higher Vietnamese production. Production would have been higher in recent years had not Indonesia suffered heavily from poor weather associated with El Niño (LCM, 1999). The absolute and relative production of the regions and the various countries varies from year to year (Figure 5: Production estimates by crop year), although there is a clear trend in the last years that the production of Vietnam is increasing in absolute and relative terms.

![Production estimates by crop years](image)

*Figure 5: Production estimates by crop year (after NKG, 2001)*

2.4.2 Trade

De Graaff (1986) states that: “coffee is a typical example of south-north trade, approximately 95% of the coffee on the world market is exported by less developed countries and 94% is imported by developed countries. In most exporting countries coffee is the most important agricultural export production often followed by sugar, rubber and cocoa products.” He indicates furthermore the ambivalence of many producer countries governments.
According to de Graaff (1986): "the governments of these countries try on the one hand to satisfy producers to ensure maintaining or increasing production levels. On the other hand, though, they have to impose taxes and regulate exports in order to utilise export and foreign exchange earnings to the full. To what extent both types of intervention are successful depends largely on the highly unstable world market price."

An attempt to stabilise fluctuating prices has been taken was early as 1959 with the International Coffee Agreement. This agreement was based on basic export quotas allocated to producing countries in an effort to control market prices on the one hand and guaranteed prices by importing countries on the other hand. Ratification did not come during the fierce negotiations of 1962, after prolonged negotiations a tentative quota agreement was reached. The deadline for ratification was set at December 1963, in the meantime the five-year agreement would go into effect informally (Bates, 1997). The agreement called for quarterly quota adjustments requiring approval by two-thirds of both importing and exporting countries. Pendergrast (1995) points at the agreements weakness by noticing that: "Countries with low coffee consumption like Japan, China and the Soviet Union were exempted from the quota system, which gave exporters the opportunity to export unlimited amounts to Japan and behind the iron curtain. The agreement gave lip service to promotional efforts to increase worldwide consumption and to limit overproduction, but the provisions were all voluntarily. Any country could withdraw from the agreement with ninety days’ notice." Since that time more attempts have been undertaken to stabilise prices and production but it never effectually worked. Main problems centred on the voluntarily joining and the falsification of export certificates as well as so-called tourist coffee which implied that importing countries not under the agreement served as a transit point for large importers, enabling exporters to circumvent the agreement.

After oil, coffee is the world’s largest valued commodity in international trade. In coffee there is strong relation between production and consumption, meaning that prices are strongly influenced by demand and supply. The dramatic fall in coffee prices from mid-1989 to mid-1994, following the ending of International Coffee Agreement export quotas, led to strongly decreased export earnings for producer countries, from a peak in 1986/87 at 12,5 billion USD to approximately 5,4 billion USD in 1992/93. The higher prices following the Brazilian frost in 1994 led to an increase of export values to 12,4 billion USD in 1996/97 and remained at 12,0 billion USD in 1997/98. Presently, coffee prices are relatively stable at an ultimate low of 0,32 USD/pound.

2.4.3 Trade and production characteristics of Vietnam

Vietnam largely produces robusta coffee, but also small quantities of arabica. While producing around 70,000 bags in the 1960s and 300,000 bags in the mid-1980s, production increased tremendously over the following years reaching 6.7 million bags in 1997/98. The increase in production is due to an increase in planting and an increase in yields.
Processing of NKG data results in Figure 6: Production and yields showing the production and yields over the last four decades.

![Production and yields](image)

*Figure 6: Production and yields (after NKG, 2001)*

LMC (1999) reveals that: “Presently, Vietnam has around 400,000ha, a small portion of which is arabica. Under a new government scheme, backed by the French Development Fund 100,000ha of arabica are to be planted before 2010.” The majority of the coffee production is smallholder operated, with sun drying of cherries. Since 1988 smallholders are allowed to sell to both the private and public sector (MARD, 2002). However, the public sector dominates and consists of trading companies owned by provinces, districts and cities.

Vietnams strong position in the coffee market is partly due to the low production costs. Low wage rates coupled to high yields make it the most effective robusta producer according to LMC (1999). The breakdown of the production costs reveals that maintenance, harvesting and processing are the most important components costs. Still, these costs are well below world average at 46% of total costs. Wage rates in Vietnam are lower than in any other producing country, resulting in labour costs to average 43% of total costs between 1993/94 and 1997/98, compared with a worldwide proportion of 60%. This enabled Vietnam to still make a marginal profit while in other countries farmers have been neglecting their crop because they can not pay the inputs in the form of labour and fertilisation anymore. However, if prices continue to drop even a low wage country like Vietnam will not be able to produce profitably, especially so when the quality aspects of the coffee are considered.
Vietnam is not renowned for its' high quality coffee and, although improvements are made, a shift to more sustainable production system is vital for the profitable continuation of Vietnam's coffee production. This is where the FFS approach comes in the picture as a possible route to sustainable production.

2.5 Coffee and sustainability

Since the Brundtland commission put sustainability on the map in 1987, close to 100 definitions of "sustainability" have been published. Although controversial and diffuse due to conflicting definitions and interpretations of its meaning, the concept of sustainability is useful because it calls attention to concerns about agriculture that stress co-evolution of socio-economic and natural systems (Reijntjes et al. 1992). Main focus is often directed at plant nutrition through organic nutrient sources, nutrient balances and IPM balanced against the social and cultural context of a given situation. This is emphasised by Andrew Campbell (1994) when he stated that: "attempts to define sustainability miss the point that, like beauty, sustainability is in the eye of the beholder...It is inevitable that assessments of relative sustainability are socially constructed, which is why there are so many definitions."

Young (1997) states that sustainability: "has been variously defined, although the Food and Agricultural Organization (FAO) definition has gained common acceptance." The FAO (1995) defines sustainability as: "Sustainable agriculture and rural development are defined as the management and conservation of the natural resource base, and the orientation of technological and institutional change, in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development conserves land, water, and plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable, and socially acceptable."

Altieri (1995) further details the focus of sustainable agriculture by formulating strategies for enhancing agricultural diversity leading to sustainable agricultural systems:

- **Crop Rotations**: By incorporating temporal diversity into cropping systems, crop nutrients are provided from one season to the next, and the life cycles of insect pests, diseases, and weeds are interrupted (Sumner 1982, Liebman and Ohno 1998).
- **Polycultures**: Cropping systems in which two or more crop species are planted within certain spatial proximity can result in complementarities that enhances crop yields (Francis 1986; Vandermeer 1989).
- **Agroforestry Systems**: Agricultural systems in which trees or other perennials are grown together with annual crops and/or animals can benefit from complementary relations between components, at the same time producing multiple products from the agroecosystem (Nair 1982).
• **Cover Crops**: The use of pure or mixed stands of legumes or other annual plant species, e.g., under fruit trees for the purpose of improving soil fertility, enhances biological control of pests and modifies the microclimate (Finch and Sharp 1976); also intercropped plant species can reduce erosion and provide nutrients to the soil (Magdoff 1992).

• **Animal Integration in Agroecosystems**: High biomass output and optimal nutrient recycling can be achieved through biological processing and the return of animal manure to the soil (Pearson and Ison 1987).

These forms of agroecosystem management, though diverse, share the following features:

• **Vegetative cover** to conserve soil and water is maintained through the use of no-till practices, mulch farming, and use of cover crops and other appropriate methods.

• A regular supply of **organic matter** for the soil is provided through the addition of compost, green manures, animal manure, and/or promotion of soil biotic activity.

• **Nutrient recycling mechanisms** are enhanced, for example, through the integration of livestock systems based on legumes.

• **Pest regulation** is promoted through the enhanced activity of biological control agents, achieved by introducing and/or conserving natural enemies and antagonists (Altieri and Nicholls 1999).

In coffee cultivation a number of initiatives has been deployed over the years. From organic bird friendly coffee to Fair Trade, Coffee Kids and IPM FFS. However the initiatives were often small-scale, it is only since the last few years that the coffee industry, under increasing pressure from consumers, starts to explore sustainable production on farm and local processing level. The importance of the major players getting involved is tremendous, when an organisation like the Neumann Kaffee Gruppe, that handles 15% of the worlds green bean volume, takes initiative, the scoop of impact can be drastically broadened. On farm level this is noticed in numerous projects financed by these industry giants aiming to improve product quality, an important step towards increased sustainability. Auridac (1997) noticed this increased awareness when he stated that: “The concept of sustainability is a relatively recent response to the decline in quality of the natural resource base associated with modern agriculture.

2.5.1 **Contrasting views**

Where Altieri (1995), Young (1997) and Reijnietjes et. al. (1992) stress the need to incorporate natural processes into farming practices, making use of the benefits that cover crops, nutrient recycling, integrated systems of animal husbandry and crops and agroforestry systems can bring, to sustain agriculture in general and feed a growing world population.
Apart from pointing at the need to incorporate natural processes, Pretty (1995) also pleads for institutional reforms and government interference to enhance these efforts. There are, however, several different schools of thought.

The strongly contrasting views of e.g. Rosegrant and Agcoalli (1994) focus on the believe that the market mechanism will always meet an increasing demand of food. To exemplify their point they mention that: “…food prices are falling (down 50% in the past decade for most commodities), this indicates that there is no current crunch over demand. Food production will continue as the fruits of biotechnology ripen, so boosting plant and animal productivity.”

This market regulatory view is taken to larger heights by Avery (1995), Wirth (1995) and Knutson et al (1990). According to their view the “Third World” countries will not be able to feed themselves because of a myriad of ecological, institutional and infrastructural reasons, therefore the industrialised world has to fill the increasing gap between agricultural productivity and consumption by an increasing population. Proposing large, mechanised operations that take more “marginal” farmers out of business, the pressure on natural resources will decrease. The large producers will then be able to trade their products with those who need it, or have it distributed by famine or relief aid. Avery (1995) argues that any adverse health and environmental consequences of chemically-based agricultural systems are minor compared with those resulting from expansion of agriculture into new lands. External inputs and free trade are said to represent a crucial part of any strategy for feeding the world.

Borlaug (1992) summarised these views when he said that: “Leaders in developing countries must not be duped in the believe that future food requirements can be met from continuing reliance on…the new and complicated low-input, low-output technologies”

A nationwide survey in the US (NAF, 1994) showed that at least 40,000 farmers in 32 states are using sustainable agriculture technologies and have cut their use of external inputs substantially. This includes 2,800 sustainable agriculture farmers in the North Western States, who grow twice as many crops compared with conventional farmers, use 60-70% less fertiliser, pesticide and energy, while their yields are roughly comparable.

The findings of NAF (1994), together with numerous case studies by e.g. Pretty (1995), give clear evidence as to why sustainable agriculture can and must succeed. Furthermore, the market regulatory view, attempting as it may seem, is assuming that the US and Europe will, at least, decrease their protectionist measures. Recent clashes between the US and Europe (Volkskrant, 2002) indicate that this is not likely to happen soon.
2.5.2 Designing sustainable cultivation

Sustainability in agriculture often aims at long term productivity, for this a variety of methods can be used:

- Optimizing the use of *locally available resources* -- combining different components of the farm system, i.e., plants, animals, soil, water, climate and people, so that they complement each other and have the greatest possible synergetic effects.

- Reducing reliance on *off-farm, external, and non-renewable inputs* -- in part because they have potential to damage the environment or can harm the health of farmers and consumers. Benefits accrue to farmers also from minimizing the variable costs of production by more careful and targeted use of the remaining inputs. Agroecological approaches do not assume that there will be no outside inputs, but there is a burden of proof that these will indeed add to economic and environmental net benefits over multiple years, and that such benefits cannot be attained by other, less costly means.

This leads to the principle of:

- Relying mainly on *resources within the agroecosystem* -- replacing external inputs with nutrient cycling, better conservation, and an expanded use of local resources where possible.

- Improving the *match-up between cropping patterns and productive potentials* -- as well as with environmental constraints of climate and landscape, to ensure the long-term sustainability of current production levels.

- Working to enhance appreciation of and to conserve *biological diversity*, both in the wild and in domesticated landscapes, making optimal use of the biological and genetic potential of plant and animal species.


The goal of designing sustainability in this way is to integrate components (Figure 7) in ways that improve overall biological efficiency, preserve biodiversity and maintain agroecosystem productivity and its self-regulating capacity. By approximating the structure and function of natural ecosystems in a given locality, an agroecosystem with high species diversity and a biologically active soil will promote natural pest control, nutrient recycling and continuous soil cover to prevent resource losses (Altieri, 1989).
The goal of designing sustainability in this way is to integrate components in ways that improve overall biological efficiency, preserve biodiversity and maintain agroecosystem productivity and its self-regulating capacity. By approximating the structure and function of natural ecosystems in a given locality, an agroecosystem with high species diversity and a biologically active soil will promote natural pest control, nutrient recycling and continuous soil cover to prevent resource losses (Altieri, 1989).

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**Figure 7: Requirements for a sustainable agriculture (after Altieri, 1989)**
3. Methodology

The approach that will be used in this research will consist of a literature study aimed at drawing up a theoretical framework for the assessment of the influence of a FFS on the sustainability of coffee production. To define sustainability in this particular area the literature resources will be used as a basis to which field observations and group discussions and interviews with actors will be added. The FFSs in Huong Hoa consists of around 75 participants, divided into groups of about 25 persons each. This facilitates contact during meetings with the target group.

Activities of the FFS will consist of a participatory approach to devising management alternatives that should lead to a more sustainable production. To test these alternatives, on-farm trials are implemented at club members farms, both as a learning tool and as a source of discussion topics. The farmers themselves are responsible for these trials, but they will receive guidance from the researcher. Experiences from the past have shown these trials not to be too reliable from a scientific point of view. However, the attitude objective in this context is more important than factual results. The role of the researcher is to guide these trials and supply farmers with advice on a demand driven basis, although the monthly FFS meetings will also pay attention to progress and specific problems encountered during the trials.

