

What can organic agriculture contribute to sustainable development? Long-term farming systems comparisons in the tropics



External review August through December 2009

Mission headed by Urs Scheidegger

With contributions by:

Mukishi Pyndji (Kenyan part)
Om Rupela (Indian part)
Oscar Llanque (Bolivian part)

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Contents

Acknowledgements	ii
Abbreviations	ii
Executive summary	iii
1. Introduction	1
1.1. The project in brief	1
1.2. The rationale for the external review	2
1.3. Methodology	2
2. Analysis across the three countries	4
2.1. Relevance of the Project to stakeholders	4
2.2. Effectiveness	5
2.3. Experimentation	8
2.4. Efficiency	10
2.5. Project management	11
2.6. Risks and potentials	15
3. Kenya	17
3.1. Introduction	17
3.2. Relevance to stakeholders	17
3.3. Effectiveness	19
3.4. Long-term experiments	22
3.5. On-farm work	27
3.6. Efficiency	30
3.7. Project management	31
3.8. Risks and potentials	31
3.9. Budget-relevant additional activities recommended	32
4. India	33
4.1. Introduction	33
4.2. Relevance to stakeholders	33
4.3. Effectiveness	34
4.4. Long-term experiment	35
4.5. On-farm work	38
4.6. Efficiency	41
4.7. Project management	41
4.8. Risks and potentials	42
4.9. Budget-relevant additional activities recommended	42
5. Bolivia	43
5.1. Introduction	43
5.2. Relevance to stakeholders	43
5.3. Effectiveness	45
5.4. Long-term experiment	46
5.5. On-farm work	50
5.6. Efficiency	53
5.7. Project management	54
5.8. Dissemination of results and communication	55
5.9. Risks and potentials	56
5.10. Budget-relevant additional activities recommended	58
6. Important conclusions and recommendations	59
7. References	61

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Abbreviations

AOPEB:	Association of ecological producers of Bolivia, La Paz
ARD	Agricultural Research for Development
ASARECA	Association for strengthening agricultural research in eastern and central Africa
CGIAR	Consultative Group on International Agricultural Research
CIAT	Centro Internacional de Agricultura Tropical
CIMMYT	International Maize and Wheat Improvement Center
CIP	International Potato Center
Ecotop:	Consultancy firm specialized on ecological agriculture, Sapecho, Bolivia
ER	Expected Result
EU	European Union
FiBL	Research institute for organic agriculture, Frick, Switzerland
icip	International centre of insect physiology and ecology
IE:	Ecology Institute of San Andrés University, La Paz, Bolivia
GMO	Genetically modified organisms
KARI	Kenyan Agricultural Research Institute
KIOF	Kenyan Institute of Organic Farming
KIOAN	Kenyan Organic Agriculture Network
KU	School of Environmental Studies and Human Sciences of Kenyatta University, Kenya
MoA	Ministry of Agriculture
MoU	Memorandum of Understanding
NGO	Non-Governmental Organization
OA	organic agriculture
PABRA	Pan-African Bean Research Alliance
PIAF-El Ceibo:	Program for agroecological and forestry implementation of El Ceibo (association of cocoa producer cooperatives), Sapecho, Bolivia
PROINPA:	Foundation for research and promotion of Andean Products, Cochabamba, Bolivia
QPM	Quality Protein Maize
RT	Review Team
SC	Steering committee
SDC	Swiss Agency for Development Cooperation
ToT	Training of Trainers
TORs	Terms of references
TSBF-CIAT	Tropical Soil Biology and Fertility Institute of International Center for Tropical Agriculture

Executive summary

The project "long-term farming systems comparisons in the tropics" is an initiative of FiBL (research institute for organic agriculture, Switzerland) to compare organic and conventional farming systems in Kenya, India and Bolivia. Together with local partners, replicated field experiments were established to discern the effects of organic agriculture on yield, yield stability, product quality, soil fertility and biodiversity, as well as on natural and economic resource efficiency. Overall, the project shall generate reliable data on the environmental and socio-economic performance of organic in comparison to conventional agriculture. After thorough preparation, experiments were initiated in 2007 in Kenya and India and in 2008 in Bolivia. Each of the three sites works with crops representative of the area: Maize, beans and vegetables in Kenya, cotton, soybeans and wheat in India and cocoa as a lead crop in Bolivia.

The external review consisted of visits to all three countries, where experimental sites and on-farm work was observed and project partners and stakeholders interviewed. Discussions in Switzerland with FiBL staff and with Project governing bodies completed the review.

The reviewers conclude that the experiments are well designed and implemented. Care was taken to define the treatments in a way that crop rotation and input levels are realistic for the area, while allowing for across-site conclusions. Experiments were carefully laid out and endorsement from authoritative exponents of conventional and organic farming was sought (in Bolivia, identification of respective bodies is still underway). All the experiments are scientifically sound.

The Project is highly relevant to a wide array of stakeholders, who include in the first place policy makers (at national and international level), scientists, extension agents and organic movements. As the Project initiated in 2009 an on-farm technology development component identifying and addressing the most urgent concerns of organic farmers, it managed to arouse the interest of farmers and their organizations. The combination of replicated, long-term systems experiments with on-farm work holds promise to turn out results useful for farmers. All stakeholders acknowledge that the Project's systems comparison and long-term approach to assess sustainability are unique for the tropics. Obtaining solid information on organic agriculture is highly relevant to most stakeholders (including farmers), while it will be a challenge to get the interest of policy makers and development agencies.

Project partners are highly committed to the Project and its objectives. The Project has managed to involve or link with important ARD stakeholders. Farmers and local extension agents show high interest in the experiments as "physical reference points". The reviewers recommend further nurturing linkages with strategic partners and reaching out to selected new ones.

The systems comparison is considered as fair by exponents of conventional agriculture and credibility of the Project has been well established. Yet, the formulation of Objective 1 (advocating organic agriculture) should be revised, as it might compromise credibility of the systems comparison. The Project fully achieved most of its expected results. Monitoring of Project progress and of data collection in the long-term experiment are well organized.

During the first two years, yields in the organic treatments were 20-30% lower than in the respective conventional ones, with costs not or only slightly lower. The reviewers recommend that the effects on parameters other than yield (e.g. produce quality, soil fertility, resilience) be measured as soon as reasonable to allow for presenting a more holistic picture of the different systems. Further, simple trials should be conducted that aim at making the organic treatments in the long-term experiment more effective and more relevant.

The technology development component was started well, but staff capacity for on-farm research should be further enhanced, and mechanisms developed to build on farmers' knowledge. The reviewers consider it timely to embark on a dialogue on how to best validate the results of on-station work on farm.

The Project is highly complementary to other research initiatives and is working in general with the right partners, who assume complementary responsibilities. Working modes are transparent, participatory, interactive and empowering, with the local Steering Committees playing a key role in coordination. In Bolivia a solution for institutional leadership and coordination has to be found in the medium term and in India links with mainstream agricultural research institutions are presently established. The reviewers recommend identifying efficient ways to foster exchange of experience and approaches between the three Project sites to enhance team spirit and keep up momentum.

Project management is well organized, both at local level and in interaction with FiBL, who's contribution is highly appreciated by the local partners, especially for its scientific expertise. High priority needs to be given to securing adequate funding for the core activities as well as for special studies, with FiBL coordinating local initiatives. All Project sites manage funds highly efficiently, but budgetary restrictions are severe. Especially for Bolivia and Kenya ways need to be found urgently to alleviate budget restrictions.

Risks are in general well checked. Water stress (due to climate change or other factors) is both a risk (hampering trials) and a potential (organic management enhancing resilience) for the Project. Staff fluctuation could affect effectiveness, yet record keeping and handing-over is well organized. To minimize the risk of losing the long-term experiment, the Project should gain full support of farmers and farmers' organizations in the vicinity of the experiment. Context variables (e.g. commodity prices, evolution of genetically modified crops) should be systematically monitored to react in time with modifications in the experiment.

The Project has an excellent potential to reach its objective and to turn out results that will help to make mainstream agriculture more sustainable. International and especially domestic demand for organic products is increasing and the Project will be in a good position to provide answers on how this opportunity can be exploited. During the review, impact hypotheses (impact pathways) have been developed and the reviewers recommend elaborating indicators related to these and designing studies to measure the indicators in collaboration with concerned stakeholders (partners, farmers) as an efficient approach to assess impact.

Overall, the Project has been very successful and the reviewers recommend to donors to continue and expand their financial support.

1. Introduction

1.1. The project in brief

The concept of organic agriculture is regarded as a promising option for sustainable agricultural intensification in the tropics. It combines low-cost technology, environmental conservation, input/output efficiency and access to premium price markets through branding. It is now increasingly being taken up by farmers, NGOs, national programs and agricultural development agencies in tropical countries as a means to improve food security and rural livelihoods in a sustainable way (Kilcher 2007, Pretty et al. 2006). In Europe, numerous studies have proven the advantages of organic agriculture in terms of ecosystem services and economic impact (Pimentel et al. 2005, Mäder et al. 2002, Offermann and Nieberg 2000, Stolze et al. 2000). However, few attempts (e.g. Eyhorn et al. 2007, Blaise 2006, Rasul and Thapa 2004) have been made so far to systematically compare this farming system alongside conventional practices on a medium to long-term perspective under tropical conditions. The long-term perspective is important when comparing organic agriculture to other approaches, since soil structures and processes take time to develop.

To respond to the demand for reliable data on the environmental and socio-economic performance of organic agriculture, FiBL and its partners in the developing world are running long-term farming system comparisons in Africa, Asia and Latin America. Replicated field experiments allow monitoring the effects of organic agriculture on yield, yield stability, product quality, soil fertility and biodiversity, as well as on natural and economic resource efficiency.

As a second component of the Project, technology development trials address the main concerns of organic farmers at each site. A third component aims at creating an environment conducive to dialogue on organic and conventional agriculture and sharing the results of the long-term experiment.

In Kenya, investigations focus on largely subsistence-oriented cultivation of maize, common beans and vegetables on two trial sites under the sub-humid conditions of Central Kenya. The treatments – conventional and organic, at two levels of intensity in each case – were applied for the first time in March 2007. Local partners are the International Centre of Insect Physiology and Ecology (*icipe*), the Tropical Soil Biology and Fertility Institute of International Center for Tropical Agriculture (TSBF-CIAT), the Kenyan Agricultural Research Institute (KARI) and the School of Environmental Studies and Human Sciences of Kenyatta University (KU). Since January 2009, the Kenyan Organic Agriculture Network (KOAN) and the Kenyan Institute of Organic Farming (KIOF) are also part of the local Steering Committee.

In India, the comparison of farming systems is based on an export product – cotton – and is located in semi-arid Central India (Madhya Pradesh). Soybean and wheat, two other important cash crops, are also included in the study. The trial comprises an organic (ORG), a biodynamic (BD), a conventional (CONV) and a GMO (BT) treatment. Operations commenced in the 2007 cotton season. The main local partner is bioRe Association India, a social organisation working with the bioRe India textile chain. Appraisal of national or international research partners is currently under way.