3.1 Research requirements, actors and approaches

To assess the influence of the FFS on the sustainability of coffee cultivation a number of aspects need consideration, which are summarised in Table 3: Research requirements, actors and approaches as related to research questions

<table>
<thead>
<tr>
<th>Information requirement</th>
<th>Resources or actors involved</th>
<th>Approach</th>
<th>Related research question</th>
<th>Expected results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Define sustainability</td>
<td>1.1 Literature</td>
<td>Analysis of selected literature on sustainable agriculture</td>
<td>What are suitable indicators of increased sustainability, both productive, social and environmental in coffee production in the Huong</td>
<td>Theoretical basis for assessment framework</td>
</tr>
<tr>
<td></td>
<td>1.2 Farmers</td>
<td>Participatory analysis and priority ranking through group discussions</td>
<td></td>
<td>Adapting assessment framework to local circumstances</td>
</tr>
<tr>
<td></td>
<td>1.3 TLPC extension staff</td>
<td>Informal interviews</td>
<td></td>
<td>Identification of sustainability issues as seen by extension staff</td>
</tr>
</tbody>
</table>
### Table 3: Research requirements, actors and approaches as related to research questions

<table>
<thead>
<tr>
<th>Section</th>
<th>1.4 “Outside” experts</th>
<th>2.1 Literature</th>
<th>2.2 Extension staff</th>
<th>2.3 Farmers</th>
<th>2.4 FFS meetings</th>
<th>3.1 Farmers</th>
<th>3.2 Extension staff</th>
<th>4.1 Farmers</th>
<th>4.2 Extension staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methodology</td>
<td>Informal interviews</td>
<td>Exploration of FFS literature</td>
<td>Informal interviews</td>
<td>Priority ranking of subject matter taught and linkage to sustainability views as expressed by farmers under point 1.2</td>
<td>Participation and observation of FFS meetings</td>
<td>Group discussions, field observations</td>
<td>Informal interviews</td>
<td>Group discussions, priority ranking of needs</td>
<td>Informal interviews</td>
</tr>
<tr>
<td>Verification and broadening of definition by incorporation of international aspects influencing local circumstances</td>
<td>Overview of FFS approaches</td>
<td>Overview of curriculum setup &amp; contents and teaching methodology</td>
<td>Analysis of the extend to which the FFS fulfils local expectations, needs and demands related to farmers’ perception of sustainability</td>
<td>Informal assessment of curriculum setup &amp; contents and teaching methodology</td>
<td>Assessment of application of FFS taught sustainable cultivation practices</td>
<td>Assessment of application of FFS taught sustainable cultivation practices as seen by extension staff</td>
<td>Where should the focus of the studying club be directed at in order to result in a more sustainable production of coffee?</td>
<td>Comprehensive list of opportunities in the FFS curriculum</td>
<td></td>
</tr>
</tbody>
</table>

#### 3.2 Quantification of actors

In the execution of the research, various actors are approached, the type of actors and the number of people contacted vary with the research requirement (Figure 10).
The influence of a FFS on the shift to a more sustainable coffee cultivation in Huong Hoa, Vietnam

-Chapter 3. Methodology-

<table>
<thead>
<tr>
<th>Research requirement</th>
<th>Actors involved</th>
<th>Number and percentage of total</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Define sustainability</td>
<td>Farmers</td>
<td>25 farmers; 33%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.2 TLPC extension staff</td>
<td>2 staff; 100%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.3 “Outside” experts</td>
<td>3</td>
<td>Expatriate project staff</td>
</tr>
<tr>
<td>2. Analyse FFS curriculum, setup and teaching methodology</td>
<td>4.3 Extension staff</td>
<td>2 staff; 100%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.2 Farmers</td>
<td>75 farmers; 100%</td>
<td>3 separate discussion groups</td>
</tr>
<tr>
<td>3. FFS impacts on sustainability</td>
<td>3.1 Farmers</td>
<td>75 farmers; 100%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.2 Extension staff</td>
<td>2 staff; 100%</td>
<td></td>
</tr>
<tr>
<td>4. Cultivational and organisational needs assessment</td>
<td>4.1 Farmers</td>
<td>75 farmers; 100%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.2 Extension staff</td>
<td>2 staff; 100%</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Quantification of actors

The group discussions with farmers will be held within the existing structure of the FFS. Of the total of 75 FFS participants, 69 have joined in the discussion groups. The two groups in Khe Sanh consisted of 21 women and two men, the other was formed by 15 men and 10 women. The third group in Huong Phung consisted entirely of men, the reason being that these farmers are settled in the lowland and only come up to Huong Phung for shorter periods of time.

The number of men and women joining the group discussions give a fairly accurate representation of the gender ratios in household labour where coffee is concerned.

3.3 Consequences of methodology on validity

The target group of this research are farmers participating in the FFSs. The total number of participants is around 75 people, through the group discussions all these people can be consulted. This results in a high grade of reliability when FFS topics are considered. A downside of using only FFS participants may be that, because of their better access to information, their opinion on local sustainability issues is not reflecting the general situation. Hopefully this is countered by the participants in Khe Sanh who have only recently started attending the FFS.
4. Results

The framework (Table 5) lines out possible sustainability indicators that can be influenced by the FFS. In informal interviews with three local experts¹ and different workshops with farmers indicators thought suitable for Huong Hoa are selected. The rating of the indicators (Table 5) is the result of extensive informal interviews, workshops with FFS participants, field observations and literature review. An assessment of macro indicators (section Fehler! Verweisquelle konnte nicht gefunden werden.) advances the micro level (FFS) assessment. Part of these macro indicators relate to farm management and the FFS, and are controllable by the farmers, others are found beyond farm level and are much more difficultly influenced by the farmers and the FFS. Further differentiation between micro and macro indicators will be made to analyse the sustainability of the cultivation system.

¹ Mr. Jan von Enden, project co-ordinator of “Sustainability of coffee cultivation”; Mr. Thiet, FFS facilitator and coffee farmer; Mr. Trieu, TLPC employee and owner of fertiliser shop.
### 4.1 Overall assessment

#### Macro indicators of sustainability and their rating in Huong Hoa

<table>
<thead>
<tr>
<th>Indicator category</th>
<th>Indicator</th>
<th>Description</th>
<th>Possible ratings (scale 1-10)</th>
<th>Actual rating</th>
</tr>
</thead>
</table>
| **Political**      | Interaction with authorities | • Consulting population  
                    • Consulting, but with “veto” on authorities side  
                    • One way communication | • 6-10  
                    • 3-5  
                    • 1-2 | • 5 |
|                    | Access to information | • Free access to relevant and up to date information  
                    • Limited access to information  
                    • Very limited access to information | • 6-10  
                    • 3-5  
                    • 1-2 | • 5 |
|                    | Supportive policy structure | • Bonus for sustainable practices  
                    • Supportive policy in place, but not yet operational  
                    • No supportive policy structure | • 8-10  
                    • 5-7  
                    • 1-4 | • 4 |
|                    | Trading position of farmers | • Independent trade channels available  
                    • Farmers depending on limited number of traders  
                    • No trade channels available | • 7-10  
                    • 4-6  
                    • 1-3 | • 4 |
| **Economical**     | Income security | • Household income enough to support the family and evenly spread over the year  
                    • Erratic income division over the year  
                    • Household income insufficient to support family | • 8-10  
                    • 5-7  
                    • 1-4 | • 5 |
|                    | Landownership | • Redbook (=ownership)  
                    • Greenbook (=Gov lease)  
                    • Bluebook (=SOE lease) | • 8-10  
                    • 5-7  
                    • 1-4 | • 2 |
|                    | Access to credit | • Access to affordable credit  
                    • Limited access to credit  
                    • No access to credit | • 8-10  
                    • 4-7  
                    • 1-3 | • 4 |
|                    | Access to inputs | • Access to affordable inputs in the vicinity of the farm  
                    • Access to affordable inputs  
                    • Limited access to inputs | • 1-4  
                    • 5-6  
                    • 7-10 | • 6 |
|                    | Infrastructure | • >80% of roads paved  
                    • 50-80% of roads paved  
                    • <49% of roads paved | • 9-10  
                    • 5-8  
                    • 1-4 | • 6 |
| **Social & Cultural** | Labour | • Seasonal labour available  
                    • Limited access to seasonal labour | • 7-10  
                    • 5-6 | • 9 |
<table>
<thead>
<tr>
<th>Technical &amp; Environmental</th>
<th>• labour</th>
<th>Seasonal labour hardly available</th>
<th>• 1-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Child labour</td>
<td>• Household supportive labour</td>
<td></td>
<td>• 6-10 • 8</td>
</tr>
<tr>
<td></td>
<td>• School-replacing labour</td>
<td></td>
<td>• 1-4</td>
</tr>
<tr>
<td>• Participation of women</td>
<td>• No. of women in FFS reflects no. of women working in coffee</td>
<td></td>
<td>• 8-10 • 9</td>
</tr>
<tr>
<td></td>
<td>• More women working than attending FFS</td>
<td></td>
<td>• 5-7</td>
</tr>
<tr>
<td></td>
<td>• Little female participation</td>
<td></td>
<td>• 1-4</td>
</tr>
<tr>
<td>• Inputs (fertiliser)</td>
<td>• Yield related input use with correct timing</td>
<td></td>
<td>• 8-10</td>
</tr>
<tr>
<td></td>
<td>• Limited relation between yield and amounts applied, incorrect timing</td>
<td></td>
<td>• 5-7 • 6</td>
</tr>
<tr>
<td></td>
<td>• Hardly any yield related fertilisation</td>
<td></td>
<td>• 1-4</td>
</tr>
<tr>
<td>• Nutrient recycling</td>
<td>• Returning organic matter to soil</td>
<td></td>
<td>• 7-10</td>
</tr>
<tr>
<td></td>
<td>• Limited use of organic material</td>
<td></td>
<td>• 4-6 • 5</td>
</tr>
<tr>
<td></td>
<td>• Hardly any use of organic material</td>
<td></td>
<td>• 1-3</td>
</tr>
<tr>
<td>• Use of cover crops</td>
<td>• Use of e.g. legumes for N-fixation</td>
<td></td>
<td>• 8-10</td>
</tr>
<tr>
<td></td>
<td>• Use of weeds for cover (cutting instead of weeding)</td>
<td></td>
<td>• 5-7</td>
</tr>
<tr>
<td></td>
<td>• Hardly any use is made of cover crops</td>
<td></td>
<td>• 1-4 • 4</td>
</tr>
<tr>
<td>• Agro-forestry</td>
<td>• Use of shade trees, with additional economic benefits</td>
<td></td>
<td>• 8-10</td>
</tr>
<tr>
<td></td>
<td>• Use of shade trees</td>
<td></td>
<td>• 5-7 • 6</td>
</tr>
<tr>
<td></td>
<td>• Hardly any use of shade trees</td>
<td></td>
<td>• 1-4</td>
</tr>
<tr>
<td>• Pest and disease control</td>
<td>• Use of IPM measures</td>
<td></td>
<td>• 7-10</td>
</tr>
<tr>
<td></td>
<td>• Selective application</td>
<td></td>
<td>• 4-6</td>
</tr>
<tr>
<td></td>
<td>• Unselective application</td>
<td></td>
<td>• 1-3 • 4</td>
</tr>
</tbody>
</table>

**Average rating** | **6**

Table 5: Macro indicators of sustainability and their rating in Huong Hoa

### 4.1.1 Justification for rating of sustainability indicators

The general assessment reveals that constraints in increasing sustainability are primarily found in the political and economical indicator category (Table 5), although technical constraints also occur. A brief justification of the points further exemplifies the rating (Table 6).
Table 6: Relevance of indicators of sustainability for coffee cultivation in Huong Hoa

<table>
<thead>
<tr>
<th>Category</th>
<th>Indicator</th>
<th>Rating</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical &amp; Environmental</td>
<td>Interaction with authorities</td>
<td>5</td>
<td>The communication between authorities, be it governing bodies or TLPC, and farmers is often marked by a one-way type of interaction, i.e. according to top-down format. Increasing two-way interaction would certainly benefit sustainability as it gives farmers (i.e. clients of TLPC) the opportunity to voice their needs, and TLPC the chance to improve their services.</td>
</tr>
<tr>
<td></td>
<td>Access to information</td>
<td>5</td>
<td>Concerning coffee cultivation, the farmers have three means of access. Firstly, the FFS focussing on technical information covering the whole cultivation process. Secondly, input supplying companies extending advice on input use, and the Huong Hoa extension station, both seem weakly developed. Thirdly, the network of farmers exchanging ideas on coffee cultivation. The latter aspect seems underdeveloped and could be a focus point for the FFS.</td>
</tr>
<tr>
<td></td>
<td>Trading position of farmers</td>
<td>3</td>
<td>Three coffee factories are present in Huong Hoa, all SOEs in transition, which makes their position fragile. TLPC is largely dependent on DE and Kraft in selling coffee. Apart from these, there are no regional selling points for fresh cherries.</td>
</tr>
<tr>
<td></td>
<td>Income security</td>
<td>4</td>
<td>Farmer’s income is strongly influenced by the fluctuating, and currently low, coffee price on the world market. However, the PPP partners Kraft and Sara Lee made it clear that they are willing to pay more for good quality coffee, which should/could be an incentive for TLPC to focus on quality of coffee at the farm level. This effect will be felt by the farmers too, as TLPC plans to pay the farmers more for better quality.</td>
</tr>
<tr>
<td></td>
<td>Landowner ship</td>
<td>2</td>
<td>Absence of redbooks makes the farmer highly dependent on TLPC, it restricts their access to credit (redbook=collateral) and given the precarious position of TLPC might endanger sustainability.</td>
</tr>
<tr>
<td></td>
<td>Access to credit</td>
<td>4</td>
<td>According to the contracts between TLPC and farmers 70% of annual investments will be pre-financed by TLPC. However, the interest rate of TLPC is higher than surrounding institutions and dispersion of credit is erratic.</td>
</tr>
<tr>
<td></td>
<td>Access to inputs</td>
<td>6</td>
<td>At least two fertiliser shops are present in Huong Hoa, inputs are affordable compared to yield levels and prices fetched, access in Huong Phung is difficult.</td>
</tr>
<tr>
<td></td>
<td>Infrastructure</td>
<td>6</td>
<td>The total Huong Hoa area is estimated to have 60% of the roads paved. However, this number is much lower in Huong Phung, where consequently many problems arise in the harvest time. Which coincides with the peak of the rainy season.</td>
</tr>
<tr>
<td>Social &amp; Cultural</td>
<td>Labour</td>
<td>9</td>
<td>Seasonal labour is year-round available at reasonable costs, credit seems to lack utilisation, however.</td>
</tr>
<tr>
<td></td>
<td>Child labour</td>
<td>8</td>
<td>Young household members participate in the work. At household level this labour done by children is not replacing school activities. Seasonal labourers though, occasionally use their children in harvest times, which do not coincide with school holidays.</td>
</tr>
<tr>
<td></td>
<td>Participatio of women</td>
<td>9</td>
<td>Throughout the growing season important decisions have to be made by the household. E.g. how to organise and divide labour, what area should we stump and when, how much fertiliser should we apply, etc. The participation of women in the FFS, where they receive access to the kind of knowledge needed for sound decision making, is more or less equal to the no. of women working in the field.</td>
</tr>
<tr>
<td></td>
<td>Inputs use(fertiliser)</td>
<td>6</td>
<td>Presently, the use of inputs does not seem balanced, with especially excessive amounts of P are being used. The FFS pays attention to fertilisation, but as yet not on a soundly researched basis of yield estimations-nutrient removal, which could increase efficiency.</td>
</tr>
<tr>
<td></td>
<td>Nutrient recycling</td>
<td>5</td>
<td>Little use is being made of the returning coffee pulp to the field to enhance the nutrient balance and increase the organic matter content of the top soil. TLPC has started a pilot in composting coffee pulp but this is not yet fully operational. The soil part of the FFS curriculum pays attention to nutrient recycling, but farmers are not yet actively involved in this.</td>
</tr>
<tr>
<td></td>
<td>Use of cover crops</td>
<td>4</td>
<td>Although considered by many authors as a prerequisite for sustainable agriculture, cover crops are not used in the Huong Hoa area. Primarily, labour demand and lack of understanding seem to be the constraining aspects. Furthermore, the high planting density of approximately 5000 trees per ha is constraining the use of cover crops, as light penetration is often too little.</td>
</tr>
<tr>
<td></td>
<td>Agro-forestry</td>
<td>6</td>
<td>Although the coffee variety used in Huong Hoa is said to be Catimor, a variety more adapted to high light intensities than many other Arabica cultivars, the heavy exposure to sunlight leads to huge amounts of berries that the plant cannot sustain, resulting in die-back and bi-annual bearing. Partly, this is expected to be influenced by the present fertiliser applications (Op De Laak, 2002) and the fact that the variety used seems to have some Catimor characteristics, but certainly is not true to type. Shade trees and balanced fertiliser use could limit the problem of overbearing and die-back, but so far no conclusive tests have been carried out, neither by the FFS nor by TLPC.</td>
</tr>
<tr>
<td></td>
<td>Pest and disease control</td>
<td>4</td>
<td>Although the economical impact of disease occurrence is limited (except for last years CLR outbreak in Huong Phung), farmers have a limited knowledge on disease and protection agents in general. No use of IPM measures is made.</td>
</tr>
</tbody>
</table>

Table 6: Relevance of indicators of sustainability for coffee cultivation in Huong Hoa
Assessment of the indicators revealed some strengths and weaknesses (Table 6). After an assessment of the influence the FFS has had so far on sustainability of coffee cultivation through the technical issues taught, a combination of the general- and FFS assessment should reveal constraints in increasing sustainability as experienced by the FFS (Section 4.6).

### General assessment of sustainability in Huong Hoa

<table>
<thead>
<tr>
<th>Macro indicator category</th>
<th>Average rating</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Political</td>
<td>4.3</td>
<td></td>
</tr>
<tr>
<td>Economical</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>Social &amp; Cultural</td>
<td>8.7</td>
<td></td>
</tr>
<tr>
<td>Technical &amp; Environmental</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

![Category value](image)

**Figure 8: General assessment of sustainability in Huong Hoa**

A first indication is that, especially the political and economical indicator categories (Figure 8) are constraining increased sustainability.

### 4.2 Influential sphere of FFS (micro level assessment)

To measure the influence of the FFS on sustainability, a framework is presented that shows qualitatively measurable indicators related to FFS taught practices. This framework contains five parts:

- Content matter of the FFS curriculum compared to sustainability indicators formulated by experts; and
- methodology used in transferring this knowledge as well as generating it;
- rates of adaptation by farmers;
- rates of adaptation compared with relevance for sustainability; and
- overall judgement of the FFS by participants.

The FFS as currently run in Huong Hoa has a limited scope of impact when compared to the whole field of sustainability aspects. From the curriculum assessment and through informal interviews with TLPC staff, it was derived that the current focus of the FFS is on technical...
matters. The indirect influence on other than technical aspects is found in the way these technical aspects influence, for example, labour use and income security. As mentioned before, the PPP partners as well as other world market players are willing to pay more for good quality coffee, and as such the FFS, when teaching farm management measures aimed at enhancement of quality, becomes a primary promoter in the field of sustainability.

4.2.1 Measuring FFS influence on sustainability, technical issues

To assess the effect FFS has had on farmers attitude towards measures to improve sustainability of coffee cultivation, participatory consultation has taken place with farmers and FFS staff (Annex II provides a detailed outline of the workshop that facilitated the consultation). The more the FFS aspects overlap commonly accepted sustainability criteria, as formulated in section 2.5.2, the higher the grade given will be. These grades, on a scale of 1 to 10, are decided on through participatory consultation with both the farmers and the FFS staff.
The influence of a FFS on the shift to a more sustainable coffee cultivation in Huong Hoa, Vietnam

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4.2 Relevance for sustainability of topics treated in FFS

<table>
<thead>
<tr>
<th>Topic</th>
<th>Accordance with commonly accepted sustainable measures (scale of 1-10)</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Soil coverage</td>
<td>7.5</td>
<td></td>
</tr>
<tr>
<td>Liming</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Organic manure</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Cover crop</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Fertiliser</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Nutrition deficiency</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Pruning</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Weeding</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Pest &amp; disease control</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Harvesting</td>
<td>9.5</td>
<td></td>
</tr>
<tr>
<td>Propagation</td>
<td>7.5</td>
<td></td>
</tr>
</tbody>
</table>

Figure 9: Relevance for sustainability of topics treated in FFS

In the curriculum, certain topics are more relevant for sustainability than others (Figure 9). Naturally, a balanced combination of all topics is what can make a cropping system potentially sustainable, but the content matter of the topics treated determines how relevant they are. Given this, the FFS curriculum has some opportunities for improvement. The topics organic manure, cover crop, fertilisation, nutrition deficiency and pruning appear to have room for improvement.

4.2.2 Opportunities in FFS subject matter improvement

The participatory consultation resulted in a number of opportunities for further FFS involvement. The order of presentation reflects the ranking of the subjects by the farmers during the workshops.
4.2.2.1 Fertiliser application

During the establishment of coffee farms in Khe Sanh and Hung Phuong, respectively 10 and 5 years ago, fertiliser requirements were researched by EKAMAT, a Vietnamese coffee research station. The results have been disseminated to the farmers, but questions concerning the validity of these data have arisen. Mainly, because the research mission took 3 months, whereas the effect of fertiliser applications in perennials should, preferably, be studied over longer periods of time, in order to get reliable data. Three years ago new factorial trials have started, when the results of these trials become available, the rating of the relevance for sustainability of the fertilising topic will increase. Apart from this, a recent mission by Op de laak (2002) suggested a new application scheme, focussing on nutrient removal during harvest. Although seemingly viable, this scheme also needs to be cross-checked through prototyping research (Annex I Field trial rationale and outline).

4.2.2.2 Pruning

Until the recent session of the FFS where pruning was discussed, the farmers did not seem very aware of the rationale for pruning. Although EKAMAT has instructed the farmers during and after establishment of the coffee gardens on the importance and appropriate techniques for pruning, neglect has set in, which is at present difficult to correct. This will result in shorter stumping intervals, and economic loss. The importance for pruning in coffee is great. When properly done it can reduce the occurrence of fungus disease, a result of better air circulation. Furthermore, pruning can prolong the productive life of a coffee tree, resulting in larger stumping intervals, and increase yields (Mr. Thiet, personal communication, 2002). Although the FFS participants have received extension on pruning through the FFS this year, they expressed the need for more knowledge and especially practice on this subject.

4.2.2.3 Pest and disease control

According to the experts consulted, pests and diseases are not a major problem in Khe Sanh. In Hung Phuong, however, CLR (*Hemileia vastatrix*) caused considerable damage during last year’s season. Not surprisingly, the farmers in both areas identified pest and disease control as a limit on their potential production. Although the farmers expressed their satisfaction with the present content matter on pest and disease control, only four diseases (CLR (*Hemileia vastatrix*), die-back (*Colletotrichum coffeanum* Noack), coffee berry disease (*Colletotrichum kahawae*) and brown eye spot (*Mycosphaerella coffeicola*) are mentioned, according to both the farmers and the FFS staff, this should be expanded in the future. Opposed to the FFS principle (see section 2.2.2) of IPM utilisation, the farmers stated that they need more and better information on available crop protection agents. After the meeting however, one farmer confided that what his colleagues should do is monitor their fields more closely, instead of asking for more information. According to this farmer, the problems were caused more by neglect of timely detection, than efficiency of available crop protection agents.
4.2.2.4 Soil

Among the participating farmers the awareness of soil related constraints in production is emerging. Recent soil analyses (Annex I Field trial rationale and outline) revealed that the acidity of the soil does not correspond with the preferences of the coffee tree, furthermore, organic matter content is low, whereas coffee requires a soil rich in organic matter (Agricultural Compendium, 1989). Although the FFS pays attention to soil characteristics it should, according to the farmers, be directed more specifically at the local context, in combination with information on soil improvement.

4.2.2.5 Shadow trees and windbreaks

Although pruning and even removing of shadow trees seems common practice in Huong Hoa, the need for windbreaks is evident. Both strong winds from the north, and monsoon winds from Laos occasionally inflict damage, especially on recently stumped fields with new and fragile shoots growing. The knowledge on windbreaks is available and the participants realise the importance. During the workshop, however, it became clear that there is little awareness of the difference in benefits derivable from different tree species. Although the FFS has instructed farmers on the advantages and disadvantages of especially shadow trees, participants expressed the desire to conduct field trials at the farms of participants to gain more in depth knowledge on species and optimising shadow tree use.

4.2.2.6 Organic material

The application of organic matter, both manure and (semi-) composted material is frequently carried, especially in Khe Sanh. A number of families buy organic manure from intensive animal husbandry systems in throughout the province, this number however, is small compared to the number of farmers who use semi-composted coffee processing waste material. The problem with this latter material is that, at least this year, it has not been properly composted and hence will use nitrogen from the soil, until it is fully composted. Due to transportation difficulties and costs, the rate of application in Huong Phung is considerably lower. Given the low organic matter content of the soil in Huong Hoa (see Annex I Field trial rationale and outline) application of organic manure and/or compost would improve the buffer capacity of the soil.

Awareness of the importance of organic material is mixed. The FFS pays attention to this subject, but, according to FFS facilitator Mr. Thiet, around 40% of the farmers seem to think that tree species do not have such high requirements on organic matter and can survive on N, P and K only. On the short term this is certainly true, but long term sustainable utilisation of the soil requires the organic matter content of the soil to be sustained. The other 60% of the farmers who realise the importance are limited in their application by outside constraints (see section 4.6).
4.3 Teaching methods (micro level assessment)

Another major factor contributing to the influence of FFS on sustainability, concerns the method of teaching, especially the extend to which this is done in an experiential and participatory way. A comparison with methods considered important in literature (section 2.2.3) was made, based on observations during FFS meetings in Khe Sanh and Huong Phung and on information gathered in informal interviews with the two staff involved in establishing and operating the FFS, as well as the participating farmers. Again, a division of points is made, the participants comments form the basis which is supplemented with informal interviews with the FFS staff and observations of FFS meetings. An activity scores 10 out of 10 points when the participants have only positive comments on it, and gradually decreases when the number of suggestions for improvement increases.
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Figure 10: Orientation of teaching methods to sustainable FFS

<table>
<thead>
<tr>
<th>FFS teaching methods</th>
<th>Accordance with commonly accepted sustainable measures (scale 1-10)</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiential learning activities</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Participatory deciding on contents</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Comparing &quot;old&quot; with new practices</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Self-directing approach</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Role of the tutor, guiding instead of lecturing</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Adjustment to local problems</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Utilisation of coffee field as learning material</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

The teaching method at the FFS at Huong Hoa appears to be deficient in four areas (Figure 10), where improvements could be made to fit the FFS better to the education of adults, and to enhance the participation of the target group:

- a more “Self-directing approach”;
- the “Utilisation of coffee field as learning material”;
- “Experiential learning activities”; and
- “Comparing "old" with new practices.

From the informal interviews it became clear that three main reasons could be distinguished for a seeming lack of utilisation of participatory approaches:

- Farmers attend the FFS meetings, but seem reluctant to contribute to the content of the curriculum through their own experiments at farm level;
• when we tell farmers to experiment and ask after the results the next meeting it turns out that hardly anybody did what they promised;
• farmers just want clear cut advice telling them what to fertilise when, and in what amounts; and
• participants are reluctant to present their methods of management in front of meetings.

However, the arguments listed as reasons are likely to be results from past top-down extension activities.

4.3.1 Self directing approach

Several reasons can be distinguished for this anticipating attitude. One TLPC extension staff (Nguyen Van Thiet, 2002) calls it “waiting disease”, according to him the farmers are used to top-down approaches where either TLPC, the extension station or the local government tells them what to do. Presently, this approach is discarded by both the central government and MARD (see section 2.1.2) in favour of a grass roots level strategy. However, the FFS participants find it difficult to adjust to the new approach, after having worked within the top-down structure for many consecutive years. Changes are slowly emerging though, during the workshop the participants in Hung Phuong expressed that an increasingly “self-directing” as favourable to the enhancement of FFS activities and the effectiveness of its efforts. This is stressed by Jarvis (1987): “Because of the process of maturation a person moves from dependency towards increasing self-directedness, but at different rates for different people and in different dimensions of life. Adults have a psychological need to be self-directing”.

4.3.2 Adjustment to local problems

Another aspect mentioned is the adjustment to local problems. An example of this is the use of the soil tests as teaching material, utilising it as framework to teach, not only general soil knowledge, as is presently done, but broaden the scope to methods for soil improvement relevant for the Huong Hoa area. Especially the soil improvement was expressed by the participants as a vital point for sustaining cultivation, but also pest and disease control and fertilisation could do with increased adjustment to the local situation, according to the participants.

4.3.3 Experiential learning activities

Experiential learning activities follow Kolbs (1984) learning cycle (section 2.2.3) of concrete experience resulting in observation and reflection leading to generalisation and abstract conceptualisation and followed-up by active experimentation. Participants mentioned that to illustrate theoretically discussed topics a field session would be beneficial to understanding. If using Kolbs (1984) learning cycle, this session could be expanded to small field tests where groups of participants actually test the theory. Full utilisation of this concept could also enhance the pest and disease control topic, especially so, because pest and disease control shows results over short periods of time, making it attractive to work with for the participants.
A possible enhancement of “Comparing ‘old’ with new practices”, also identified as weak by the participants could be very well combined in small tests.