In Bolivia, the trial site is being established in a cacao agroforestry system in humid Alto Beni. The treatments represent conventional and organic farming systems at three levels of agrobiodiversity. Tree planting was done in October 2008. The following institutions have joined forces: Instituto de Ecología de la Universidad La Paz, Asociación de organizaciones de productores ecológicos de Bolivia (AOPEB), El Ceibo, Ecotop, and Promoción e investigación de productos andinos (PROINPA).

The overall goal of the Project is to contribute to agriculture becoming more sustainable. The Project's **strategic objectives** are:

- To bring the discussion about the benefits and drawbacks of organic agriculture on a rational basis
- To create physical reference points for all stakeholders in agricultural research and development, which can be used in policy dialogue and decision making
- To identify the challenges for organic farming so that they can be addressed systematically
- To give an impulse to the development of the organic sector in tropical developing countries
- To increase acceptability of sustainable intensification, and thus to contribute towards conventional farms becoming more ecological

The Project intends to reach directly or indirectly, stakeholders on all levels of international agricultural research and development, i.e. policy makers, researchers, advisory, development agencies, NGO's and extension, producer organizations, individual farmers and consumers.

1.2. The rationale for the external review

The external evaluation was carried out as a mid-term review, as the Project is now on-going for 4 years (2.5 years with SDC funding) and has not undergone any external evaluation up to date. The purpose of the review was to ensure that the Project implementation remains well targeted on achieving its intended results. Further, SDC requires a review as a basis on which a decision for further funding from 2011 onwards can be taken. And the external evaluation was meant to serve as a source of information for other present and potential future donors to base their funding decisions upon. In addition, it is expected that the findings of the external evaluation can be used as a planning basis for the next project phase.

The objectives of this first phase evaluation are the following:

- Assess the Project with regard to its relevance for stakeholders, effectiveness, efficiency and risks/potentials for the mid-term future
- Provide relevant and feasible recommendations, including country-specific and global strategies and activities for subsequent project phases

1.3. Methodology

The external review was carried out between August and December 2009. The consultant heading the mission, Urs Scheidegger, was briefed by FiBL and SDC. For each site he recruited, in discussion with FiBL, a local independent consultant. He traveled for about one week to each of the Project sites (Kenya, India and Bolivia). The resulting teams of two for each site are referred to in this report as "review teams" (RT). The Terms of Reference (annex 1) applied to all three sites and all consultants.

The activities of the review teams consisted in:

- Studying the extensive documentation of the Project
- A briefing by the local Project team on site
- Visits to the long-term experiment sites
- Visits to farmers participating in on-farm trials and to producers in general
- Interviews with local project partners and their staff as well as with other selected stakeholders

An interview guide (annex 2) was developed by the review team, which translated the crucial questions from the TORs into tangible questions that were discussed with the interviewees according to their interest and experience. The findings and analyses were synthesized and presented to the project staff and representatives of local partners in a debriefing meeting.

The review teams elaborated a draft report for each site and circulated it to the Project partners (including FiBL) for comments. The lead consultant then compiled the content of the three reports by country into the present global report, which was presented to FiBL and SDC and discussed in a debriefing meeting in Bern on January 12, 2010.

The review was designed to be a platform for mutual learning between all the project partners and the review team and provide information, know-how and experience on technical aspects in the field of organic farming systems. The review also makes recommendations on appropriate strategies and activities for subsequent phases of the Project.

The present report is structured along the "crucial questions" as outlined in the TORs for the review. Not all these questions were studied with the same degree of detail in the different sites.

The analysis across the three countries (chapter 2) and the summary across sites of important conclusions and recommendations (chapter 6) were elaborated by the lead consultant. To this end, he consulted with FiBL, interviewed a member of the Coordinating Committee of Donors and a member of the Scientific Advisory Board. Local consultants were not able to contribute much to across-country synthesis, as they had all seen only the activities in one country. Hence, the term "review team" is somewhat misleading in these parts, as judgments and ideas were not formally endorsed by local consultants.

2. Analysis across the three countries

2.1. Relevance of the Project to stakeholders

In all three countries, the review teams found that all local project partners fully support the Project and its objectives. They all emphasized the need for sound information on the relative performance of conventional and organic agriculture. In India even farmers and mainstream extension staff showed interest in the systems comparisons as "this experiment will allow us to see how the different systems really perform", an unexpected early outcome of the Project. In Bolivia, similar interest exists among farmers who know about the experiment. In Kenya, farmers were interested in the first place in new crops, varieties and cultural practices they could observe in the experiment, but did not refer to the comparison aspect; Project staff there considered it a special challenge to explain the objective of the experiment to farmers. The review team concluded that indeed, the systems comparisons hold some promise for farmers. The analysis done in Kenya looking at specific interests of different stakeholder groups regarding the five strategic objectives of the Project (Table 1) therefore lists them among the stakeholders for whom objective 1 should be relevant.

Table 1: Stakeholders and their interest in the Project by specific objective (Kenya)

Strategic objective	Stakeholder to whom this is / <i>should be relevant</i> , <u>main beneficiaries</u>
1) Rational basis for discussion	<u>All partner institutions (researchers, organic movements), agricultural policy makers, development agencies, traders, <i>extension, farmers, consumers</i></u>
2) Physical reference point	Farmers, extension, organic movements, (researchers, partners), <u><i>agricultural policy makers, development agencies</i></u>
3) Identify challenges in OA	<u>Organic movements</u> , farmers, researchers
4) Impulse development of OA	<u>Organic movements</u> , donors?
5) Sustainable intensification	<u>Farmers, <i>agricultural policy makers, development agencies</i></u> , extension, research, donors

The findings shown for Kenya in Table 1 are by and large similar for the three countries, except for the degree to which farmers and extensionists know about the systems comparisons and recognize the relevance to them: Agricultural policy makers and development agencies do not know yet about the Project and it will be a challenge to interest them in the results (in the end in each country it is just one Project - basically just one experiment, even though long-term - out of hundreds competing for the attention of these stakeholders). The long-term experiment is likely to yield results on product quality that will be interesting to consumers, although presently it may be premature to try involving them. The experiment as a physical reference point is certainly interesting for farmers and extension staff (who already used by it in this sense), while researchers will be able to take advantage of the installation as a "field laboratory". This potential is already exploited in Bolivia, where supplemental studies on flora and fauna were initiated.

In general, the Project does address questions and concerns that are relevant to its stakeholders. The comprehensive assessment of the effects of organic agriculture is certainly attempting to answer questions that researchers, policy makers, advocacy groups and extensionists are asking. As for farmers (organic and conventional), the Project is scheduled to look at a series of technical issues (under technology development and in the long-term experiment) that are likely to give answers to their most burning questions. However, by design (and restriction of funds) the Project will not be able to work on marketing issues, an important concern for farmers especially in Kenya.

Regarding linkages with other actors of agricultural research for development (ARD) there exist large differences between the three countries. In Kenya, many ARD actors are actually Project partners (four of the partners are typical ARD institutions). The review team suggested additional links in the areas of breeding and human nutrition. In Bolivia, the ARD

landscape is currently only lightly populated, making it difficult to establish effective linkages. One of the more stable actors is nominally a Project partner, but currently does not actively participate in the Project. A further problem might be the remoteness of the experimental site, making it difficult for the few remaining ARD actors to link efficiently. The Project is foreseeing establishing consultative links with newly emerging ARD actors. In India, the Project links mostly informally (offering visits to the experiment, consultative) to some of the many ARD actors in the state of Madhya Pradesh and at national level. The review team recommends involving the actors more intensively through joint studies in the "field laboratory".

2.2. Effectiveness

The most important achievement to date in all three countries is the establishment of the long-term experiments and the setting-up of a highly committed group of Project partners around these experiments. The review team concludes that in all three sites, the long-term experiments are fair, that is the trial concept and the treatments are designed to allow for a fair comparison between conventional and organic farming. More important, fairness and scientifically sound designs are primary concerns of the local partners and FiBL.

Having a well designed experiment in place and fully supported by partners, with daily management and data collection well organized and committed staff well prepared to follow through is certainly an impressive sign of effectiveness. In Kenya, the review team analyzed systematically the achievement of expected results as formulated in the Project logframe, with almost all of them being fully on schedule. In India, the same can be said. In Bolivia, with the Project start later than in the two other sites, some details on treatments still need to be defined, but the Project is working hard at it. In India and Kenya, some delays in soil sample analysis hampered progress in continuous analysis of input-output efficiency, and new arrangements have been or have to be found in this area.

The three sites are well on track to reach their objectives. However, the review team recommends revising the formulation of Objective 1 of the Project. Put bluntly, objective 1 is about **advocating organic agriculture**, while objective 2 is **to find out about its benefits and drawbacks**. Having them in this order can hamper credibility of the entire Project. The review team considers objective 2 as the backbone of the Project. Objective 1 should build on the respective findings and thus come later in time. We support many of the ideas presently listed under objective 1, yet we propose to revise the formulation carefully, put it second, and formulate the activities that can be done already now more in the sense of "advocating an open dialogue on OA".

2.2.1. Unexpected results

The Project achieved some unexpected, very encouraging results. In Kenya, the involvement of four mainstream ARD actors in the Project and their full commitment to the Project objectives is an achievement that could not be taken for granted to that extent beforehand. In India, the vivid interest in the long-term experiment of conventional farmers in its vicinity as well as of exponents of mainstream agriculture is encouraging as well as the fact that already after two years some evidence, though rather observed than measured, for better soil quality under the organic treatments could be found. In Bolivia, the Project has come up with a series of innovations over the original Project designs such as including in the long-term experiment twelve different cocoa varieties, thus allowing to address the important farmers' concern of variety choice, but also the taking over of already established trials in farmers' field (also on varieties) that can speed up considerably the obtaining of meaningful results in technology development. In addition, the collaboration with the ecological institute has allowed initiating investigations on the effects of the different farming systems at landscape level with baseline studies.

2.2.2. Additional components

In all sites, the review team identified a series of questions regarding the details of the different treatments in the long-term experiment and gave suggestions on how to make especially the organic treatments more effective and more relevant. However, these suggestions need to be tested first and carefully evaluated before changes in the long-term experiment are made. Fortunately, in all three sites there is spare land bordering the experimental plots or close by. The review team recommends giving high priority to designing simple trials for testing such potential changes and studying questions emerging from the long-term experiment. It should be possible to do that with limited additional funding.

The Project should pay special attention to technology development: Elaborate a coherent document outlining objective, scope, content, priorities and timing of this component in all three sites. On this basis, trial protocols can then be developed on a yearly basis. To this end, the Project needs to strengthen its capacity in on-farm and participatory research. Attention to this component and capacity development will require some additional funding, but especially re-allocation of working time of the staff.