4.3.4 Comparing “old” with new practices

Combined with an increased use of experiential learning activities the participants expressed the need for an increase in the number of tests held in collaboration with, and during FFS meetings. By comparing “old” with newly taught practices the participants have an increased exposure on “learning by doing”, which is highly suitable for adult teaching (see section 2.2.3). Furthermore, a conscience comparison can reveal weaknesses in the curriculum, which might previously have gone undetected.

4.4 Adaptation of FFS taught practices by farmers (micro level assessment)

So far, analysis of the relation between FFS and sustainability was mainly on a theoretical level. However, the crux of the biscuit is in the biting, or for FFS, in the adaptation of farmer practices by incorporating or learning from alternative practices as have been taught in the FFS. Since FFSs at Khe Sanh have just started, information on this effect of the FFS could only be based on the farmers’ experiences in Huong Phung, which has been operating for over a year. During the workshop, participating farmers were asked to indicate on which of a set of aspects they had been changing their crop management due to participation in the FFS. Adaptation rates were estimated for practices treated at FFS meetings, based on the opinion of participants and FFS staff, points on a scale of 0 to 10 were given, each point reflects 10% of the participating farmers’ adaptation of a FFS practice (Figure 10).
## Adaptation rates of practices as influenced by FFS in Huong Phung

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Adaptation of practices (scale 1 to 10)</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Soil coverage</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Liming</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Organic manure</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Cover crop</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Fertiliser</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Nutrition deficiency</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Pruning</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Weeding</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Pest &amp; disease control</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Harvesting</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Propagation</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 10: Adaptation of practices as influenced by FFS in Hung Phuong**

Assuming that an adaptation rate of at least 50% of farmers is needed for FFS to be considered successful in changing farmer’s behaviour and positively influencing sustainability of cultivation, the average rate of 60% can be called a success. On several aspects the FFS at Huong Phung has been quite successful, but room for improvement (Figure 10) can also be identified. Adaptation rates of practices in the fields of soil, soil coverage, organic manure, pruning and harvesting are around or below 60%. Other issues like pest and disease control, weeding, fertilising, liming and pruning are utilised by the majority of the participants. Despite the fact that during the workshop, the farmers clearly expressed that they realised the importance of the practices taught and largely agreed with the contents, they stated that they are facing external difficulties, mainly related to capital and credit, hindering adaptation (Section 4.6).

### 4.4.1 Adaptation rate vs. relevance for sustainability

Combining Figure 9 and Figure 10 gives a clear indication as to what extend the FFS has influenced the shift to a more sustainable coffee cultivation. The difference between relevance of topics for sustainability and adaptation rates indicate that the cultivation system can be improved in terms of increased sustainability (Figure 11).
Comparison of relevance and adaptation of practices treated in FFS

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Relevance for sustainability (scale 0-10)</th>
<th>Adaptation of practices (scale 0-10)</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td>8</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Propagation</td>
<td>7.5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Cover crop</td>
<td>7</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Soil coverage</td>
<td>7</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Fertiliser</td>
<td>7</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Liming</td>
<td>5</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Organic manure</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Pruning</td>
<td>7</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Weeding</td>
<td>8</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Pest &amp; disease control</td>
<td>9</td>
<td>6</td>
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</tr>
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<td>Harvesting</td>
<td>9.5</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Propagation</td>
<td>7.5</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Although the adaptation rates reflect success some issues of concern have been raised by the participants and the FFS staff.

4.4.1.1 Fertilisation

Of great importance is the fertilisation, this is presently based on the three-months EKAMAT research data, to increase the sustainability of the cultivation, accurate data on fertilising according to requirement is needed. In this case, the adaptation rate of fertilising instruction overtakes the relevance for sustainability of this topic. This clearly is an opportunity for improvement of sustainability, when the adaptation rate can be kept at the same level, or increased, combined with accurate “fertilising according to need” information overall sustainability can be improved.

4.4.1.2 Harvesting

Harvesting is another point of concern, although the knowledge of selective harvesting is widespread, to a lesser extend utilised and TLPC pays a slightly better price for selectively harvested cherries the farmers are reluctant to use this practice.
According to the farmers the price for selectively harvested cherries does not reflect the extra time and money they have to invest. With the normal harvesting one man-day gives 50kg of cherry, selectively harvesting results in 40kg, 20% extra labour is needed. However, during last year’s harvest the price for normal cherries and selectively harvested ones, was respectively 1600VND/kg and 1700VND/kg, a distinction of 6%. Furthermore external reasons were mentioned as hindering the use of selective harvest techniques. (Section 4.6).

4.4.1.3 Soil
Knowledge on soil characteristics and determination is commonly used by the farmers in Huong Phung, since that subject has been treated in the FFS. However, participants mentioned an increased knowledge of especially soil improvement would benefit their management. This is also reflected in the suggestion of participants to have the FFS adopt more to locally important aspects of cultivation.

4.4.1.4 Cover cropping
Cover cropping and soil coverage are of medium relevance for the cultivation in Huong Hoa. The main reason is the high planting density found of up to 5,000 trees per hectare. This leaves limited space for different crops. Although cover cropping with legumes could benefit the soil organic matter content as well as decreasing run-off and adding nitrogen, little use is made of it. The participants, as well as two TLPC employees summarised the reasons as:
- light insufficiency will cause the crop to grow up and strangle the coffee trees;
- the extra labour input required is not worth the benefits;
- harvests from intercropped crops are small; and
- cover cropping will lead to increased occurrence of fungus diseases in the rainy season.

4.4.1.5 Soil coverage
Soil coverage is hardly practiced. It is doubtful however, if it is required to improve the sustainability. Cut imperator grass could serve as coverage, increasing the buffer capacity of the soil by increasing the organic matter content, in Hung Phuong. However, the extra labour will make it nearly impossible for the farmers to use this practice. A possible alternative mentioned by farmers is to utilise weeds growing in the coffee garden as soil cover. This is reached by replacing weeding by cutting. At present one farmer in Huong Phung has started with this approach, and preliminary impressions show good results, according to the participants.

4.4.1.6 Organic manure
Organic manure is used in Khe Sanh, especially since the coffee factory installed a composting installation for coffee processing waste material.

As mentioned in section 4.2.2.6, the relevance of organic manure for sustainability is important, however, the isolated location of Huong Phung does only permit the use of locally
available materials like imperator grass, as there is no animal husbandry undertaking of sufficient scale to supply all the plantations with organic manure. An alternative would be to transport it from other areas, but with the isolated location of Huong Phung, the transportation costs would definitely overtake the benefits.

4.5 Participants’ overall judgement of FFS (micro level assessment)

Overall satisfaction with the FFS of the participants is very good. Despite several comments, which have been mentioned in this chapter, the participants are content with the approach of the FFS, they appreciate the curriculum contents and feel it is a useful tool to improve their management (Figure 12).

<table>
<thead>
<tr>
<th>Topic</th>
<th>Grade (scale 0-10)</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attending meetings (% *10l)</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Average adaptation rate</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Satisfaction with contents</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Satisfaction with methods</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Continuation rate (%*10)</td>
<td>9.5</td>
<td></td>
</tr>
<tr>
<td>Appropriateness of curriculum</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

Figure 12 Overall judgement of FFS by participants

Although the participants are content with the FFS, the adaptation rates are lagging behind when compared with the overall judgement (Figure 12). During the workshops it became evident that the potential influence of the FFS is considerable, which is reflected in Figure 12. External factors however, are limiting the extend to which the participants can utilise the practices taught (see also section 4.6).

4.6 Macro level influences on FFS efforts

The general assessment, combined with the analysis of the FFS shows that, although the FFS is very viable tool for increasing sustainability, macro level indicators aspects of an economical and political nature hinder full effectiveness.
The display of average ratings for macro level indicators (section Fehler! Verweisquelle konnte nicht gefunden werden.), show that the macro indicators are exerting great influence on the shift to a more sustainable production, whereas section Fehler! Verweisquelle konnte nicht gefunden werden. attributes this influence more specifically to political and economical aspects. Section 4.6.2.3 and onwards gives the opinions of experts and farmers, participating in the workshop on how exactly these macro level indicators influence the FFS efforts. Summarising the most constraining aspects, based on section 4.1:
Summary of macro level constraints

<table>
<thead>
<tr>
<th>Category</th>
<th>Indicator</th>
<th>Rating</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Political</td>
<td>Interaction with authorities</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Access to information</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supportive policy structure</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trading position of farmers</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Economical</td>
<td>Income security</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Landownership</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Access to credit</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Infrastructure</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Figure 14: Summary of macro level constraints

4.6.1 Political influences

4.6.1.1 Interaction with authorities

Communication of a consultative nature is present, but authorities have a “veto” on decisions. In practice this means that e.g. TLPC, the extension service or district authorities, can block decisions favoured by the majority of stakeholders. In relation to FFS efforts this is found in annual cherry price discussions between TLPC and contract farmers (table 7), where so far the farmers’ plea for realistic price for selectively harvested cherries has not been fully granted. This results for TLPC in undesired cherry quality, which is not up to the standards of the private partners.
Example (1) of macro level political influence on FFS

<table>
<thead>
<tr>
<th>Macro sustainability indicator</th>
<th>Micro sustainability indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interaction with authorities</td>
<td>Harvesting</td>
</tr>
<tr>
<td>Consultative but with &quot;veto&quot; on authorities side.</td>
<td>Selective harvesting techniques are known.</td>
</tr>
<tr>
<td>Rating: 5</td>
<td>Rating: 9.5</td>
</tr>
</tbody>
</table>

Constraints:
Harvesting techniques hardly used by farmers, because of cost-benefit discrepancy for farmers, partly caused by lack of communication and understanding of parties involved.

Suggested approach for improvement of situation:
Devise a mutually agreed cherry price, reflecting realistic costs and benefits for both parties.

Table 7: Example (1) of macro level political influence on FFS

4.6.1.2 Access to information

Presently, access to information on coffee cultivation is rather limited, apart from the FFS, the local extension service is involved in disseminating information. However, workshop participants expressed a favour for the more participative FFS approach, but co-operation is weakly developed (table 8).

Example (2) of macro level political influence on FFS

<table>
<thead>
<tr>
<th>Macro sustainability indicator</th>
<th>Micro sustainability indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to information</td>
<td>Overall judgement of FFS by participants</td>
</tr>
<tr>
<td>Limited</td>
<td>FFS find a good acceptance in the field</td>
</tr>
<tr>
<td>Rating: 5</td>
<td>Rating: 8</td>
</tr>
</tbody>
</table>

Constraints:
Linkage with and integration of FFS initiative and local extension service is weakly developed, largely due to great methodological differences.

Suggested approach for improvement of situation:
Actively approach local extension station to enhance co-operation efforts, agree on a mutually accepted extension strategy, utilising the strengths of both parties (e.g. network of extension service and methodological approach of FFS).

Table 8: Example (2) of macro level political influence on FFS

4.6.1.3 Supportive policy structure

Although MARD fully acknowledges the need for grass roots level participation in extension, this approach does not seem to reach provincial and district level, hence the difficulties in co-operation between the FFS and local extension service (table 10).
Example (3) of macro level political influence on FFS

<table>
<thead>
<tr>
<th>Macro sustainability indicator</th>
<th>Micro sustainability indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Political</td>
<td>Overall judgement of FFS by participants</td>
</tr>
<tr>
<td>Fully in line with MARD policy</td>
<td>FFS find a good acceptance in the field</td>
</tr>
<tr>
<td>Rating: 10</td>
<td>Rating: 9</td>
</tr>
</tbody>
</table>

Constraints:
Due to the only little transparent and “very diverse” structure of information distribution in the VN extension system, the new approach has not trickled down to province and district level.

Suggested approach for improvement of situation:
Actively communicate FFS pilot concept of PRI/PPP on all levels (district, DARD, MARD) under inclusion of policy makers and widen approach to other coffee producing areas through VICOFA and PPP structures.

Table 9: Example (3) of macro level political influence on FFS

4.6.1.4 Trading position of farmers

The limited number of fresh cherry buyers and the fact that all local factories are in transition from SOE to a private business, weakens the trading position of farmers. The relevance of FFS topics for sustainability is high, allowing the farmers to steadily improve their cultivation, but with a weakly developed market structure income security is easily endangered (table 11).

Example (4) of macro level political influence on FFS

<table>
<thead>
<tr>
<th>Macro sustainability indicator</th>
<th>Micro sustainability indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trading position of farmers</td>
<td>Relevance for sustainability of topics taught in FFS</td>
</tr>
<tr>
<td>Dependent on limited number of trading channels</td>
<td>Enables farmers to produce quality products, as requested by TLPC and private partners</td>
</tr>
<tr>
<td>Rating: 4</td>
<td>Rating: 7.5</td>
</tr>
</tbody>
</table>

Constraints:
Insecurity for both TLPC and two other coffee factories on surviving the equitisation process, as export markets are highly demanding. Without secure outlet for products relevance of FFS is none.

Suggested approach for improvement of situation:
Exploration of farmyard processing, which will enable the farmers to sell outside the region of Huong Hoa.

Table 10: Example (4) of macro level political influence on FFS
4.6.2 Economical influences

4.6.2.1 Income security

As mentioned in section 1, quality of coffee is becoming a more important aspect for the whole coffee market. TLPC, being a coffee exporter has to follow this trend to remain competitive. A good way of increasing coffee quality is selective harvesting (on which the FFS has potential influence, see table 12), as this decreases the number of green cherries, which influence the quality of the end product negatively. For this reason TLPC has a coffee pricing policy where differentiation in price is made between selectively harvested and non-selectively harvested beans. For the seven years this policy has been in place farmers have continuously complained the higher price they receive for selectively harvested cherries does not by far compensate them for their extra labour investment. Last year, the average cherry price was 1600VND/kg, whereas selectively harvested cherries raised an average price of 1700VND/kg, the estimated investment in labour time is around 20%, the increase in cherry price around 6%.

<table>
<thead>
<tr>
<th>Example (1) of macro level economical influence on FFS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Macro sustainability indicator</strong></td>
</tr>
<tr>
<td>Income security</td>
</tr>
<tr>
<td>Income erratically divided and linked to world market price</td>
</tr>
<tr>
<td>Rating: 5</td>
</tr>
<tr>
<td>Constraints:</td>
</tr>
<tr>
<td>Limited capital prevents farmers from adapting practices to the full extend</td>
</tr>
<tr>
<td>Suggested approach for improvement of situation:</td>
</tr>
<tr>
<td>Cherry price should reflect labour and capital input of farmers, ensuring a stable income, which is part of the basis from which to improve sustainability</td>
</tr>
</tbody>
</table>

Table 11: Example (1) of macro level economical influence on FFS

4.6.2.2 Landownership

In the equitisation process of TLPC land has been allocated to farmers. This allocation consisted of 20 to 50 years lease contracts for land planted with perennial crops. In other words, farmers “own” the land for a certain period. The absence of full ownership is one of the constraints that farmers face in relation to credit availability. The subsidised credit, at an interest rate 0.6% per month, is only available for those with sufficient assets that can serve as collateral. A lease contract does not fit in this category, hence farmers are restricted to TLPC credit, at 1% interest per month.
Example (2) of macro level economical influence on FFS

<table>
<thead>
<tr>
<th>Macro sustainability indicator</th>
<th>Micro sustainability indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landownership</td>
<td>Adaptation rates</td>
</tr>
<tr>
<td>Consisting of bluebook</td>
<td>FFS receives good acceptance among farmers, which is reflected in adaptation rates.</td>
</tr>
<tr>
<td>Rating: 2</td>
<td>Rating: 6</td>
</tr>
</tbody>
</table>

**Constraints:**
Lack of landownership deprives farmers from increasing adaptation.

**Suggested approach for improvement of situation:**
Phased dissemination of redbooks, or lining TLPC credit policy up with Gov policy on credit in mountainous areas.

| Table 12: Example (2) of macro level economical influence on FFS |

**4.6.2.3 Credit**

The dispersion of credit and the general credit policy of TLPC seems troublesome to farmers. Being contract farmers the participants have a right on access to credit. There was however, common agreement among the participants that the company does not in every case follow the contracts signed with the farmers. It became apparent that farmers, who have had a bad harvest in one year and can not payback their initial investment loan to TLPC, run the risk of receiving a reduced amount of credit the next year, or even exclusion from credit provision scheme. Furthermore, farmers complained that the interest rate of TLPC is higher compared to other regional credit facilitators like Huong Hoa Agricultural Bank. Farmers stated that the credit rate at TLPC is about 1% per month, whereas Huong Hoa bank only charges around 0.6%. This discrepancy can be attributed to the location of TLPCs head office in the lowlands. The government subsidised low interest loans are only applicable in the mountainous areas, even though TLPC has many contract farmers in Huong Hoa (a mountainous district) the location of their head office prevents the imbursement of subsidised loans. The last point related to credit, focused on the timely dispersion of the loans. There is no set time line for the dispersion of credit, although the situation has improved drastically compared to a few years ago, a standardised procedure is considered more convenient by the farmers, as this allows them to plan more efficient. Presently, the timing of e.g. fertiliser applications can be (negatively) influenced by the availability of credit, suboptimal fertilisation may very well decrease yields, which might have an influence on the availability of TLPC credit the next year. Besides influencing amounts of inputs, the availability of credit also affects the amount of extra labour that a farmer can rent. During the workshop, labour was often mentioned as a constraint. With assumingly high unemployment rates\(^2\) in the area it is not so much the

\(^2\) This information is only available after submitting a written proposal to the district authorities.
availability of labour that is constraining but more the financial situation that prevent farmers from using additional labour to carry out adaptation of FFS practices (table 14). Naturally, this aspect, of primary importance to the sustainability of the cultivation, is also related to the coffee price.

<table>
<thead>
<tr>
<th>Example (3) of macro level economical influence on FFS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Macro sustainability indicator</strong></td>
</tr>
<tr>
<td>Access to credit</td>
</tr>
<tr>
<td>Limited access to credit</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Rating: 4</td>
</tr>
<tr>
<td>Constraints:</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Suggested approach for improvement of situation:</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Table 13: Example (3) of macro level economical influence on FFS

4.6.2.4 Transport and infrastructure

Infrastructure is, according to the workshop participants, a major constraint in delivering good quality coffee to the factory. A large part of the Khe Sanh coffee area is dissected by road number 14, which is presently being surfaced. However, the roads to the coffee plantations are not paved, and since the harvest time coincides with the peak of the wet season transportation difficulties are rather rule than exception. The situation in Huong Phung is even worse, even the slightest amount of rain turns the road leading to the settlement in a pool of mud. As a result, both in Khe Sanh and Huong Phung pre-fermentation of cherries takes place on the farms (table 15). Needless to say, this has a strong influence on the cherry quality. According to the farmers and experts, the transportation time between harvesting and processing should be drastically decreased. Although TLPC has undertaken an experiment during last years harvest in Huong Phung with a mobile processor, the results were not satisfactory.
Example (4) of macro level economical influence on FFS

<table>
<thead>
<tr>
<th>Macro sustainability indicator</th>
<th>Micro sustainability indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure</td>
<td>Selective harvesting</td>
</tr>
<tr>
<td>In Huong Phung, infrastructure is a great constraint on delivery of quality cherries</td>
<td>Selective harvesting will improve product quality of TLPC coffee, and farmers can get higher prices</td>
</tr>
<tr>
<td>Rating: 4</td>
<td>Rating: 9.5</td>
</tr>
</tbody>
</table>

Constraints:
Farmers in Huong Phung are not very willing, as the gain in quality with selective harvesting gets lost due to long transport time and intervals

Suggested approach for improvement of situation:
Either improve infrastructure in Huong Phung or increase transport intervals

Table 14: Example (4) of macro level economical influence on FFS

4.6.3 TLPC-farmer relation

The relation between farmers and TLPC is, according to the participants, marked by mutual distrust. On the one hand, TLPC states that the farmers do not understand the difficulties of the company faces in trying to deliver good quality green beans to the world market, where prices fluctuate heavily. On the other hand, farmers exemplify their point when saying that the buying practices of TLPC are not fair. An example mentioned is that when the predetermined processing target is likely to be endangered, TLPC buys cherries from private traders. Farmers state that they have noticed that TLPC buys from the private traders the same quality of cherries at a higher price. Naturally, a relation marked by distrust is not enhancing TLPCs plans to increase coffee quality.
5. Discussion

TLPC, as a SOE, being in the process of equitisation faces many difficulties. The new form of doing business requires new attitudes and skills. One of the aspects involved is the relation of TLPC with the farmers from whom they buy coffee. With the collapse of the Soviet Union in the eighties, TLPC, just like many other Vietnamese companies, had to find new markets for their produce. After the lifting of the American trade embargo by US President Clinton in 1994, these new markets became available on a larger scale than before. TLPC is presently exporting coffee to Germany and Europe, within the framework of the PPP project. This cooperation with Western companies has distinct advantages for TLPC, besides receiving good prices for their coffee, they receive, amongst others, support in upgrading their processing facilities to ensure a good and stable quality of European standard. However, in the present setup, the private partners are the only access of TLPC to the European market, creating an over-dependency. Furthermore, private partners have high demands, not only in terms of product quality, but also regarding the way it is produced. Under increasing consumer pressure in Europe the private partners have to show their goodwill by offering fair prices for coffee, of which a fair share should be returned to the farmers, in other words: consumers demand a sustainable fabricated product. This is also where the difficulties for TLPC arise. To produce a sustainable product means that the whole production chain, from farmer to consumer needs to work on a basis of mutual understanding, with both sides being aware of the constraints and opportunities of the other. As stated in section 4.6.3, the relation between TLPC and the contracted farmers is, as yet, not optimal. Major issues regard the coffee price, which the farmers think is too low, and which TLPC states can not be raised because it will endanger the economic existence of the company.

5.1 Sustainability issues

TLPC has taken efforts to shift to a more sustainable production. On factory level installation of modern processing machinery and waste water treatment should ensure a stable quality without seriously damaging the surrounding environment.

At farm level, where this research had its focus, FFS have been started. A major constraint for farmers is access to knowledge, and the FFS, at least partially, meets the solution for this problem. As can be seen in section 4.2, the micro level impact of the FFS on sustainability is considerable. Participating farmers acknowledge the usefulness of the FFS. When comparing the curriculum of the FFS with literature on FFS (section 4.2.1), it becomes clear that the content matter, perceived by farmers as useful, is largely in line with the most important sustainability subjects like soil improvement through organic matter enhancement and pest and disease control. The methodology of teaching is surprisingly up to standard. The surprising aspect is that whereas the Vietnamese educational system is largely depending on “chalk and talk” to transfer knowledge, the Huong Hoa FFS, also uses this method, but at the same time tries to stimulate the participants to get involved in a more participative way, hence...
increasing sustainability (see Jarvis and Pimbert on adult education, section 2.2.3). A possible constraint in this case is that the facilitators do not have a sound conceptual background in FFSs and adult education, while a conceptual understanding would greatly attribute to the functioning of the FFS. In the Huong Hoa case, this constraint is of minor importance because the main facilitator has an open attitude and an intuitive feel for teaching and facilitating. Improvements could be established though, when these teaching and facilitating capacities are embedded in a theoretical understanding of FFS principles.

During the research it became evident that, although the FFS is certainly enhancing farmers’ capacities towards sustainable cultivation of coffee, outside constraints (macro level aspects) are hindering the farmers in large scale adaptations of FFS taught practices (see section Fehler! Verweisquelle konnte nicht gefunden werden. and 4.4.1). These aspects are primarily of a political and economical nature. Credit and coffee price seem to be jeopardising FFS efforts, but also access to information and available trade channels to the farmers are identified as weak points in the system. To shift to a more sustainable production such issues need to be dealt with, in order to create the pre-conditions under which sustainable cultivation can take place.

As a result of the workshops, the following indicators scored below the average of six points, these form the important pre-conditions not yet fully developed and that destabilise the influence the FFS has had so far:

- Interaction with authorities
- Access to information
- Supportive policy structure
- Trading position of farmers
- Income security
- Landownership
- Access to credit
- Infrastructure

On all these points, TLPC can have a decisive, or at least altering influence. The aspects within full reach of the company should be discussed both in- and externally with the appropriate institutions like MARD and DARD.

The contracted farmers lease the land of TLPC for certain a period of time, often on a 50 year basis, but can not use their lease contract as collateral for cheaper, subsidised credit. According to some TLPC staff, the company is afraid to loose control over the farmers when they have redbooks. This could well be the case, the Huong Hoa area has three coffee processing factories and ownership would give the farmer the right to sell to whom they choose. Despite this, there are distinct advantages when farmers own the land. With the PPP
project firmly in place, TLPC receives higher prices for their coffee than the two local competitors. Part of the DE strategy is that higher coffee prices paid by them, should result in better prices for farmers, if TLPC devises a competitive cherry buying strategy, as is presently being done, than the farmers will be very willing to sell their cherries to the company. It will not solve the distrust that presently marks the relation between TLPC and farmers, but paying a fair price for cherries will influence the status of the relation greatly. This effect could be enhanced by setting up a transparent accounting system of cherry buying and prices received, for this it would probably be beneficial when farmers have access to information on world market prices. Another aspect could be to involve contract farmers in the actual delivery of cherries to the factory. Farmers have expressed that they feel cheated when private traders receive better prices for the same quality and amount of cherry, and according to the farmers this often seems to happen, although nobody knows the full story. This feeling could be erased, or at least reduced, when farmers, taking turns, “supervise” the delivery of cherries to the factory. One or two farmers could team up with TLPC staff, involved in this job, and witness the process.
6. Conclusion and recommendations

6.1 Conclusions

Three main conclusions can be drawn from this research:

- A properly run FFS is in potential an effective tool in shifting to a more sustainable coffee production on a micro level; but
- the FFSs ability to increase sustainability is heavily influenced by factors outside the FFSs reach (macro level); and
- improved relations between TLPC and farmers could eliminate some of these outside influences and therefore enhance the FFS effort and the shift to a more sustainable production.

The technical issues that the FFS teaches are well up to standard, when compared with internationally accepted sustainability criteria for agriculture as formulated by e.g. Altieri (1995). Issues for improvement have been identified and focus on locally viable fertiliser application schemes, correct and timely application of pruning, the importance of organic matter to sustain the soil, either through cover crops and/or organic manure and adequate pest and disease control. Despite the huge experience of the FFS staff, further knowledge on fertiliser applications and pest and disease control is needed. Part of this can be generated through factorial trials, but since the farmers during the workshop expressed the need for tests it is more appropriate to work with farm trials, in on farm conditions.

Teaching methods in the FFS are of primary importance for adaptation rates. When farmers feel they are not part of the process, the knowledge, however good it may be, will quickly evaporate. The FFS in Huong Hoa is, despite the conceptual background of the staff involved, teaching largely according to FFS principles (see sections 2.2.3 and 4.3), this is a major reason for the success and satisfaction of the participants.

Full utilisation of FFS taught practices are hindered by factors outside the FFSs reach but within the framework of sustainability indicators.

The present policy on credit is not sustaining the farmers effort to enhance the sustainability of their production. Timely and affordable credit is urgently needed. A fixed time for credit applications processing would enable the farmers to plan their activities, while affordability will increase the amount of labour a household can rent to adapt the techniques learnt in the FFS.

Closely linked with the credit is landownership. With ownership of the cultivated land the farmers can access cheaper credit, increasing their economic efficiency, which is crucial in times when the coffee price is at a stable, but ultimate low.
The relation between TLPC and the farmers is marked by distrust, a sound reason for TLPC to hesitate in handing out redbooks. However, a cherry price which reflects the farmers input would first of all, be higher than the price surrounding factories offer, and secondly, tie the farmers closer to the company, improving the relation. An added advantage is that with better prices TLPC can demand better quality resulting in higher export prices while the farmers’ need for credit diminishes, thus allowing them to enhance sustainability of their farms.

Infrastructure is a major constraint, especially in Huong Phung, which is difficult to reach in the wet season, causing the picked cherries to ferment in the farmyard.

6.2 Recommendations

Based on the conclusions, a number of recommendations can be made to enhance the effort of the FFS to shift to a more sustainable coffee cultivation. Two categories of recommendations can be distinguished: Firstly, recommendations related to the FFS, secondly, ones that relate to external aspects.

6.2.1 Recommendations for FFS

Despite the experience of the FFS facilitators and the satisfaction of the farmers with the FFS approach, room for improvement has been identified.