Another area, requiring however substantial additional funding, is the initiation of special (additional) research in the long-term experiment on the effects of the different systems on soil dynamics and product quality. While it is timely to start with product quality studies in India and Kenya now, soil organic matter and soil biology should be studied as soon as first differences due to treatment effects can be expected. Positive effects of the organic treatments in this regard would not only enhance the natural resource base for agriculture (and thus make the systems more productive in the medium term) but could be an advantage in times of more erratic or more limited rainfall as experienced in all three sites.

Other work packages stipulated in the logframe for future work (conditional on the successful identification of additional funding) are:

1. In-depth studies on soil fertility, product quality and biodiversity in the framework of the long-term farming systems comparisons field trials
2. On-farm validation of on-station results, including socio-economic aspects
3. Market development to address main marketing concerns of stakeholders
4. Increasing organic production (through advisory work)
5. Training (elaboration of training manuals, dissemination of results towards farmers)
6. Curriculum development at various levels (from agricultural schools to universities)

The review team discussed these work packages. They are all complementary to the core Project. We attribute however different degrees of complementarity to the different work packages and correspondingly assessed the priority for their implementation (Table 2). Here we present our considerations:

1. Studying the presumably positive effects of organic farming will be of paramount importance and in fact part of the core project. Yet timing for these studies depends on the aspect. Changes in soil fertility (organic matter content, quality of humus, soil microbiology) will take time to establish and therefore, it does not make much sense to start studying these aspects before the first three to five years after converting a soil to organic farming. On the other hand, effects of the farming system on produce quality may be expected as soon as a new equilibrium is achieved. Studies on pesticide residue load, taste and nutritional quality should therefore be initiated as soon as possible, starting with aspects (such as taste) that do not require expensive analytical facilities. This will allow targeting expensive analyses, limiting them to examine hypotheses developed based on the first studies. We consider the effects on biodiversity at plot level (basically on weed composition) to be of lower priority to the Project and these changes will also take

considerable time to manifest themselves in a new state of equilibrium. In Bolivia, landscape level changes of biodiversity are assessed to test the hypothesis that organic agriculture provides important ecosystems services. This is certainly of high priority to the Project and has a different time-line (with intensive baseline studies already done).

2. On-farm validation is important to the Project to off-set the shortcomings of the long-term experiments (limitation to few sites, impossibility to obtain meaningful socio-economic information). In India validation trials were already started in 2009; in Kenya, thinking about the best approach for on-farm validation should be initiated now.
3. Helping farmers to develop premium markets is less crucial to reach the objectives of the Project. Yet, for instance in Kenya the Project (by its sheer existence) has raised expectations among organic farmers regarding premium prices and among middlemen regarding better linking offer to demand. This justifies a major effort in market development for Kenya. While such an effort should be linked to the present Project, it would considerably go beyond its scope. We therefore propose for 2011 to examine the possibility to initiate a separate market development project, which appears to be most justified in Kenya. Later the need for further activities may arise as farmers begin to put results of the Project to use.
4. Increasing organic production is an implicit objective of the Project and is expected to result from convincing evidence on the profitability plus other positive effects of organic farming. We consider it to be dangerous for the Project to get involved in activities advocating explicitly the expansion of organic production. In order to preserve the credibility of the Project, advocating organic farming should be left to organic movements (who can hopefully make use of Project results to this end).
5. The Project is expected to produce results that are relevant for training of farmers (organic farmers as well as conventional farmers looking for more sustainable forms of production). We consider it important that the Project translate these results into training and extension contents that are relevant to farmers. The Project document mentions "manuals", which may go beyond the possibilities of the Project partners. In any case, allies will have to be identified who master the challenge of translating research results into extension contents adapted to farmers and the Project will have to ensure quality control. Yet training and extension *per se* should be left to actors having a respective mandate. In all three sites, such actors are among the Project partners and can easily link to others.
6. Similarly, for curriculum development, the Project (with its partners from universities) can play the role of facilitating building blocks for curriculae at universities (based on its research results), but should not get involved in directly influencing curriculum development.

Table 2: Suggestions of the review team for additional work packages stipulated in the Project document for later implementation (conditional to successful identification of additional funding)

#	Work package		Priority	Importance of the role of different actors			Timing*
				FiBL	Present Project partners	Other allies	
1	In depth studies on:	Soil fertility	■■■■■	■■■■■	■■■	■	□□□■
		Product quality	■■■■■	■■■	■	■■■■■	■□□■
		Biodiversity	■■	■■	■■■	■	□□□■
2	On-farm validation		■■■■■	■■■■■	■■■■■	■	■□■■■
3	Market development		■■■	■■	■■	■■■■■	□□□■
4	Increasing organic production		■	■	■	■■■■■	□□■■■
5	Training		■■	■■	■■■	■■■■■	□□□■
6	Curriculum development		■■	■■■■■	■■■■■	■■	□□□■

* Roughly corresponding to the next years (2010-2014 for Kenya and India), ■ = important effort in this year

For all the work packages, FiBL has considerable expertise to contribute (although not necessarily the staff involved so far in the Project). But local expertise has to be mobilized, especially for market development, training and university education.

2.2.3. Results so far

Results from the first two years of the long-term comparison experiment in Kenya show that overall, yields in the organic treatments were 21% lower than in the conventional, with similar costs. Yet, this "yield gap" is highly variable, and considerably wider in the low fertility site in Thika than in Chuka (Musyoka 2009). For the third year (2009), the review team observed in the field that for development of the potato crop (ground cover at full flowering) the organic treatments are consistently lagging behind the respective conventional treatments.

With only marginal cost differences between organic and conventional treatments, this translates to lower gross margins in the organic systems. This is one of the reasons for the importance to measure and document other (presumably positive) effects of organic agriculture (e.g. soil dynamics and product quality).

In India, results so far indicate that cotton and wheat yields are 20 to 30% lower in organic treatments, while soybean yields are comparable. It appears that the gap is closing from year one to year two. These yields were achieved with only about half the amounts of nutrients in the organic treatments. While costs were a bit lower in the organic treatments, these savings did not make up for the lower yield, even if the currently paid premium price was considered. An appropriate premium price is crucial for organic producers to cover up for the yield gap.

In all three sites, a monitoring system is in place that allows for tracking and processing data from the experiment. Quality management of information is well organized. Also at the level of expected results in the log-frame, the Project regularly reflects on achievements and documents them in the half-yearly reports. Shortcomings with information recording occurred in Bolivia and led to the change of a Project staff, but it appears that the present team is getting things under control. A critical assessment of achievements, including the interpretation of experimental results is somewhat complicated by the fact that trial data are jointly processed by FiBL and local partners. The review team considers the way in which FiBL involves local Project staff in data analysis and interpretation (during field visits of FiBL staff) as efficient, yet participatory. However, this arrangement along with delays in data entry and cross-checking on site causes a considerable time lag between data collection and analysis, making it difficult for staff on-site to draw lessons for daily management of trials and data collection.

2.3. Experimentation

The Project was designed with the long-term experiment as a backbone. Its main purpose is to produce solid data on the relative performance of different cropping systems, a question that is rarely addressed as it requires a long-term approach. At the same time this experiment serves as a "physical point of reference", where the different systems can be seen, their evolution observed and their characteristics and performances shown to a wider public. Also, additional studies can be initiated in the experiment, taking advantage of the different systems established there and comparing them for instance in terms of their long term effects on soil biology, on the environment and on produce quality. These additional studies typically are initiated once the systems are reaching production and have stabilized.

In addition to the long-term experiment, other components are foreseen in the Project (Figure 1): Technology development trials on organic farming should in the first place address questions and concerns of organic farmers and provide in a short time results that are useful to them. On the other hand, the Project document stipulates verifying the results from the (on-station) long-term experiment under the diverse conditions of farmers. For this purpose,

a variety of different approaches are possible, i.e. on-farm comparison trials, farm surveys or farmers' groups recording and sharing farm data. Which of these approaches is most appropriate must be decided separately for each site. In India, where funding of this component is already available, FiBL and bioRe decided to conduct on-farm validation trials. Such trials typically compare a system included in the long-term experiment with the practice of each participating farmer. The idea is to validate a system in real contexts. Thus, the validation trials have two roles: They are multi-locational experiments assessing the performance of a system over a range of agro-ecological conditions and they should yield socio-economic information on the system under test regarding the reaction of the farmers to it, their potential and limitations to use it and its profitability.

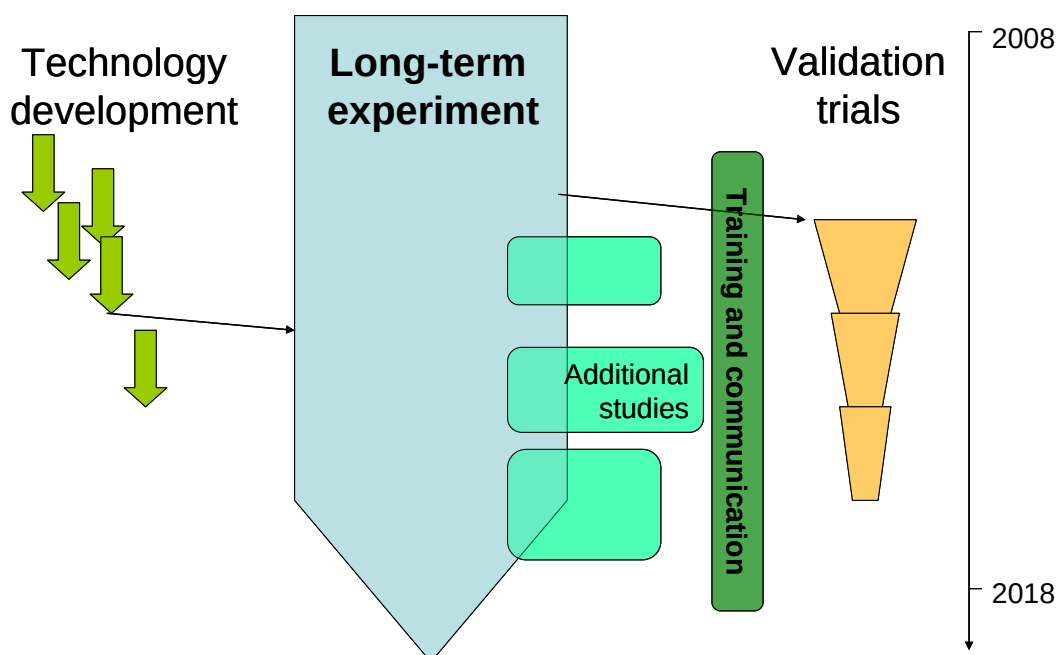


Figure 1: Relation between the different research components of the Project over time (timing for the example of Bolivia)

The different components of the Project have different target groups and different objectives. But they need to be related: Technology development can yield results that will be incorporated – after thorough examination – in the long-term experiment. And all the components have to feed together into communication about the Project.

The above description is the review team's understanding of the relation between the different components, derived from the Project document, containing probably some elements of our own interpretation. Among local Project partners, we found different interpretations of these relationships, suggesting that the general concept is not sufficiently shared among all the staff involved in Project implementation. The review team recommends further clarification.