Fertiliser applications should be according to estimated yield level. The presently running factorial trials are supplemented by the recently started prototyping trials (see Annex I), which are operated in close collaboration with three farmers. These three trials are carried out in collaboration with farmers who are locally recognised as skilful. To gain a more complete picture of management alternatives, and therefore possible improvements in sustainability, the FFS should, to a larger extend than is presently done, incorporate farmers experiences in the curriculum. This can be done in two ways that reinforce each other.

- One way is to broaden the scope of the prototyping trials, including as many different management styles that locally be found as possible.
- Secondly, representative farmers for each different style should present their ideas during FFS meetings, after which discussion between participants can enhance, not only the knowledge and awareness for alternatives, but also the information exchange between farmers.

The soil, cover crop and organic matter components of the curriculum should be reinforced. With present fertiliser applications, medium term sustainability, say ten years, is questionable. The low organic matter content and acidity of the soil (see Annex I), call for strong measures to be taken.

This year, one farmer in Huong Phung has started to utilise the weeds growing in his garden as a soil cover, by cutting it on a monthly basis, this example should be incorporated in the
curriculum as an alternative for cover cropping. Besides enhancing soil fertility, structure and biological activity, it also saves labour in weeding.

Pest and disease control are mentioned by farmers as a constraint in production. Participants expressed the need for more knowledge on crop protection agents. Although this is certainly part of the solution, other equally important aspects focus on timely detection and determining damage levels, as well as biological and cultural measures. For this purpose the FFS should organise more practical sessions, with an increasingly diverse content. Presently, focus is on crop protection agents, but biological and cultural measures can also achieve good results. An example of practical assignments could be to analyse amounts and species of insects found in a coffee garden (see Box 1), also refer to Annex III for a complete listing of possible practical assignments.
The influence of a FFS on the shift to a more sustainable coffee cultivation in Huong Hoa, Vietnam

Chapter 6: Conclusion and recommendations

6.2.2 Recommendations for TLPC

The FFS initiative is destabilised by macro-level influences, some of which can be attributed to TLPC policy. Therefore, if sustainability is to increase, TLPC should pay attention to a number of matters:

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**Exercise: Monitoring coffee fields**

**Objective**
To understand the importance of field monitoring

**Materials**
Polythene sheets, vials, polythene bags, hand lens, coffee field (preferably unsprayed), flip charts, colour pens

**Procedure**
In small groups, visit different coffee fields (preferably those that haven’t been sprayed recently) and make observations on insects, diseased leaves, branches, stems, berries etc that are known or can be recognised by the participants. In each field, each group selects and tags one or more coffee bushes. Each tagged bush is observed systematically through detailed observations of bottom, middle and top branches. Spread a polythene sheet on the ground below the tree. Beat / shake tree stems so that the insects, diseased berries, and leaves fall on the sheet. Gather the polythene sheet carefully and observe its content: how many different types of insects are found, which of these are known as pests, how many berries and leaves are found and why did they drop off the tree? To record the results, draw a large picture of the coffee plant in the correct colours and draw the major pests and other constraints that were observed. Present the results per group. During the discussions, establish the local names of insects and diseases observed and the difference between the different fields. Arrive at a consensus on why coffee fields should be observed. As much as possible differentiate insect pests from natural enemies (farmers’ friends)

**Guide questions for discussion**
1. Which pest problems were found and what are the local names for these?
2. Can you differentiate those insects that are pest insects and those that are natural enemies (‘friends of the farmers’)?
3. Was there a difference in results between the various fields? Why (why not) and what can we learn from this observation?
4. Is there a need to observe coffee fields regularly? Why (why not)?

*Box 1: Exercise: Monitoring coffee fields (after CABI International, 2001)*

In general it can be stated that the FFS has the potential of achieving fine results in improving the sustainability of the coffee cultivation in the Huong Hoa area. However, several external constraints are limiting the fulfilment of the promising start in Huong Phung.
TLPC should enable the contracted farmer access to cheaper credit, as provided by the Huong Hoa Agricultural Bank. The policy of subsidised credit should also be accessible to them, as they are living in a mountainous area. For this is will probably be necessary for TLPC to discuss with either provincial or national authorities. If, and when this becomes available for contract farmers, quality of coffee can be improved. Workshop participants frequently stated that, although they appreciate the practices taught in the FFS, sufficient capital is often lacking adaptation.

Another solution for this problem is the issue of redbooks. Without ownership papers, farmers can not borrow at cheaper rates. Besides creating access for farmers to cheaper credit, which enables them to improve sustainability of cultivation, an added advantage for TLPC might be that they do not have to face the difficult task of denying farmers access to company credit (see section 4.6.2.3). The Houng Hoa Agricultural Bank will have to take care of that, this could improve the relation of TLPC and the farmers, as farmers are presently not satisfied with TLPCs credit policy. Combined with a mutually agreed cherry price, beneficial for both parties, sustainability of cultivation comes within reach.

The cherry price is a hot issue of discussion between farmers and TLPC. Farmers state that the price TLPC offers for the quality they require (id est. selectively harvested cherries) does not compensate the extra labour time required during harvest, whereas TLPC has to deal with the uncertainties of a fluctuating world market price. On the one hand the farmers seem not fully aware of the mechanisms that determine the international coffee price, hence the distrust of TLPCs pricing policy, and on the other hand TLPC does not have a transparent buying strategy, which fuels the distrust of the farmers. Two recommendations apply to this situation. Firstly, farmers, e.g. through the FFS, should acquire knowledge on the price mechanisms of coffee. Secondly, the pricing strategy of TLPC and the related accounting system should preferably be accessible for farmers. With such a transparent system in place a large portion of the reasons for distrust can be taken away, improving the relation between farmers and TLPC, and creating a favourable environment for the production of quality green beans, which fetch good prices on the world market. A possible strategy TLPC could follow is to offer a basic price during the whole season and hand out a share of the profit when all the beans have been sold.

Infrastructural facilities, especially in Huong Phung, are a major constraint in increasing sustainability of production in that area. The amount of time elapsing between harvesting and transport to the factory causes the cherries to pre-ferment in the farmyard, which has a strong negative influence on the quality of the end product. The effective solution here is to pave the road from road no. 14 to Huong Phung.
### 7. Consulted literature and sources

#### 7.1 Literature

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Year</th>
<th>Title and Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altieri, Miguel A.</td>
<td>1995</td>
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</tr>
<tr>
<td>Altieri and Nicholls</td>
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<td>Agroecological principles and strategies for sustainable agriculture (From a forthcoming book edited by Norm Uphoff at Cornell University)</td>
</tr>
<tr>
<td>Avery, D.T</td>
<td>1995</td>
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<tr>
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<tr>
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</tr>
</tbody>
</table>
The influence of a FFS on the shift to a more sustainable coffee cultivation in Huong Hoa, Vietnam

Chapter 7: Consulted literature and sources

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Year</th>
<th>Title</th>
<th>Publisher/organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magdoff, F.R.</td>
<td>1993</td>
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<td>US, University of Nebraska Press</td>
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<tr>
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<td>UK, NKG Statistical unit Ltd.</td>
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<td>Opdelaak,</td>
<td>2002</td>
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</tr>
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<td>Vietnam, World Bank</td>
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</table>
The influence of a FFS on the shift to a more sustainable coffee cultivation in Huong Hoa, Vietnam

-Chapter 7: Consulted literature and sources-

**Young, A.** 1997 Agroforestry for soil management. UK & US, CAB International

### 7.2 Internet and software

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- [http://www.coffeeresearch.org](http://www.coffeeresearch.org), 2002
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- [http://www.nationalzoo.si.edu/smbc/Research/Cacao/waage.htm](http://www.nationalzoo.si.edu/smbc/Research/Cacao/waage.htm)
- [http://www.vicofa.org.vn](http://www.vicofa.org.vn)
- [http://www.worldfactbook.org](http://www.worldfactbook.org)

**Software source**
Annex I Field trial rationale and outline

Title: Fertiliser application according to estimated yield level in coffee

Starting July, 2002

Objective: to identify appropriate management alternatives contributing to a more sustainable coffee production, taking into account all aspects of management recorded in fieldbooks by the farmer.

General description
Execution of three prototyping on-farm trials at three different farms, two of which are located in Khe Sanh, and one in Huong Phung. The two participating farmers in Khe Sanh are Mr. Luc and Mr. Loi, in Huong Phung, the field of Mr. Thi is used. Every field is divided in two equally large sections, one under normal farm management and one under alternative management. During the first year the focus will be on fertilisation, in the following years a broadening of the scope is considered in terms of pruning, selective harvesting and cherry/leave analysis.

The N-fertilisation will be applied differently, following three instead of two applications annually. The following schedule will be used.

<table>
<thead>
<tr>
<th>Fertiliser</th>
<th>Timing &amp; % of total applied</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>May</td>
</tr>
<tr>
<td>Urea</td>
<td>30%</td>
</tr>
<tr>
<td>Rock phosphate</td>
<td>100%</td>
</tr>
<tr>
<td>KCI</td>
<td>100%</td>
</tr>
</tbody>
</table>

The amounts of fertiliser applied are based on the estimated yield level. To determine the yield level, the observations of the farmer are combined with the assessment made by TLPCs coffee expert, Mr. Thiet. The average of both observations is the starting point for fertilisation.

Trial descriptions

2.1 Mr. Loi
A slightly sloping field (<3%) of 0,50ha, with the slope oriented in east to west direction. Around the field many shadow trees are found, mainly eucalyptus and some acacia, which also serve as a windbreak against the fierce winds from Laos and the north.
Scattered over the field a small number of trees are found which seem to belong in the leguminosa family. The estimated planting density is 2700 trees which translates to 4800 trees per ha. The figure below gives a schematic presentation of the field and the surrounding location. The boundary between both halves is marked by a banana plant on the road side, at row 39 counted from the road to Khe Sanh, at 2/3 of this row a two-stemmed tree stands which has a clear sign attached to it.

The soil at the plot of Mr. Loi is silt loam, with a silt percentage of 82%. The organic matter content in the top 20cm of the soil is 2.51%, which is a medium value. The pH of the plot is very low, the top 20cm average a value of 4.55. CEC is low at around 10, causing overall fertility to be of a medium to low value (see annex I, soil analysis results).

The number of trees involved in this trial is around 1250. The first fertiliser treatment of the year in May has been done in accordance with farmers management. A second application will take place in July and a third in September. The total amount of fertiliser is related to the estimated fresh cherry yield in tonnes. The following figure gives an outline of the fertiliser requirements at Mr. Loi's field, based on the cherry yield.
### Fertiliser requirements according to yield level

<table>
<thead>
<tr>
<th>Fertiliser</th>
<th>Estimated yield: 15 tonnes/ha</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amount (kg/ha)</td>
<td>Nutrients (kg/ha)</td>
<td></td>
</tr>
<tr>
<td>Urea (46% N2)</td>
<td>452</td>
<td>208</td>
<td></td>
</tr>
<tr>
<td>Rock Phosphate (16.5% P2O5)</td>
<td>242</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>KCl (60% K2O)</td>
<td>333</td>
<td>240</td>
<td></td>
</tr>
</tbody>
</table>

Based on the farmers' treatment in combination with the expected cherry yield, the following table shows any additional applications, if necessary, and the treatments for the rest of the year.

### Fertiliser application scheme for test plot, 0.25ha

<table>
<thead>
<tr>
<th>Fertiliser</th>
<th>Annual fertiliser requirement</th>
<th>Applied by farmer in May</th>
<th>Additional amounts</th>
<th>Timing and amounts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>May</td>
</tr>
<tr>
<td>Urea (46%)</td>
<td>113,0</td>
<td>86,4</td>
<td>-</td>
<td>33,9</td>
</tr>
<tr>
<td>Rock Phosphate</td>
<td>60,5</td>
<td>100,0</td>
<td>-</td>
<td>100,0</td>
</tr>
<tr>
<td>KCl</td>
<td>83,3</td>
<td>50,0</td>
<td>33,3</td>
<td>50,0</td>
</tr>
</tbody>
</table>

Note: the **bold** amounts are additional to the farmer’s gift in May, the amounts in *italics* are according to the schedule of PRI

2.2 Mr. Luc

The field of Mr. Luc is slightly sloping, with an estimated inclination of 1%. Surrounding the field are shadow trees, that also serve as a windbreak. Most commonly Eucalyptus and Acacia are found, the latter contributing to N-content of the soil through litter fall. In the field itself few trees are found, but the number is so little that significant influence on the yield through shadow is very limited. The orientation of the field is east-west, with the elevated area of the field at the east side. The total size is 0.56ha, half of which will be used in the trial. The boundary between the two halves is marked by a line of stumped coffee trees, 12 in total. The following figure gives an outline of the field.

The soil at the field of Mr. Luc also has a low pH and CEC, although the organic matter content is slightly higher. The pH in the first 30 cm of the soil is around 4.4-4.5, with an average CEC of 9.43. Organic matter content in the first 30cm averages 2.32%. According to the results of the analysis the soil can be classified as *silt loam*. 
The influence of a FFS on the shift to a more sustainable coffee cultivation in Huong Hoa, Vietnam

 Annex I: Field trial rationale and outline

The number of trees involved in the experiment is around 1250 on an area of 0.28ha. This results in a planting density of around 4800 trees/ha, this is about the maximum that can be grown on 1ha. The first fertiliser treatment of the year in May has been done in accordance with farmers management. A second application will take place in July, a third in September, the last in December or early January. The total amount of fertiliser is related to the estimated fresh cherry yield in tonnes. The following figure gives an outline of the treatments at Mr. Luc’s field.

Fertiliser requirements according to yield level

<table>
<thead>
<tr>
<th>Fertiliser</th>
<th>Estimated yield: 15 tonnes/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amount (kg/ha)</td>
</tr>
<tr>
<td>Urea (46% N2)</td>
<td>452</td>
</tr>
<tr>
<td>Rock Phosphate (16,5% P2O5)</td>
<td>242</td>
</tr>
<tr>
<td>KCl (60% K2O)</td>
<td>333</td>
</tr>
</tbody>
</table>

Based on the yield estimates, as assessed by Mr. Luc and TLPCs coffee expert, Mr. Thiet the following application scheme has been formulated.
The influence of a FFS on the shift to a more sustainable coffee cultivation in Huong Hoa, Vietnam

-Annex I: Field trial rationale and outline-

Fertiliser application scheme for test plot, 0,28ha

<table>
<thead>
<tr>
<th>Fertiliser</th>
<th>Annual fertiliser requirement</th>
<th>Applied by farmer in May</th>
<th>Additional amounts</th>
<th>Timing and amounts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>May</td>
</tr>
<tr>
<td>Urea (46%)</td>
<td>126,5</td>
<td>100</td>
<td>-</td>
<td>100,0</td>
</tr>
<tr>
<td>Rock Phosphate</td>
<td>67,8</td>
<td>100</td>
<td>-</td>
<td>100,0</td>
</tr>
<tr>
<td>KCl</td>
<td>93,2</td>
<td>50</td>
<td><strong>43,2</strong></td>
<td>50,0</td>
</tr>
</tbody>
</table>

Note: the **bold** amounts are additional to the farmer’s gift in May, the amounts in *italics* are according the schedule of PRI

2.3 Mr. Thi

The field of Mr. Thi comprises 10.000 trees on 1,8ha. The test plot is about 0,9ha with 5.000 trees. Differences in yields within the field are considerable, with the higher slope yielding less compared to the lower parts.

The soil in Huong Phung is very acid, at Mr. Thi’s field the pH is 4,20. Organic matter is slightly better at 3,01% in the first 10cm, and subsequently decreasing from 2,28% to 1,41% from 20 to 30 cm. The CEC is low at 9,36 in the first 10cm and 8,96 from 10 to 20cm, indicating poor availability of nutrients for the plant.

The following figure presents a sketched outline of the field.
The boundary in the field is marked by a nylon cord hung between bamboo poles. As the trees are now heavily loaded with cherries, Mr. Thi did not seem very eager to start stumping. The agreement is that after the harvest stumping will be done, following the line marked with the nylon cord.

<table>
<thead>
<tr>
<th>Fertiliser</th>
<th>Estimated yield: 17,5 tonnes/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amount (kg/ha)</td>
</tr>
<tr>
<td>Urea (46% N₂)</td>
<td>496,5</td>
</tr>
<tr>
<td>Rock Phosphate (16,5% P₂O₅)</td>
<td>266,5</td>
</tr>
<tr>
<td>KCl (60% K₂O)</td>
<td>371,5</td>
</tr>
</tbody>
</table>
According to the estimated yield level of 17.5 tonnes per hectare (30 tonnes for the whole field of 1.8 ha), the following amounts of fertiliser should be applied to the test plot of 0.9 ha.

<table>
<thead>
<tr>
<th>Fertiliser</th>
<th>Annual fertiliser requirement</th>
<th>Applied by farmer in May</th>
<th>Additional amounts</th>
<th>Timing and amounts</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea (46%)</td>
<td>446.5</td>
<td>500.0</td>
<td>-</td>
<td>500.0, 111.6, 200.9</td>
<td></td>
</tr>
<tr>
<td>Rock Phosphate</td>
<td>239.5</td>
<td>250.0</td>
<td>-</td>
<td>250.0</td>
<td></td>
</tr>
<tr>
<td>KCl</td>
<td>334.4</td>
<td>250.0</td>
<td><strong>84.4</strong></td>
<td>250.0, <strong>84.4</strong></td>
<td></td>
</tr>
</tbody>
</table>

Note: the bold amounts are additional to the farmer's gift in May, the amounts in *italics* are according to the schedule of PRI.
Annex II Workshop outline

Assessing Farmer Field School (FFS) opportunities for the shift to a more sustainable coffee production.

1. Background

To enhance their extension activities, TLPC has started FFSs, focussing on pepper and coffee cultivation with the aid of a DED expert, Mr. Lempke. During the month of June this year, three new FFSs have started in Khe Sanh, on the subject of coffee cultivation. In total, an estimated number of 75 farmers is joining the meetings. This workshop aims to provide feedback to the FFS staff through participative consultation of the 75 farmers on the subjects they consider important to sustain their coffee farms at the back of low world market prices for coffee.

2. Objectives

The objectives of this workshop are to:

- jointly analyse the measures that can be taken at farm level to enhance the sustainability of coffee cultivation;
- assess in as far these measures are presently incorporated in the FFS curriculum; and
- determine how the FFS can enhance their influence on the sustainability of coffee cultivation through the teaching methods applied.

3. Timing

To discover what the target group thinks of the FFS approach as it has been implemented thus far four meetings will be held at the following dates:

23rd of July, 13:30: Khe Sanh, in factory meeting hall; 25 farmers
24th of July, 13:30: Khe Sanh, in factory meeting hall; 25 farmers
25th of July, 13:30: Hung Phuong, in house of Mr. Thi; 15 farmers
26th of July, 13:30: Khe Sanh, in factory meeting hall; 25 farmers

The meetings will take place in the afternoon, following the FFS meeting of the morning, and last from 13:30 to around 17:00.

4. Programme
The following tables present an outline of the preliminary programme. As the FFS in Hung Phuong has been in operation for a longer time than the one in Khe Sanh, the programme and the discussion outline is slightly different.

<table>
<thead>
<tr>
<th>Workshop programme, Khe Sanh</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Activity</strong></td>
</tr>
<tr>
<td>----------------</td>
</tr>
</tbody>
</table>
| 1. introduction | • Introducing each other  
• Explaining purpose and methods | 13:30-13:45  
(15 minutes) | | |
| 2. Generating ideas | • Individuals write down constraints in coffee production at farm level on cards  
• Discussing points mentioned | 13:45-14:45  
(1 hour) | Cards, 30 filt-tipped pens | |
| 3. Categorising and ranking of points generated under point 2. | • Following discussion an order of importance is made of the points. | 14:45-15:30  
(45 minutes) | Flip charts, filt-tipped pens, chalk | |
| 4. Coffee/tea break | | 15:30-16:00 | Coffee and tea, snacks | |
| 5. Elaborating solutions | • Through group discussion possible solutions from the farmers’ perspective are drafted. | 16:00-17:00  
(1 hour) | Flip charts, filt-tipped pens, chalk | |
| 6. Closing | • Thanking participants | 17:00-17:05 | | |
| 7. Evaluating for facilitators | • Strong points, weak points  
• Formulating possible adaptations for next meeting | 17:15-17:30 | | |

The programme in Hung Phuong will have a different focus, and will pay more attention to the functioning of the FFS so far, and how it is has contributed to the sustainability of the cultivation. The next table gives an outline.
# Workshop programme, Huong Phung

<table>
<thead>
<tr>
<th>Activity</th>
<th>Details</th>
<th>Duration</th>
<th>Materials needed</th>
<th>Remarks</th>
</tr>
</thead>
</table>
| 1. introduction | • Introducing eachother  
• Explaining purpose and methods | 13:30-13:45 (15 minutes) | | |
| 2. Generating ideas | • Participants write down what the FFS contributed to their farms  
• Participants write down constraints in production | 13:45-14:00 (15 minutes) | Cards, 30 filt-tipped pens | |
| | | 14:00-14:15 (15 minutes) | | |
| 3. Categorising and ranking of points generated under point 2. | As a result of discussion common agreement is reached on the ranking of both aspects mentioned under point 2. | 14:15-15:30 (1 hour and 15 minutes) | Flip charts, filt tipped pens, chalk | |
| 4. Coffee/tea break | | 15:30-16:00 (30 minutes) | Coffee, tea, snacks | |
| 5. Elaborating curriculum adjustments and methods | Of the points ranked under point 3., which should be incorporated in the curriculum and how should they be taught? | 16:00-17:00 (1 hour) | Flip charts, filt tipped pens, chalk | |
| 6. Closing | Thanking participants | 17:00-17:05 (5 minutes) | | |
| 7. Evaluating for facilitators | Suggesting adjustments for the next workshop | 17:15-17:30 (15 minutes) | | |

5. Discussion points

To stimulate discussion among the participants it is important to formulate challenging questions. For each point mentioned in the programme questions have been drafted below:

5.1 Khe Sanh
Activity 2. -Suppose your children want to continue the coffee farm, what can you do now, that will provide them with good conditions when they take over, say 20 years from now?

-Suppose the coffee price falls even lower than present levels: What aspects of your management you think can be improved in order to: Increase yields and/or decrease costs?

-The project partners of TLPC, two major coffee companies from Holland and Germany stated that they are willing to pay better prices for good quality coffee. How are you going to achieve this on your farm?

-What aspects of your management you feel uncertain about, in other words: can you outline the knowledge needs you have to increase product quality?

-throughout the growing season, what are the main aspects limiting production (e.g. labour, credit, tree variety, etc.)?

Activity 5. -Of all the points mentioned under the activity 2, some are without your reach to change. Others seems attainable, can you suggest possible measures that will contribute to the solving of these problems?

-How do you expect the FFS will contribute in the solving of the listed problems?

-How should the teaching methods of the FFS look to be most effective in transferring information?

-Who is responsible for the improvement of your farm management?

-Can you learn from your colleague farmers, if so what and how?

-Did you ever consider taking small tests at your own farm to analyse problems and find possible solutions, should the FFS assist you in this, and if so, in what way?

5.2 Hung Phuong

Activity 2. -Of all the FFS subjects, which have you used in your farm?

-If there are subjects you did not use, what were the reasons for not utilising the knowledge?

-Did the FFS contribute to the profitability of your farm, and if so, in what way?
-At present the coffee trees in Hung Phuong, in general, do not look very good, what are the reasons for this, and how do you think the FFS can contribute in increasing the quality of your farm?

-Besides the constraints mentioned in the previous question, are there any other aspects of cultivation that are presently not very well covered in the FFS and need more attention?

Activity 5.

-Do you think the researchers, like mr. Lempke and Mr. Thiet can analyse all the information that needs to be gathered?

-How could you contribute to the process of identifying suitable management alternatives?

-The way of farming is quite diverse in this area, how can you learn from your colleagues? And could a comparison between different ways of cultivation lead to improvement?

-Regarding the teaching methods of the FFS, how do you think the effectiveness of the FFS can be increased?

-Are the presently used teaching methods used sufficiently effective or would you like to see changes in the way of teaching, and if so, how?

5. Further comments

As this workshop is aimed at exploring opportunities for the FFS from which the farmers will benefit directly, no incentives will be paid to the participants.
Annex III Discovery based learning exercises for coffee

Exercise 1. Appraisal of coffee production constraints

Objectives

- To obtain information on farmers’ coffee management practices and identify the major problems encountered by farmers
- To prepare a seasonal calendar as a guideline for farmer field school study plots

Procedure

In the meeting place:
Facilitate a general interactive discussion session to discuss the kind of information that needs to be gathered from coffee farmers. Work through the entire coffee production cycle, including land preparation, seedling management, planting, flowering stage, fruiting stage, picking, etc. At each step, decide what kind of information that needs to be gathered from coffee farmers, in terms of production constraints and the management practices associated with each stage of the crop, including pest and disease management (e.g. spraying, cultural controls), pruning practices, fertilisation practices, etc.

In the field:
In small groups of 4-6 participants, visit different coffee fields. Discuss farmers’ practices and problems with each farmer and visit the fields to observe and verify some of the problems.

Back in the meeting place: Each small group prepares posters to present their findings to the rest of the group. After the discussions, develop a seasonal calendar, which is a record of crop growth and development stages plus, per stage, what is done, by when, by who and for what reason. This becomes a guideline for the farmers’ practice treatment in comparative experiments to test alternative, IPM management options in a field school set-up.

Guide questions for discussion
1. What do farmers see as the main constraints to coffee production?
2. At what stage(s) of the cropping season is each constraint important?
3. What options do farmers perceive they currently have to overcome these constraints? Are there other ICM options available?
4. Which of the constraints could be addressed in a farmer field school programme? How?

Observing coffee constraints in the field

Exercise 3. Observing coffee fields through Agro-Ecosystem Analysis (AESA)

Objectives

- Analyse the field situation by making observations, drawing findings and discussing potential management actions needed
Study the coffee agro-ecosystem for informed decision making
Understand the various interactions that occur amongst the components in the coffee ecosystem and demonstrate their balance

Materials
- Coffee field
- Vials
- Polythene bags
- Cotton wool
- Methyl alcohol (70%)
- Sweep nets
- Hand lenses
- Notebooks, pencils and erasers, colour markers and crayons
- Poster paper (flip charts / newsprint)
- Meter rule

Procedure
AESA data are normally collected from various treatments (e.g. IPM versus Farmers’ Practice) to learn about the impacts of those treatments.

Preparation:
In groups of 3 or 4 participants (if possible with one facilitator each), visit a different coffee field. Each group selects one person to record all data (Recording can be rotated amongst group members). Each group should move diagonally across the field and select and tag at least 5 coffee bushes for observations.

Making observations (use attached data sheet for recording):
For each coffee bush/tree:
- Measure the height of the tree (cm), the canopy diameter (cm) and the No of cycles (number of seasons the tree has passed through).
- Spread the polythene sheet on the ground below the trunk of the tree. Shake or beat the trunk vigorously, so that insects, diseased berries and leaves fall on the polythene. Make sure your first shake/beat is a good one, so that you catch the insects by surprise. If the first shake does not knock them down, many insects will cling tightly to the plant and won’t fall off, no matter how much you try to dislodge them subsequently!

- For each bush, observe and record the numbers of the insects you recognise on the polythene sheet, and whether they are a pest or a beneficial. Collect any insects that you do not recognise in the vials. Take them back to the meeting place to see if any of the other groups can help you.
- After beating the tree, select branches, 1 from the top, 1 from the middle, and 1 from the bottom of the tree. Carefully observe 5 leaves on each of these branches and the branches themselves, recording numbers and species and insects remaining on the branches. Observe and record how many of the leaves and berries are diseased. If you recognise the diseases,
record them. If you don’t recognise them, collect them in vials and take them back to the meeting place.

__Count on how many bushes the major pests and diseases are found.
__Record the number and species of any weeds on or around the tree. If you are not sure whether a plant is a weed, collect it in a polythene bag, and take it back to the meeting place.
The other groups may be able to help you decide.
__Record the general condition of the plant (Healthy, Moderately Healthy, Weak).
__Record the soil moisture levels (High, medium, Low). Check whether there are signs of soil erosion. What is the health of the soil (structure, organic matter)?
__Record the weather conditions at the time when you made your observations.

Presenting your findings:
Present your results on flip charts or posters. Prepare them as follows:
__Draw a large picture of a coffee plant in the centre of the page, using the right colours
__On the left-hand side of the plant, draw the insect pests and disease symptoms found and, indicate how many you found, and where on the plant you found them.
__On the right, draw the beneficials. Indicate how many you found, and where on the plant you found them.
__Around the base of the plant, indicate the number and the species of the weeds you found.
__Somewhere on the chart, also indicate weather conditions, soil moisture, general plant health and any other general observations you made.
__Present and explain the chart to the other groups.