The review team spent considerable time assessing the long-term experiment and the respective considerations can be found under the chapter of each site. One question the review team was discussing across all sites is, if in tropical agro-ecosystems it would not be more appropriate to use any available organic matter as mulch rather than composting it. This would cut back on labor costs for organic agriculture and might be more beneficial for soil dynamics and water balance. The review team suggests evaluating the advantages and drawbacks of biomass composting versus using it as mulch in separate trials.

Similarly, for technology development, site-specific considerations are described in chapters 3 to 5. One common recommendation is, to strengthen the capacity of local staff to plan, implement and analyze on-farm trials, to involve farmers as much as possible in this process and to systematically collect farmers' reactions and appreciations regarding the trial objects. In addition, as mentioned above, elaborating a strategic document for technology development should receive high priority, as it will be the basis for developing specific trial protocols.

2.4. Efficiency

The Project is unique in three ways: In systematically comparing organic and conventional farming in a systems approach, in doing it on the basis of resources available to farmers, and in doing this with a long-term perspective. It is therefore highly complementary to other research in all the three countries. All interviewees consistently pointed this out.

Interactions with other research projects are appropriate. Yet, of course linkages to other projects can be improved and interaction enhanced in specific cases as described further down.

The Project made considerable efforts to bring the most appropriate partners on board. In Kenya it was very successful. In India, the base of partners is presently narrow and does not include research organizations. In Bolivia, the base of partners is broad, yet no partner with a track record in agronomic research is presently actively participating in the Project. Below we elaborate much more on these institutional issues and we try to outline some avenues for improvements, although we must admit that given the institutional context of each country, finding solutions is not easy. The strategy of the Project to work only with partner organizations that invest their own resources and thus demonstrate interest certainly has a number of advantages (e.g. high commitment and good ownership among the partners), but limits the choice of eligible partners.

In all sites, the Project partners had to stretch themselves to accomplish the work at hand. Especially in Bolivia this led to changes in the roles and responsibilities, which were basically re-defined on the go and presently do not fully correspond anymore to the MoUs. This worked out well and partners are by and large complementary and collaborate in the context of the Project with a spirit of reaching a common goal. Yet, the review team recommends revising (discussing) the roles and responsibilities and outlining them in one document for each site that reflects the present situation and adjustments to make over the next year. This does not necessarily have to be a (multi-party) MoU. A simple document endorsed by the Steering Committee would do and could be modified periodically if needed.

Working modes are transparent, participatory, interactive, empowering, with the local Steering Committees playing a key role. For instance in Kenya, when asked about improvements in the Project, several partners mentioned that they had already made their suggestions and these had been dealt with by the Steering Committee or the management. The Steering Committees are already quite large, at least in Kenya and Bolivia and further enlargement would put at stake their efficiency. Therefore, when further actors are involved in the Project, this should usually have the form of collaboration rather than of full Project partners with MoU. Hence, new bodies were proposed (at least for India and Bolivia), "Advisory Boards" or consultative bodies where new actors as well as technical authorities can participate in a network mode. In order to further enhance empowerment, targeted training for Project staff should be foreseen to enhance their capacity to do the work and participate in decision making: On technical issues for technicians, on research management for trial coordinators (data analysis and interpretation, priority setting in and planning of on-farm trials with farmers).

The review team observed that local Project teams highly appreciated information on the other two sites provided by FiBL staff in short presentations. We consider fostering the exchange between the three Project teams as important to enhance among local teams the spirit to work towards a common goal. The high interest of local Project staff to hear about approaches, methodology, and experiences in the other sites suggests that through exchange of respective information, motivation and commitment of local Project teams could be maintained and enhanced. And finally, such exchange expose partners to new ideas and thus may stimulate innovation in the different sites.

The question is, how such an exchange can be organized most efficiently. Certainly, FiBL staff should continue to inform partners about activities in the other sites, putting increasingly emphasis on results and experiences. There may be more systematic forms of fostering exchange: Newsletters, internet sites or electronic platforms might be established to this end, taking advantage of the opportunities of electronic media. Yet, all these activities require additional efforts by FiBL and its local partners for installation and maintenance. The review team recommends that FiBL, together with its partners, assesses different forms of information exchange in terms of their serving the purpose (effectiveness), costs and likeliness that all partners will regularly up-date the contents. Especially internet sites at country level may, on one hand, fit into the national communication strategy and on the other allow for between-site-exchange. SDC may provide inputs based on their ample experience with regional research networks. Although, due to limited geographical scope of these networks, exchange relied strongly on partners meeting periodically and other face-to-face interactions, there may be lessons learned relevant to the organic farming project. Newer networks operate globally and face similar challenges¹. In addition, SDC's new initiative for institutional knowledge management might be willing to collaborate in identifying forms of exchange worldwide that strike an optimal balance between partners requesting information and making available their own experiences. Direct interaction of staff from the different sites, like traveling of selected local staff to another site, will remain rather the exception, due to the high costs it implies.

In none of the sites the review team could identify opportunities to save substantial resources while still achieving the same results. Most of our recommendations aim at making the Project activities more relevant or more effective. In many cases, this entails budget increases rather than savings.

In all three sites, the review team was impressed by the cost-consciousness of the Project. Synergies with other projects are exploited, simple structures are built and staff uses public transport even for longer trips to the research sites. Funding is most limiting at present in Bolivia (see 5.6) followed by Kenya. But even if in India budget restrictions appear to be less pressing, this does not mean that budget could be re-allocated between the sites. FiBL itself can only cover 70% of its expenses for the Project from Project funding. The review team considers that present budgetary restrictions are so serious, especially in Bolivia, that they threaten to affect the motivation of the teams. Solutions need to be found urgently.

2.5. Project management

Project management, i.e. steering, implementation, controlling and funding, is assured by the following bodies: Coordination committee of donors, scientific advisory board, local Steering Committees, FiBL as international implementer/ project coordinator and local implementers/ coordinators at each Project site. Project management follows the guidelines of the Swiss Commission for Research Partnership with Developing Countries (KFPE, 2003).

¹ For instance BioNet, a network of taxonomists implemented by CABI, contact Richard Smith

At international level, the financing partners constituted, together with FiBL, a **Coordination Committee of Donors (CCD)**. The CCD takes global strategic decisions on the way forward, it assures sufficient funding for implementation, and it monitors Project progress at the level of strategic goals. It also decides on admission of new members to the CCD. The CCD also develops and adopts a common communication strategy. Donors presently include:

- Biovision Foundation, Zurich, Switzerland
- Coop (Sustainability fund of COOP Switzerland)
- LED (Liechtensteinischer Entwicklungs-Dienst, Liechtenstein Development Service)
- SDC (Swiss Agency for Development and Cooperation)

A **Scientific Advisory Board (SAB)** supervises scientific quality of the Project work. The scientific advisory board is important to assure unbiased results and thus credibility of the Project. This board advises FiBL and informs the CCD and the local Steering Committees about its recommendations. The SAB presently has the following members:

- Padruot Fried, formerly Agroscope, Switzerland (Swiss National Agricultural Research Institute), now retired
- Niels Halberg, International Centre for research in Organic Food Systems (ICROFS), Denmark
- Gideon Obare, Egerton University, Kenya

At the level of the countries, **local Steering Committees** consisting of main and associated partners and FiBL were formed. The local Steering Committees take strategic decisions, conceive the systems comparison field trial, decide on and plan activities on a year-to-year basis, monitor project progress at the level of the expected results, decide on the admission of new partners and develop a common communication strategy at the local level. The local Steering Committees are key bodies in the dissemination of the results of the farming systems comparisons, and in the subsequent development of the organic sector (objective 1), and suggest respective action to the CCD. According to their respective fields of expertise, local partners provide scientific input, are concerned with data collection and management, and participate in data analysis and write-up of publications. The local Steering Committees are key bodies in representing the Project at local level and in the dissemination of results.

FiBL plans the activities related to the expected results and objectives of the log-frame by working out respective one-year proposals together with the local Steering Committees and submitting them to the CCD. The CCD mandates FiBL and the local Steering Committees to implement the approved activities, and makes the necessary financial resources available. The main role of FiBL is to assure consistency in the scientific approach over the three Project sites, and to raise the funds required to implement the Project. FiBL thus provides information for strategic decisions, and suggestions on the strategic orientation, to the partner consortium. FiBL provides substantial scientific input and technical advice, especially in research designs, data management and write-up of results. FiBL is also concerned with operational and financial reporting to the attention of the CCD.

The **main local partner** in each country is responsible for executing the project work as agreed upon by the local Steering Committee. This includes implementing the specified work plan, monitoring the work progress and ensuring that work is performed to an adequate quality standard. Where appropriate, the main local partner mandates the associated partners for specific tasks in their field of expertise. In addition to these coordination responsibilities, the main local partner substantially contributes to and participates in the scientific activities.

This arrangement for project management makes sense. It is rather complex in response to the complexity of managing such a project, but is implemented with the required balance

between clear definitions of roles and pragmatism. Important decisions are taken jointly by the local Steering Committees and FiBL. Similarly, annual planning and monitoring of project progress is done together.

FiBL as the original owner of the project idea is crucial for the research strategy, project coherence and scientific consistency across sites. FiBL has well-proven experience in long-term farming systems comparisons and is thus best suited to lead this project. FiBL's sound scientific input is appreciated by all partners. FiBL manages the project with great care and transparency. Administrative processes are organised smoothly, and communication with all bodies involved is coherent.

Also at site level, project management is done well. The Project staff is committed, takes initiatives, assumes responsibility and is well organized to do the work. Interactions with FiBL are efficient, both face-to-face during the working visits of FiBL staff and through electronic media. There exist some communication problems in Bolivia, caused by the remoteness of the Project site.

Partners are working well together for project management. Work is done in a climate of mutual trust. Leadership and local coordination is clearly assumed by icipe in Kenya and bioRe in India. In Bolivia, Project coordination at local level is strongly depending on the person of Joachim Milz, without him having the respective mandate. So far results are good, but in the medium term the Project will have to develop an institutional solution for local coordination and leadership.

While project management arrangements are different in each site and face different challenges, the review team concludes that in the three sites the commitment, the ownership and the interest of all partners has been crucial for smooth management.

In Kenya, the FiBL coordinator was complemented as being highly inclusive, participatory and committed. She appears to be a good networker, crucial for setting up the Project structure and the social fabric among the partners. The review team shares this view and considers it equally true for India. In Bolivia, FiBL contributes to coordination and leadership through its staff responsible for the Bolivian site. Increasing FiBL's presence in Bolivia could certainly strengthen this contribution, but the review team is not convinced that this is the appropriate answer to the present lack institutional leadership in Bolivia. FiBL should discuss the issue of its presence and its role with the Bolivian partners.