Making management decisions:
Discuss as a group what management decisions to take. For example, given the relative pest and natural enemy populations, diseases levels, do we need to spray or are there other management options? If you do need to do something, how and when and what will be the impact on the agroecosystem. E.g. if you opt to spray a pesticide, what chemical should you use? Is it necessary to spray the whole field? Is it necessary to spray the whole plant? What will happen to the natural enemies if you spray? And what knock-on effect would you expect if natural enemies would be killed by spraying? What is the condition of the soil? Do we need to irrigate? What is the structure of the soil? If it is poor, can we improve it? Do we need to take measures against soil erosion? If so, what? Etc.

How can AESA be used?
You don’t need to answer all these questions straight away. You can use the AESA to identify topics you need to study or to give you some ideas as which IPM/ICM methods you would like to try out. AESA can be modified and used as a system for collecting data in simple farmer experiments. For example, comparing IPM and Farmer practise plots, or testing different crop varieties, or evaluating different fertilisation regimes.
TYPICAL FIELD DATA COLLECTION SHEET FOR AESA

Group Name: AESA No. Plot Name: Date:
Crop:

Insect pests, natural enemies and diseases

Organisms / Conditions Tree Number Total
1 2 3 4 5 6 7 8 9 10

Insect pests and mites
1. 
2. 
3. 
4. 
5. 
6. 

Natural Enemies
1. 
2. 
3. 
4. 
5. 
6. 

Diseases* We need to specify how we do this: see questions in text.
1. 
2. 
3. 
4. 
5. 
6. 

Weeds
1. 
2. 
3. 
4. 
5. 
6. 

Agronomic Data
Parameter Bush No.
1. Plant Height (cm)
Exercise 4. Coffee pruning

Objectives
__To learn how to do proper pruning
__To investigate how proper pruning may reduce common coffee diseases, especially leaf rust

Materials
_ Un-pruned coffee bushes
_ Secateurs or whatever farmers use as pruning tools

Procedure
*Be careful if coffee cancer is present as you could spread it on the pruning tools from infected to healthy trees!*
__Work in groups of two participants per coffee bush, carefully pruning off suckers and branches with die back diseases. Remove secondary branches in an alternate pattern.
__Make field observations of pruned and un-pruned trees over time. Use the observation and presentation methods described in Exercise 3 (AESA). Pay particular attention to disease levels, and to populations of insect pests and natural enemies.
__At the end of the season, measure and compare yields from pruned and un-pruned trees.

Guide questions for discussion
1. Did you observe any differences in disease levels (increase or decrease) between pruned and un-pruned trees? If so, why?
2. Did you observe any differences in insect pest levels (increase or decrease) between pruned and un-pruned trees? If so, why?
3. Did you observe any differences in natural enemies (increase or decrease) between pruned and un-pruned trees? If so, why?
4. Where they any differences in any other measurements you made, e.g. general plant health, numbers of berries per branch, weed infestation.
5. Considering the labour involved in pruning, do you think this is a worthwhile exercise? Why / why not?

Exercise 5. Compost preparation

Objectives
To learn how to prepare compost for application on coffee fields

Materials
- Plenty of plant material both dry and green
- Ordinary top soil
- Animal manure or old compost
- Wood ashes and charcoal dust
- Several jars of water

Procedure
- Select a location close to the place where the compost will be used. Make sure it is sheltered from the wind, rain and sun. The compost pile must not get too hot or dry.
- Measure an area one-and-a half meters to two meters wide and any convenient length depending on the available composting materials. It must be possible to work on the compost pit without actually stepping on it.
- Loosen the ground where the compost pile will be. The materials need close contact with the loose soil at the bottom. It is best to make a shallow trench about 30cm deep. In dry areas the trench or pit can be as much as one metre deep. The topsoil obtained will be used in the compost. Therefore, put it on one side beside the trench.
- The bottom layer should be of rough vegetation such as maize stalks or hedge cuttings. This layer should be about 30cm thick. Chop maize stalks etc into shorter lengths.
- The second layer should be manure or old compost or slurry. It should be about 10cm thick.
- Sprinkle some of the topsoil on top of this layer so that it just covers the material. Do not put on too much soil, and only use topsoil.
- The next layer should be made up of green vegetation about 15-20cm thick. Use green weeds, grass, hedge cuttings or kitchen waste.
- If you have wood ashes, sprinkle some on top of the green vegetation. If wood ash is not available, use topsoil.
- Add water to the pit. Use a watering can or any other convenient container, but make sure the pile is well watered.
- Repeat the whole process again, starting with rough vegetation then manure or old compost, top soil, green vegetation, ash or soil and finally water again. Repeat this process until the pile is 1-1.5m. A well-made pile has almost vertical sides and a flat top. If you have a lot of material to compost, build several smaller piles (about 2 m in length).
- To complete the pile, cover it with a 10cm layer of topsoil. This layer prevents fermentation gases escaping from the pile. But make sure that the cover doesn’t shut off any air circulation as that would promote rotting rather than composting of the organic material inside the pile. Finally, cover the whole pile with dry vegetation to prevent loss of moisture through evaporation. Take a long, sharp stick (‘thermometer’) and drive it into the pile at an angle.
- Water the compost occasionally, about every 3 days depending on weather conditions. (If it is raining there is no need to water). The compost should be kept moist, but not too wet,
angle, and use the stick to monitor the moisture levels in the pile. To monitor the moisture content, drive a stick long, pointed stick into the pile. The stick, when removed, will be warm. The stick also helps to check the condition of the pile from time to time. It will show whether the pile is dry or wet.

After two to three days, decomposition will have started in the pile, and this decomposition will start to generate a lot of heat. Use the stick (‘thermometer’) to ensure that the compost is hot, i.e. that decomposition is in progress by pulling out the stick and checking the lower part for its humidity and warmth (feel with your bare hands – wash hands afterwards). Check the stick regularly, not only for temperature, but also for the presence of a fungus called “fire fang”. Fire fang destroys the compost when the pile once the compost becomes dry. Fire fang turns the stick white, and if you detect it you should add water immediately. Once there is no more heat generation, the decomposition process is slowing down and it’s time to turn the pile.

If all goes well, the pile should be turned after three weeks. Do not add any fresh material during turning, except water if "fire fang" has developed. Make sure that while turning the bottom part of the pile ends up on the top. This is necessary because decomposition at the bottom goes slower than at the top.

After three more weeks the pile should be turned a second time. The pile should stay moist, not wet. When the pile has been taken care of well, there is no need for further turning. By now the compost should have a fresh earth smell and no grass, leaves or animal droppings should be visible. Some woody branches or stalks may still be present as they take a long time to decompose.

Three weeks after the second turning, the compost should be ready for use. If the planting season is still some time away, leave the pile where it is. Keep it well covered and moist, but not wet (compost is wet when water drips-out of a handful which is squeezed tightly).

Guide questions for discussion
1. What happens with weed seeds, pupa of pest insects and disease spores inside the compost heap?
2. When is it better to compost crop residues rather than digging in crop residues (as e.g. in a smallholder coffee garden where there is mixed cropping with vegetables)?
3. Do farmers in your area make compost? If not, why not? If yes, do they have alternative methods for doing so (e.g. discuss: ‘above procedure looks complicated, do the odd alternating of layers of vegetation, soil and manure work as well?’)?
4. What are the costs / benefits of making and utilising compost?

Source: Henry Double Day Association

Exercise 6. Making liquid manure and plant teas

Objectives
The influence of FFS on the shift to a more sustainable coffee cultivation in Huong Hoa, Vietnam

Annex III: FFS assignments

The aim of making liquid manure and plant teas is to quickly provide a crop with adequate natural plant food during the growing season. Liquid manure and plant teas are ready for use after two or three weeks, as compared to six weeks or more for compost.

Materials
- Manure – e.g. chicken or rabbit or a mixture of both
- A container – either a drum / half a drum for small quantities
- A strong sack or gunny bag
- A strong pole and rope

Procedure

Liquid manure:
__Put the manure in a strong sack or gunny bag with 50 kg of manure for one drum of water. Fill it in such a way that you can tie the top of the bag securely.
__Suspend the bag containing manure in a drum full of clean water. The bag should be tied securely with a rope and suspended on a strong pole placed across the top of the drum.
__Leave the manure to stand for 15 days. Cover the drum to prevent excessive evaporation.
__After three days and every other day thereafter, stir the drum contents by lifting the bag several times using the pole.
__After 15 days the water will have turned blackish and most of the plant food in the manure will have been washed into the water. Remove the bag.
__Dilute the contents of the drum 1:2 (to one part of the liquid manure add two parts of clean water). Spray the crop at the stem and not at the leaves. Alternatively water around the roots near the stem.

Plant teas:
__When preparing plant teas, branches and green sappy leaves are chopped up and placed in a drum full of clean water. It is not necessary to put the leaves in a bag.
__Leave the chopped leaves to stand for 15 days. Cover the drum to prevent excessive evaporation.
__After three days and every other day thereafter, stir the drum contents.
__After 15 days the water will have turned blackish. Dilute the contents of the drum 1:2 (to one part of the plant tea add two parts of clean water). Spray the crop at the stem and not at the leaves. Alternatively water around the roots near the stem. Water with this liquid manure or plant tea for two or three weeks. It is effective as top dressing after planting the crop using compost.

Guide questions for discussion
1. Do farmers in your area make liquid manure / plant teas? If not, why not? If yes, do they have alternative methods for doing so?
2. What are the costs / benefits of making and utilising liquid manure / plant teas?

Exercise 7. Assessing farmers’ friends in the coffee field

Objective
To discover the impact of farmers’ friends in the coffee field by examining pest populations on coffee trees with and without predators

**Materials**
- Unsprayed coffee trees infested by pests
- Nylon mesh
- Long sticks (about 2 m each)

**Procedure**
- Prepare 10 nylon mesh cages (2m x 2m x 2m) supported by 4 sticks to cover individual coffee trees
- Identify and select 10 coffee trees highly infested by pests e.g. antestia bugs, aphids or mealy bugs.
- Clear all predators from the selected trees and from the soil underneath and then cage trees. The nylon mesh should be properly buried into the soil to block the way for insects. Randomly label 5 of the caged trees ‘without predators’ and 5 ‘with predators’.
- Collect 40 active predators, e.g. Lacewings or Ladybird beetles, and introduce them to each of the cages labelled “with predators”.
- After 5 days remove the cages carefully and count the number of pests on each tree in each of the treatment. Note whether the introduced predators are alive.
- Calculate the average number of individual insect pests in each treatment.

**Guide questions for discussion**
1. What was the impact of farmers’ friends in the coffee field?
2. How can you conserve farmers’ friends in the coffee field?

**Exercise 8. Learning more about insects**

**Objectives**
- To become aware of beneficial insects in coffee fields as well as their food range
- To learn more about insect life cycles

**Materials**
- Coffee fields
- Vials / glass or plastic jars
- Cotton wool / fine mesh screen
- Hand lenses
- Polythene sheets

**Procedure**
Finding out who eats what
In the field:
- Select and tag 10 coffee bushes at random.
- Lay the polythene sheet out under the stem, and beat/ shake the stem as described in Exercise 3 (AESA).
Collect several specimens of each insect you find, and place each species in a separate vial. Close the vial with some cotton wool or fine mesh screen.

Collect plant material including berries, leaves, and anything else you think the insects might be feeding on.

In the meeting place:

Introduce a range of different food types to each vial, including plant material e.g. coffee berries, coffee leaves, and some insect prey including the pests you identified in the previous step.

Observe the insects at regular intervals for as long as possible. You may be able to see it feeding on its preferred food. If this is not possible, observe the vials daily and record which food types have been eaten, or disappeared.

You may find that the insect does not eat any of the food items you have offered. It is possible that the insect is in fact a predator, but you just haven't offered it the right prey. In this case, collect more insects using the beating or shaking the stem as described in Exercise 3 (AESA).

Offer the insect a wider range of insect prey. Observe the vials as often as you can to see you can observe the insect feeding on a particular prey species. If you don't actually see the predator feeding, observe the vials as often as you can and. Count the numbers of each prey species and try and work out what has disappeared (been eaten), and what has been left.

Learning more about insects

In this part of the exercise we examine the insects that we experimented with in the first part.

Collect the insects that you are interested in at different stages of development (eggs, larva, nymph or pupae) by beating/ shaking the trees as described in the previous exercise. Put each individual in a separate vial. To avoid condensation in the vial, line the bottom with some tissue (toilet) paper. Place it in a shaded, cool place.

Feed each insect on an appropriate food source according to your findings in the first part of the exercise.

Observe the insect as often as possible, or at least once every 2 days. Observe and draw each different stage of development, as you observe it passing though the different stages of its life cycle. Also make notes on what it is doing, for example is it moving, is it still feeding, is it laying eggs and if so, how many and where?

Guide questions for discussion

1. Which of the insects, that you didn't know before, feed on plants and which of them feed on insect prey? If you do not know the name, make one up, based on its behaviour! For example, farmers in Kenya named hoverflies 'Helicopter Insects', because of the way they fly.

2. What can you say about these insects from a pest management point of view? (Remember, just because an insect feeds on the plant, it doesn't necessarily mean it is causing economic damage).

3. How do the studies of the insect life cycles help in making pest management decisions?
Exercise 9. Learning about spray drift

Objectives
__To demonstrate spray drift to other crops when spraying coffee.
__To create awareness of the direct exposure to pesticides when spraying.

Materials
__ Knapsack sprayer
__ Non-toxic dye
__ White flip charts
__ Coffee bush with surrounding crops/vegetation (other crops should be over one meter away from the coffee bush to be sprayed)
__ A volunteer!

Procedure
__Prepare 5-10 litres of dye solution in the knapsack.
__Wrap up the volunteer completely (apart from the eyes!) in white flip chart paper.
__Ask the volunteer to spray the tree as though were using a pesticide, i.e. for about 5 minutes at different heights and from different wind directions.
__After spraying, remove the sprayer and observe how much dye is on each part of the body (none, a little, a lot).
__Examine the surrounding vegetation surrounding the coffee bush, and observe how far the spray has drifted and whether or not is on crop plants.

Guide questions for discussion
1. How much spray ended up on the operator?
2. What are the hazards that pesticide contamination might pose to pesticide sprayers’ health?
3. What sort of protective clothing do you think sprayers should use?
4. How far did the spray drift? Under what conditions would the drift be greater? Under what conditions would it be less?
5. Did the spray drift on to neighbouring crops? If so what are the implications for health? What are the implications for the agro-ecosystem, in particular the pests and natural enemies in the contaminated crop?