Throughout the sites, there exists a good balance between the five areas of management: Scientific input and coordination, administrative coordination and communication, networks and exchange, public relations, acquisition of additional funds. While the teams have not made equal progress in all these areas, they acknowledge the importance of all of them and are planning activities to further balance their management.

There was a consensus among the interviewees that FiBL should focus specifically on the acquisition of additional funds and on providing scientific input and expertise. However, many donors favour partners from the South in their funding policy or restrict their programs entirely to them. Thus, even if FiBL can initiate the development of proposals and the identification of promising sources of funding, in the end the local partners will have to be in the driving seat for applying for funding and tailoring proposals to the specific donor programs accessible for them.

In Kenya, the review team heard a strong plea that the present donors of the Project, especially SDC with its good contacts to other donor agencies, should provide support in establishing contacts with other development agencies and leveraging additional funding for special studies.

At international level, the CCD meets at least once a year. Based on the meeting minutes, the review team concludes that the CCD works efficiently towards providing guidance to the Project on overall strategy. Given the diversity of donors and their interests, the CCD is certainly an important body to reach a consensus on expectations towards and respective strategies for the Project.

The SAB has so far met twice. In the first meeting it consisted of only two persons. With the appointment of the representative from Kenya, the board reached its full size as planned for the first years. The members receive the half-yearly progress report as well as other documents elaborated by the Project. While the project document (Zundel et al. 2008) stipulates that the recommendations of the board are binding, SAB, CCD and FiBL agreed that this would not be appropriate and that the SAB should rather be involved in a continuous dialogue with FiBL. The review team sees the role of SAB in raising crucial questions regarding technical and experimental issues in the long-term systems comparison and the research strategy, as well as in pointing out avenues for improvements. In addition, the SAB can play an important role (and has already done so) in networking, i.e. linking the Project with actors conducting similar long-term experiments. The review team concludes that the SAB has so far well fulfilled its role and that its members are highly supportive. However, we acknowledge that several questions remain open: 1) How can the SAB give advice based exclusively on written documents, without having seen the experiments on-site? 2) How can the SAB keep up its motivation, as long as it is considered a body that provides expertise "on-demand", for instance when the CCD requires a second opinion. On the other hand, given the limited funds for the Project (and the fact that SAB members do not receive honoraria for their work), it is not feasible that the SAB members travel to all Project sites or meet more frequently.

The review team proposes the following strategies regarding the SAB:

- Any opportunities for individual SAB members to visit the Project sites at minimum additional costs should be exploited (as has been done so far, when Padruot Fried traveled on another mandate to India and visited the bioRe site together with the FiBL coordinator). Gideon Obare should be periodically invited to the sites in Kenya. If none of the SAB members is expected to travel to Bolivia on another mandate, the CCD should assess costs and benefits of one member (presumably Niels Halberg) visiting the site in Bolivia in 2010 or 2011 on a separate mission. In all cases, it will be most efficient, if the visit of a SAB member is organized in a way that the respective FiBL coordinator is on site.
- FiBL should test the feasibility of increasing the frequency of interaction with SAB members on important Project progress. Simple, brief messages with preliminary results would help to maintain the SAB up-to-date as would involving its members in discussions about important Project issues. If exchange between Project sites is organized in a more systematic way (see 2.4), the SAB should have access to the respective tools.
- The last meeting of CCD and SAB were held on the same day, allowing for direct interaction between the two bodies. The review team considers this as important and proposes that SAB members are routinely invited to CCD meetings as observers and vice versa. Language (CCD meetings are held in German) may limit this exchange, but at least one SAB member could participate in the CCD meetings.

2.6. Risks and potentials

The local Project partners are concerned that funding for the Project may not be secured in the long term. This concern is understandable given the present degree of investment of the partners in the long-term comparison. Reduction or discontinuation of support would leave all Project partners in a very difficult situation: After having invested a lot of intellectual economic resources in the experiment, they would have to find a way to carry on until meaningful results can be obtained. In India and Kenya with their annual crops in the rotation, five years is the absolute minimum, while in Bolivia with perennial crops the time lag to scientific "return on investment" is even longer. In addition, in Bolivia the present partners are not well placed to seek alternative funding for agricultural research projects.

While obviously nobody can guarantee funding for a full ten years, the review team proposes that the CCD communicates its intention to support the experiments in the long term and that FiBL informs its partners on measures and strategies it implements to increase the probability of adequate funding in the long term.

While considerable effort was put in securing the land on which the long-term experiments are established, the risk of losing this land cannot be ruled out completely. The review team thinks that farmers around the experiments are crucial for avoiding problems with land and recommends investing in gaining support of farmers and farmers' organizations in the vicinity of the long-term experiment to secure the land.

Increasingly erratic rainfall and resulting water stress (due to climate change or other factors) is a risk in all three sites and is both, hampering the experiments and affecting farmers in the target areas. In Kenya, the Project has reacted by establishing irrigation in the high input treatments following the rationale that commercial vegetable farmers increasingly make use of irrigation. Yet, at the same time, water stress is also a potential for the Project, as the organic systems are expected to have better resilience vis-à-vis irregular rainfall patterns.

Farmers crop portfolios may change over time in response of changes in relative commodity prices, other socio-economic changes in the context and climate change. Such changes may affect the relevance of the Project and according to FiBL, it will re-consider the crop portfolio after each completion of a rotation and may modify it in such cases. The review team recommends monitoring relative commodity prices and other context variables to react in time to shifts in farmers' crop portfolio.

Genetically modified (GM) crops are becoming increasingly important in India and Kenya. In India, GM cotton is so widespread that it was included in the long-term experiments as one of the conventional systems. The review team recommends monitoring closely the evolution of GM crops, as these may affect organic agriculture in different ways: Physical mixtures and (for cross-pollinated crops, even if the degree of cross pollination is as low as 5% as in cotton) genetic contamination are common problems in areas where organic production occurs side by side with cropping of GM varieties. In India, breeding of non-GM cotton may be neglected in the future.

The potentials of the Project are numerous. In the first place, the Project is well on track to achieve its objectives as outlined under 2.2. In addition, the review team identified the following potentials:

1. Turning out results that will help to make mainstream agriculture more sustainable: Since in organic farming, self-imposed limitations need to be observed, the search for solutions to problems which may well be common for both organic and conventional agriculture has to be more innovative. This bears the potential to come up with solutions which, without such restrictions would not be developed, as they are considered too demanding for research or for implementation.

2. As outlined above, better resilience will be crucial for farmers to adapt to climate change, especially more erratic rainfall. If the Project is able to identify production practices that can enhance resilience, the potential of the Project to contribute to more stable incomes is considerable. Practices to enhance soil organic matter and mulching have the potential to enhance resilience and the detailed quantification of the effects of the different treatments will allow examining the hypothesis that these practices can really make a difference to resilience.
3. Demand for organic products is presently increasing, both internationally and especially in domestic markets. The problem with domestic markets in the tropics is that demand and offer are often not aligned. While the Project is not directly involved in market development – and the review team proposes to address this issue in separate marketing projects – it can generate the basic information to assess, how the production side can meet this demand, both in terms of quantity and quality.
4. Similarly, the Project can help to identify the real problems of organic farmers in the target area through its technology development component (and own experiences and dialogue from the long-term experiments), which will help to shape activities outside the Project in the area of technology development, value chain improvement and policy environment.
5. Partners pointed out that through their widespread consultations and the planned scientific discussion of results, the Project has the potential to enhance the interest of the scientific community in organic agriculture and to trigger additional research on sustainable farming in general. Eventually, this should lead to a more science-based discussion of issues. To realize this potential, the review team considers it important that the Project continue and broaden the dialogue with other actors involved with related research in the tropics (long-term experiments, systems comparisons, conservation tillage, soil organic matter, natural crop protection etc.).
6. Finally, the review team expects that the long-term experiment will be taken by all organic movements to see and communicate both, the potentials and the limitations of organic agriculture. Organic farming is not a silver bullet and the experiments show that especially during the first years after conversion, yields can be reduced considerably and labor demand is high. Promoting organic farming with unreflected missionary zeal may threaten livelihood of small farmers who accept to convert and damage credibility of the idea of organic farming in the medium term. While the review team fortunately did not find evidence of such missionary attitudes among the partners of the Project, we know that it exists among organic movements. The Project has the potential to teach them to communicate to farmers a more realistic and better balanced picture on organic farming.

The partners and FiBL developed impact chain hypotheses for different stakeholders of the Project. They made explicit, how the Project will be able to achieve the overall goal and the objectives, what the pathway to the intended impact will be (annex 3). At the same time they analyzed, what could, at each step, hinder the Project to achieve impact. The review team then elaborated a synthesis (annex 4). These impact hypotheses illustrate potentials (the positive, intended impact) and risks (the negative, unintended impact) of the Project.

The TR recommends that the Project further refine the impact hypotheses (impact pathways) and develop indicators related at least to the first links in the chains (output, utilization and effect) as a tool to assess the impact. Together with stakeholders (partners, farmers) studies should then be designed to evaluate, if the indicators are reached. In this way, impact can be assessed systematically, yet at low cost, as no laborious baseline studies are required.

3. Kenya

3.1. Introduction

The review team consisted of Urs Scheidegger and Mukishi Pyndji as consultant for the Kenyan component. The review took place at *icip*e headquarter in Nairobi, Kenya, with several field visits to Project sites in Thika and Chuka (for the long term farming systems comparison field experiments) and Kangari Division (to organic farmers, some of them participating in the on-farm trials). The review team visited also all the Project partners in Kenya, the farmer advisory groups, one organic shop (Green dreams Ltd) and several other stakeholders. The review team reviewed several project documents. It interviewed Project implementation staff. The review team did a pre-analysis of the findings every evening and elaborated a synthesis structured along the "crucial questions" as outlined in the Terms of Reference for the review. This synthesis was presented to the Project partners in a debriefing meeting on December 11, 2009 in Nairobi and discussed. During this meeting, partners were invited to formulate impact chain hypotheses (annex 3).

3.2. Relevance to stakeholders

The review team found that all partners fully supported the Project and its objectives. They are all emphasizing the need for sound, scientifically backed information on the relative performance of conventional and organic farming and thus fully endorse the idea of these comparisons. They acknowledge the need to make specific efforts to ensure credibility of the results and findings of the Project in the international scientific community and among policy makers. The review team found an outstandingly high ownership of the Project among all project partners. Most of them underlined that this research project is unique for the tropics and is expected to provide strong data on organic farming in the region to support the discussion on the contribution of organic farming to sustainable development.

3.2.1. The stakeholders and their interests

The review team analyzed, which stakeholder groups presently manifest a high interest in the different strategic objectives, which stakeholders should develop more interest, and who can be considered the main beneficiary of the Project results (Table 1):

As mentioned above, all Project partners and further stakeholders share the interest in obtaining sound information on the benefits and drawbacks of organic farming. We observed, however, that both farmers and extension agents at present develop little interest in the comparison *per se*. They are more interested in having something to see (=physical reference points), where they can observe the performance of new crops, new varieties and new farming techniques. As for the consumers, they have not been targeted as yet by the Project; their interest will certainly focus on produce quality (health and nutritional aspects, taste) and the respective studies have as yet not been done. Researchers and Project partners in general highly appreciate the existence of these experiments in the field for two reasons: (i) To see certain aspects and differences between organic and conventional farming directly and (ii) as an opportunity for additional studies that may be initiated at any time. A specific challenge will be to interest decision makers (policy makers, the donor community) in this research: In order to enhance the probability that they will properly acknowledge and value the results that will eventually be published, they should see the experiments. Making sure that decision makers visit the experiments once in the course of the next two years will also help to interest them in the potential of the research for making farming more sustainable for the vast majority of conventional farmers (Strategic Objective 5).

However, such visits need to be planned and prepared carefully. Data on actual nutrient inputs and information on the evolution of the systems during the conversion phase (e.g. regarding soil fertility) needs to be available and presented during the visit. Information of produce quality would be nice to have. Although the site in Thika appears to be ideal for this purpose as it is reasonably close to Nairobi town, the weak performance of the organic treatments there is a problem. Chuka is far, but this site can fully display the competitiveness of organic agriculture and has thus more potential to convince people. The advantage of the “physical reference points” is that one can see things. Bringing visitors to Thika and then mentioning that in Chuka the organic treatments perform even better would make them wonder, why they were not brought to Chuka directly.

3.2.2. Questions addressed by the project

The questions presently addressed by the Project are highly relevant to all stakeholders. Several stakeholders, however, pointed out the fact that several studies are not as yet initiated and may be addressed only if additional funding is found. They emphasized that some questions need urgent attention and ways should be identified to address them as soon as possible: What is the additional benefit of organic agriculture in terms of soil health, farmer health, consumer health, produce quality, reduced ecological impact. While issues on consumer health and produce quality can be addressed as soon as funding is available, ecological changes (soil fertility, biodiversity) take several years before they manifest. Respective studies should be planned for the earliest moment that changes can be expected.

We further identified two questions related to marketing that are of main concern for both farmers and marketers:

- How to link farmers to markets (how can you harmonize demand at urban markets with offer by producers, providing the right product in the right quality and volume at the right time and in the right place)?
- How can you realize premium prices or a sustained demand for organic produce at provincial markets?

While these issues are clearly outside the scope of the research Project, addressing them may be crucial for the future of organic agriculture in Kenya. The Project is raising expectations among farmers (as well as among marketers, as soon as they know about the Project) by its very existence and if marketing problems are not solved, frustration may result. The Steering Committee should therefore consider thoroughly, how these issues can be addressed (in partnership with existing competent actors, in the context of an additional marketing project etc.).

3.2.3. Linkages with other actors in ARD

In this area, the Project has shown its strengths and must be proud of having people and institutions committed to the success of the Project. The Project has established good links among its partners (*icipe*, KARI, KU, TSBF-CIAT, KIOF, KOAN) as well as with other actors in the organic movements. The extension service of MoA in Chuka is highly interested in the experiment and is collaborating. Links are especially good when it comes to soil fertility, insect pests and advocacy groups for organic agriculture.

During visits and interviews with Project partners, the review team observed the enthusiasm and commitment expressed by most of partners and stakeholders including small-scale farmers and farmer groups involved in the trials. However, the review team observed several limitations in partnerships that need to be addressed: 1) The Project will require increased resources to support planned activities as stated in the Project log-frame. Involvement of

other donor agencies with interest in organic farming therefore needs to be given great attention. 2) The Project is using diverse crops as entry-points for comparing organic versus conventional farming systems. The review team recommends linking with breeding and seed groups for advice and provision of appropriate crop varieties and seed used in the trials. 3) Although research on product quality is planned later, the review team thinks that the Project should already have established links with groups advocating "healthy food" in general (who could be crucial allies in promoting organic products, in case evidence is found that they are "healthier") and food science and nutrition departments. In fact, during interviews with a number of farmers and organic supporters, farmers revealed reasons along the lines of product quality for shifting from conventional to organic farming (health risks with conventional and good quality of organic product: organic cabbage is sweet and soft as compared to conventional cabbage which is watery). We therefore believe that linkages with food science and nutrition as well as with local healthy food advocating groups could change perceptions of consumers and influence positively market prices of organic products. The interviews confirmed that presently premium prices (30-40% above conventional) can only be obtained in certain urban centers, and only for certified organic produce.

Conclusion: The Project has developed and maintained good linkages with committed local partners and stakeholders to achieve the project objectives. But, this partnership needs to be extended to other multidisciplinary groups such as breeders and seed providers, food science and nutrition departments, and healthy food advocating groups.

Recommendation:

- Maintain and strengthen strategic alliances with key local partners and stakeholders for the success of the Project
- Identify and establish new linkages with other groups in the resource-to-consumption continuum
- Plan on consumer health and produce quality studies as soon as possible
- Plan on soil fertility biodiversity studies as soon as respective changes can be expected

3.3. Effectiveness

3.3.1. Achievements

Interviews made it evident where Project partners see the most important achievements to date: The fact that the long-term experiments are set up properly and the design is endorsed by all partners.

When comparing the implementation of the Project activities to date with the log-frame (Table 3), it is obvious that the majority of expected results have been achieved as far as scheduled up to 2009.

We congratulate the Project team for this progress. This success also reflects the careful elaboration of the log-frame. In most cases, expected results are realistic. The review team found, however, that under objective 1 many expected results are listed in detail, which can make tracking of them difficult (see next section).

Table 3: Review team's assessment of the achievement of the different expected results (see Zundel et al. 2008)

Expected result	Achievement	Comments
1.1 Trial = reference point	v	
1.2 Awareness for OA raised	+/-	Topic appeared less than twice a year in the mass media
1.3 Continuous dialogue on AO	+/-	KOAN in working group on OA policy, but no feedback from policy makers
1.4 Debate on OA	v	
1.5 Contributions in conferences	v	
2.1 Site selection	v	
2.2 Homogeneity test	v	
2.3 Design defined	v	
2.4 Trial supervision	v	
2.5 Trial management	v	
2.6 Agronomic performance data	v	
2.7 Efficiency data	+/-	Delay in soil and plant analysis data
2.12 OFR planned and submitted	-	SC has not yet developed proposal for on-farm validation studies
3.1 Problems and solutions identified	+/-	Well advanced, but comprehensive strategy document missing
3.2 Farmers are adapting	v	
4.1 Steering Committee established	v	
4.2 Activities coordinated	v	
4.3 Info flow clarified	v	
4.4 Finance and administration o.k.	v	
4.5 Progress reported	v	
4.6 PR activities coordinated	+/-	Project not yet known to all ARD organizations (e.g. to universities other than KU, some relevant KARI teams, regional networks; see below)

3.3.2. Re-thinking the objectives

On a broader scale, the review team considers objective 1 being somewhat in conflict with objective 2. These two objectives read as follows (Zundel et al. 2008):

1. To strengthen organic agriculture as a valid option for agricultural policy and action plan development, resulting in integration of organic agriculture in agricultural education and research programming, increased public awareness, increased organic production and improved organic markets
2. To provide solid information on the benefits and drawbacks of organic agriculture for sustainable development, compared to conventional production systems

Put bluntly, objective 1 is about **advocating organic agriculture**, while objective 2 is **to find out about its benefits and drawbacks**. Having them in this order can hamper credibility of the entire Project. The review team considers objective 2 as the backbone of the Project. Objective 1 should build on the respective findings and thus come later in time. We support many of the ideas presently listed under objective 1, yet we propose to revise the formulation carefully, put it second, and formulate the activities that can be done already now more in the sense of "advocating an open dialogue on organic agriculture". KOAN is competent and well placed to help sort that out and to take the main responsibility for general advocacy and policy lobbying for organic agriculture. The review team is not concerned with what Project partners do, but with how this issue is formulated in the Project document.

3.3.3. Unexpected results

The review team found two achievements of the Project that are rather the result of a good collaboration than of activities planned from the outset:

1. The Project enhanced its collaboration with KIOF and KOAN, making them officially members of the Steering Committee in 2008. Both institutions bring into the team important expertise and networks: KIOF in terms of practical experience with organic farming and training in organic agriculture; KOAN in terms of marketing issues, relations to a broad array of organic movements, and policy lobbying.

2. As a preparation for technology development work on soil fertility management, it was considered crucial to deliver training on manure handling for interested farmers. KIOF stepped in to organize and deliver this training jointly with the local association of organic farmers in Kangari.

3.3.4. Probability to reach the objectives

The objective of the long-term farming systems comparison field trial in Kenya as formulated in project document is to quantify:

- how organic farming affects yield and yield stability, especially in seasons with extreme weather conditions (drought & flood), product quality and product storability, compared to the conventional system;
- how organic farming affects the stability of the agro-ecological system, with emphasis on soil fertility, beneficial organisms and biodiversity, compared to the conventional system;
- natural and economic resource efficiency (output/input relationships) of the organic system compared to the conventional system.

The Project is well on track to reach its objectives. The review team bases this judgment on the following evidence:

- The long-term experiments are well designed and properly set up and managed
- A team of committed partners is collaborating in the trials; they complement each other well and together have most of the expertise required to implement the Project
- The Steering Committee is functioning well, enhancing the ownership for the Project
- The institutional setting is robust and appropriate
- The Project managed to successfully involve and commit partners well anchored in mainstream agricultural research for development (KARI, KU, TSBF), which is crucial for credibility

Conclusion: The local Steering Committee and its stakeholders recognize the importance of partnerships in reaching project objectives; thus, it is in process of establishing a dynamic and diverse team of experts from various institutions to implement the Project and achieve expected results.

Recommendation:

- The local Steering Committee should be commended for good governance and commitment to the Project success.
- The Project should continue establishing strategic alliances with stable institutions in the country and region to ensure effective management of long-term trials.
- The local Steering Committee should continue identifying and using wisely the expertise and capacities found in local research and academic institutions.

Considering the kind and type of activities undertaken until now by the Project, the review team supports the idea of the local Steering Committee to fill the gap observed in social science (Min 2 KEN/2009). This expertise is crucial for the Project to oversee socio-economic aspects that can hinder the Project to make significant impacts.

Recommendation:

- Speed up the inclusion of socio-economic expertise in the Project governing bodies to balance the composition of the local Steering Committee.

3.3.5. Conclusions that can be drawn so far

Results from the first two years of the long-term comparison experiment show that overall, yields in the organic treatments were 21% lower than in the conventional, with similar costs. Yet, this "yield gap" is highly variable, and considerably wider in the low fertility site in Thika than in Chuka (Musyoka 2009). The review team observed in the field that for development of the potato crop (ground cover at full flowering) the organic treatments are consistently lagging behind the respective conventional treatments.

As the crops were healthy throughout all treatments and both sites, the question is, why organic is losing out. Nutrient input is supposedly the same in organic and conventional treatments. It will be important to calculate and indicate the actual nutrient inputs in the different treatments (the doses are based on expected nutrient contents of the organic fertilizers) when presenting the results.

There are certain tendencies that organic treatments are slowly catching up on conventional, although such tendencies are difficult to discern after just three years and given the high variability of yields. It is therefore urgent to start studying soil dynamics in terms of nutrients (especially N and P), carbon and microorganisms, which requires additional funding.

Some of the Project partners emphasized that for them the most important conclusion was that "organic agriculture works" in the sense that one can produce healthy crops with yields approaching those of conventional farming. This is certainly an important output of the Project.

3.4. Long-term experiments

The long-term experiments are certainly the core of the Project and the review team therefore dedicated a considerable amount of time and effort to understand these trials, the rationale for certain decisions and to consider and discuss possible changes to make the trials even more relevant. Yet, in long-term experiments, one should be careful with changing the management. We would like to emphasize that the considerations given below should be discussed by the Project partners and in most cases need to be tested in trials separate from the long-term experiment first.

3.4.1. Crop rotation

It is well known that the crop sequencing is critical to avoid the build up of pests and pathogens, to control weeds, and also to improve soil structure and fertility. However, this beneficial practice is rarely applied or used by major smallholders in trial sites due to land scarcity. The local management team has wisely selected a rotation type 'to meet the basic phytosanitary requirements', as well as crop marketing and other economic variables observed in the Project areas. The general cropping system in the central region is maize and dry beans; horticultural crops are also integrated in the cropping system.

The rationale for the rotations chosen for the experiment is the following: In the low input treatments, a rotation was designed that produces the staples maize and beans that are the backbone of small-scale farming systems, complemented by one season of vegetables (*Brassicaceae* – *Chenopodiaceae* intercrop), and one of potatoes. Maize is intercropped with beans. In the high input (commercial) treatments, maize is replaced with baby corn in two seasons, and dry beans with French beans in another. The vegetable season is planted with a *Brassica* sole crop. The idea is that commercial farmers would aspire to produce cash crops for the domestic urban and for the export market.

While this rationale is understandable from the point of view of scientific comparability (having the same plant species or – for vegetables – the same family for all treatments, although for different purposes), it makes it difficult to explain the trial to farmers in the vicinity of the trial site, and development workers at divisional level. It has to be explained that the experiment works with "model" crops that are not necessarily the most appropriate ones in terms of profitability in the immediate local context, although the choice of crops is indeed based on profitability and statistics on frequency of cropping at District level. This becomes obvious in Chuka (Meru South), some 300 km away from the urban markets and export points of Nairobi, where French beans and baby corn don't have a market because of lacking market contacts. (Actually, one of the most important areas for export crop production is another 20 km further away from Nairobi, in Meru Central). The Project is raising expectations among farmers in the immediate neighborhood, which have to be cautioned steadily.

The review team suggests that the choice of crops in the rotation is re-visited carefully by the Steering Committee. Targeting the domestic rather than the export markets could enhance the market opportunities and would be politically more correct in times of general food shortages in Kenya. It could further be interesting to include indigenous vegetables like amaranth (although it is presently usually grown along field boundaries or in small pockets around the compounds rather than in rotation occupying arable surfaces) and African egg plant in the rotations. This would add the notion of authenticity, which coupled with the organic label could have a special appeal to consumers in urban centers and in Europe. In addition, these indigenous vegetables might be easier to manage in organic systems, as they have been selected for rusticity and adaptation to the areas. The AVDRC regional vegetable center in Arusha would be a source of knowledge and experience to this end. However, the Project is not meant to promote underutilized crops, but to compare systems that contain the "locally representative" crops.

In terms of green manure crops, we endorse the use of Mucuna in the organic high treatment. However, in the context of the experiment, where all biomass is carefully quantified, the intensive winding of Mucuna vines on maize causes excessive work for site staff (if Mucuna develops well). We propose revising the present protocol on biomass determination and considering a more summarily quantification (e.g. the total biomass of Mucuna and maize together at the moment of incorporation). If for the input-output balances of nutrients, maize and Mucuna biomass need to be separated at some point, it might be easier to do this shortly before Mucuna incorporation and to establish a relationship between maize biomass at time of maize harvest and maize biomass at time of Mucuna incorporation, and use these values to establish a correction factor.

We understand that it is difficult to come up with a rotation that meets at the same time the objective of scientific comparability between treatments from a global perspective, the strive for profitability (which is highly context and site-specific), the preference of subsistence farmers (again context and site specific) and the agronomic principles to alleviate biotic constraints.

Recommendation:

- Revisit the crops in the rotations of the long-term experiment, considering representativeness, demand, agronomic optimum, and comparability, and explore the possibility of including high value indigenous crops (e.g. amaranth, African egg plant)

3.4.2. Varieties and seeds

Although strong linkage has been established among institutions with soil expertise, the review team finds that the connection with crop research institutions and seed companies

was inadequate. In the long-term experiments, improved crop varieties have been used. Yet, it is not clear if these are the best adapted ones to the two sites. And smallholder farmers in trial sites still use predominantly local varieties which are susceptible to pests and diseases. For instance, farmers said to have experienced potato bacterial wilt in their fields, and were not aware of 'Asante' potato variety, resistant to this disease. Most farmers interviewed had no knowledge of provenance of improved crop varieties or seeds, while KARI research centers, University of Nairobi and seed companies could provide valuable information as they are operating in the central region.

Since organic farming claims to produce "healthier" food, it could be interesting to combine the ecological way of production with micronutrient rich or "biofortified" bean varieties or QPM maize. Further, drought tolerant bean varieties of diverse market classes are available for the area and the same might be true for maize. The KARI crop programs as well as the University of Nairobi, working with several CGIAR Centres (i.e. CIAT-PABRA, CIMMYT and CIP) possess released varieties of crops adapted to various agro-ecological zones in Kenya, including the central highlands².

The evaluation team suggests that improved varieties of different crops be evaluated outside the long-term experiments (in both sites there exist some areas adjacent to the trial that might be used for this purpose) for participatory assessment with farmers. Based on their advice and assessment, coupled with marketing considerations, a variety can be selected for inclusion in the experiments. In parallel, and in close collaboration with MoA field workers, the most popular varieties can be advanced to demonstration plots for further assessment and appropriation by farmers. Expertise in participatory variety selection with farmers can be found with KARI-trained scientists and/or the regional bean breeder at Nairobi University.

Conclusion: There exists an opportunity for the local Steering Committee to select multi-purpose crop varieties adapted to trial sites for the benefit of farmers. Mandated KARI research centers linked with CGIAR centers and diverse certified seed companies are main sources of improved crop varieties and seeds.

Recommendation:

- The Project should link with plant breeders at the University of Nairobi, KARI stations and CG Centers to get the newest adapted and released crop materials.

3.4.3. Soil fertility management

The long-term experiments look neat and proper. The biggest difference between these plots and fields of organic farmers is the absence of trees and of mulch (the review team observed mulch in plots of different organic farmers). The review team suggests that the following options be assessed to improve soil fertility management in the organic treatments:

Mulching is a useful practice to reduce run-off (and erosion) and hence enhance infiltration. As at the same time mulching reduces evaporation, the water balance of plots can be greatly improved, a big advantage in times of uncertain rainfall. Other advantages of mulch are the addition of organic matter (to build up soil C) and the reduction of soil temperatures. These advantages should be exploited in the organic treatments. Depending on the mulch material, the addition of nutrients with the mulch will be small. It has to be quantified and may be considered in the calculation of nutrient application doses in order to maintain nutrient equivalence to the conventional treatments.

² Interact directly with Prof. Paul Kimani at the University of Nairobi (email: kimanipm@nbnet.co.ke) and the national bean program at KARI Katumani.

In the organic low treatment, materials for mulching should be assessed that are more or less realistic for farmers. One option would be to collect fern leaves (a practice observed on organic farms). Possible negative effects of fern on soil fertility should be assessed based on literature. Since it will not be realistic to apply a thick layer of mulch capable of suppressing weed growth, a labor-saving way of managing the mulch in combination with weeding needs to be developed.

In the organic high treatment, crop residues are presently incorporated at tilling. Yet, to avoid nitrogen blocking by the low-N material, incorporation is limited to 2 t/ha. The review team suggests using the surplus material as mulch in the subsequent crop. Again, the management of the mulch will pose a challenge for weeding (annex 5). Alternatively, a critical review of the literature source recommending the 2 t/ha might reveal that the recommendation is given in case the crop is planted immediately after residue incorporation. In the experiments however, residue incorporation is done 4-6 weeks before crop planting – which may allow for higher doses.

Tithonia foliage is presently mixed into farmyard manure for composting in the organic low treatment. Given the high N content of Tithonia and of the manure and the lack of structure of both components, we question the appropriateness of this mix. Samples of Tithonia plants used in the experiments showed a C:N ratio of about 10, which makes composting of Tithonia unnecessary (Zundel 2009, personal communication). Tithonia could be better taken advantage of by incorporating it into the soil or using it as mulch.

Presently, Tithonia liquid manure is produced to supply nitrogen to the growing plants (top-dressing). We suggest that this is a lot of effort to supply small amounts of nitrogen to the crop. If this Tithonia liquid manure only has a fertilizing effect, we propose to apply the same amount of Tithonia directly to the base of the plant as mulch. If nutrient volatilization is feared in this case, the mulch layer may be covered lightly with soil. The review team recommends testing in an additional trial the efficiency of Tithonia mulch *versus* Tithonia liquid application.

Integrating trees or rather shrubs in the experiments is certainly a challenge. Incorporating them into the trial plots is not recommended, as this will be an undue competition to the crops and will further complicate analysis. Yet, when planting them outside the plots, in the border area, any foliage obtained from these shrubs will have to be accounted for as "external" input. In this case, the value of the shrubs will be more aesthetic than agronomic. Still, shrubs may change the micro-climate in the plots. We could imagine planting Tithonia shrubs above each plot (also the conventional ones) and keeping them low by pruning and lopping so as to minimize their influence on the trial plots (annex 6). We recommend, however, that the Steering Committee consider all the pros and cons of such a change carefully.

In any case, we recommend that all the modifications proposed here are first tested outside the long-term experiments and based on the results obtained there, the Steering Committee takes a decision.

Recommendation:

- Consider the following changes to the soil fertility management in the experiments:
 - Mulching with material from outside the farm (organic)
 - Use crop residues in excess of 2 t/ha as mulch (organic high)
 - Use Tithonia as mulch rather than mixing it into the compost (organic low)
 - Apply the Tithonia as mulch to the base of the plant instead of making liquid manure
 - Plant shrubs in the borders of the elementary plots

3.4.4. Pests and diseases

In both, long-term experiments and on-farm trials, home-made organic pesticides are used to control diverse insect pests and diseases on cultivated crops (maize, grain legumes, and vegetables) in addition to avoiding pest and disease problems through intelligent systems management and to biological control with commercially available products such as neem-based sprays and Bt-products. In order to reduce costs for crop protection in the long-term experiments (and thus increase gross margins) it would be interesting to substitute commercial organic products for home-made ones, at least in the organic low treatments. On the other hand, different home-made recipes varying in ingredients are prepared by small-scale farmers in various manners with normally big variation in active ingredients. Farmers complain about the fact that sometimes their products are only partially effective and applications have to be repeated. Thus, replacing commercial for home-made products could increase the risk of organic production. In fact, project staff is presently using commercial products even in the low-input organic treatment for fear of major problems in the experiment. Therefore, the review team recommends that trials outside the long-term experiment are initiated to compare home-made recipes with commercial products used presently (relevant for the long-term experiment) and with no application (relevant to farmers).

One of the questions that the long-term comparison will intend to answer is on the possible effects of organic farming on pests and diseases. The experiment is intended to record data on pests and diseases of the crops in the rotation. The Project is using field technicians with limited knowledge on pests and diseases. Therefore intensive training in identification and evaluation of these pests and diseases using international standard evaluation systems established for each type of crop and disease is required. Currently, none of these standard evaluation systems is used. Technical and scientific staff expressed their interest in acquiring knowledge and skills in evaluation of pests and diseases and during a respective training it might discuss with the specialists, which degree of precision and effort for pest and disease records is justified given the small size of the experimental plots.

Conclusion: There is complexity in assessing effectiveness of various home-made recipes used in trials. Field staff is not familiar with international standard evaluation systems for common pests and diseases.

Recommendation:

- Test and assess home-made recipes to reduce costs in the organic treatments
- Assess, if international standard evaluation systems can be used for scoring pest and diseases
- Organize on-the-job or short-term training courses for Project technical and scientific staff

3.4.5. Long-term experiment as a learning site

As emphasized above, the methodology in a long-term experiment should remain reasonably stable over time. Hence, modifications to the methodology should be introduced with due care. We therefore recommend testing all modifications first outside the actual experiment and only introduce them, if benefits are obvious. Such trials can be simple, basically comparing the present practice with one or two alternatives. Two replications will usually be enough. Such trials can be considered as learning ground for organic agriculture, making up for the fact that management of conventional treatments can draw from the experience of thousands of trials.

These small trials will be very interesting for farmers. In fact they are part of technology development and may be the starting point for new on-farm trials. We therefore recommend that farmers are invited systematically to evaluate these trials.

Farmer groups have already been invited to the long-term experiment. It is a challenge to explain the experiment to farmers, since its primary objective is not to develop new technology but to compare entire systems. We therefore propose that the Project makes a major effort to develop material (concept, demo material, simple posters) to explain the experiment to farmers. This material should be tested and improved according to feedback (or lack of it) by farmers.

The review team considers the long-term experiments as excellent tangible reference points. We propose that these trials are visited once or twice a year with an interdisciplinary team, including Steering Committee members. The purpose of such visits will be to capture the entire array of assessments, interpretations and questions such a diverse and experienced group may have and to discuss technical issues directly in the field.

The different stakeholders emphasized in their discussions with the review team two burning questions that have so far not yet been addressed:

- What is the effect of organic farming on soil dynamics, soil health and resilience to drought?
- What is the effect of organic farming on product quality (taste, nutritional value and pesticide residue load)?

While we acknowledge that additional funds are needed to study these aspects in detail, we recommend that some simple studies, carried out for instance by MSc-students, are initiated now. We endorse the studies planned for March 2010 to explore if treatment effects on soil water holding capacity, soil organisms, weed population, and product quality are already visible. Furthermore, it would help clarify issues among Project partners, if study protocols for future in-depth studies were drafted already.

Recommendation:

- Test all intended changes first in trials outside the long-term experiment;
- Invite farmers to evaluate these trials as this is part of technology development;
- Visit the long-term experiments periodically with an interdisciplinary team including Steering Committee members.
- Initiate explorative studies on soil and produce quality immediately

3.5. On-farm work

3.5.1. Technology development

Technology development started recently in 2009. As a first activity, focus groups discussions were held in February 2009 in Kangari and Yatta (Anonymous 2009a). Based on the results, Kangari Division was selected for on-farm trials and enhancing organic manures as the general research area (Anonymous 2009b).

The first topic addressed was manure handling with a "demo trial" laid out as a complete factorial with farmers' manure (boma) and Massai manure composted in two ways or not at all. Farmers then chose out of the six treatments the ones they wanted to test on their farm. Basically, this represents a mother-baby-trial design.

These trials were well done and the methodology corresponds to good on-farm trials. The 38 trials established will allow for a meaningful analysis. Data have been collected that will allow for quantifying the relative amounts of manure that went into the different treatments on each

farm, a factor that will be crucial for interpreting the results. Eight trials were established with farmers who have recently started with organic farming. In several farms we found the two 6 m² trial plots to be the only organically managed land on the farm. This has the shortcoming that for the non-experimental factors it is not possible to keep them at farmers' levels or that these levels do not represent time-tested practices of each individual farmer, if changes were necessary in the conversion from conventional to organic farming. On the other hand we consider it an interesting approach to initiate organic farming with a trial. But this fact should be considered in the interpretation.

It will be crucial for the success of these trials to systematically collect farmers' observations and feedback on the different treatments. If the trials are to be continued in 2010, composting without additional biomass should be envisioned, since for farmers it seems to be difficult to find enough biomass for animal bedding, mulching and composting. Further, it should be considered if the manures on each farm can be analyzed for nutrients to relate composting method to results in terms of nutrient content. For farmers on the other hand it is more important to be able to compare directly the effect of equal amounts of raw bovine manure treated in different ways on crop performance.

For 2010, Project staff mentioned the idea of comparing different commercially available organic fertilizers (Anonymous 2009b). The review team discourages this, since for small-scale farmers buying organic manure will most probably not be profitable. Such trials would first of all benefit the larger, commercial growers, if at all. Manure on the other hand seems to be the option and is presently increasingly used also by conventional farmers, as mineral fertilizers have become expensive.

The review team identified a number of issues that should be considered for on-farm trials:

1. Effectiveness of rock phosphate (direct application *versus* incorporation into compost) as planned for 2010 in Kangari (Anonymous 2009b)
2. Varieties (in coordination with the long-term experiment) that might be tested in a qualitative design in the Kangari and Chuka areas, together with MoA staff
3. Effectiveness of home-made treatments against pests or diseases (here a major crop and a respective major pest or disease would have to be selected to start with; home-made versus commercial products should be tested). This has to be closely linked with similar work in the border areas of the long-term experiments. Additional on-farm trials in the Kangari area could, however be justified, as farmers mentioned disease and pest problems and the big and sometimes futile efforts to control them quite frequently (more often than would be expected based on the relatively low ranking of the issue during the focus group discussions). KIOF is already active in testing the effectiveness of home-made crop protection solutions. Therefore, collaboration with KIOF would be mandatory for such an endeavor.

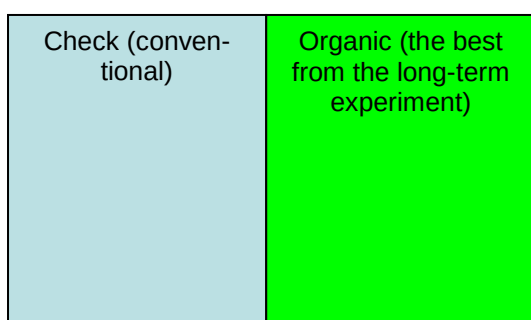
The review team recommends to evaluate carefully with farmers, which of these topics should be treated in on-farm trials, based on tentative ideas about potential solutions. Structured *ex-ante* evaluation with farmers can be applied to prioritize (Tripp and Wooley 1989) and will neatly build on (be able to capture the preferences of farmers in more detail than) the focus group discussions (Anonymous 2009a).

The review team concludes that the technology development work has started well. A comprehensive plan will now have to be elaborated. Staggering the work well will be crucial for success. The idea of the Project to follow through with one trial for two years (with modifications in the second year based on the lessons learned from the first) holds much promise. Starting each year with a new trial (thus, having two different trials simultaneously as of 2010) is a good idea. Simple, straight forward trial designs that can easily be understood by partners and collaborating farmers are, however, a pre-condition to avoid confusion and may allow for some of the trials to be essentially farmer-managed (including

the major part of data collection) to reduce workload for technicians. In all that, the Project staff has to be pragmatic. Research protocols will have to be elaborated for each trial and revised every year. Discussing these protocols with experienced on-farm researchers may help to identify best ways to build on farmers' knowledge, keep trials simple and involve farmers optimally in the trials.

3.5.2. Validation trials

The Project foresees confirming the results of the (on-station) long term experiment under farmers' conditions in different ecological environments (ER 2.12, Zundel et al. 2008). The review team understands that these might be validation trials and that they can only be done in case additional funding becomes available. These would be trials comparing on-farm the organic treatment from the long-term experiment with conventional farming, meant to validate the results of the long-term experiment in different locations and under farmers' conditions. They could be designed as multi-locational trials.



The review team recommends that the Steering Committee develops a proposal for such validation trials. Working with small farmers could be interesting, since many of them manage only a small part of their farm organically. However, there are a series of aspects that have to be considered:

- Farmers should commit themselves to work the two sub-plots under the same management (organic or conventional) over several years; this is all the more important as there may be a yield drop during the conversion phase (although for small farmers this may not be true as they do not presently use much fertilizer) and the benefits of organic management will only show after some years.
- In order to assess the socio-economic impacts, the plots should be of "commercial scale", i.e. the farmer should dedicate one of his larger plots entirely to this trial.
- The farmer would most probably not be able to obtain certification as long as the trial lasts.
- For small farmers, the difference between conventional and organic may not be substantial. However, one could look at the organic plot as "more careful farming with a long-term, sustainability focus".

Zundel (2009, personal communication) mentions a series of other options for comparing systems under farmers' conditions, e.g. farm surveys, ideally even longitudinal studies, or farm data rings, where a farmer group decides to record agronomic, ecological and economic key data of their farm, and share them anonymously (such data of organic groups can be compared to the data of conventional groups). A comprehensive assessment of these approaches (their feasibility, benefits and drawbacks in the local context) was not possible in the context of the review. Yet, the review team is willing to further discuss the issue with the Project and compare alternative approaches with straight forward validation trials.

3.5.3. Training of farmers

This is an area of strength for the Project though capacity building for small-scale farmers is not clearly stated in the project document. The local Steering Committee and local partners identified the way of handling farmyard manure by smallholder farmers as a limiting factor for optimizing crop yield at farmer level. The problem analysis revealed the lack of knowledge in composting and animal manure handling. This has led to training of farmers in partnership with KIOF, as a strategic partner responsible of training, especially in Kangari, the on-farm site of the Project. The evaluation team attended shortly on Saturday, 5/12/09 the training session. Farmers were taught different methods of improving their handling of manure, starting with proper animal housing, using bedding material, managing the manure and composting it with other biomass, both in boxes or in heaps.

Discussion with some farmers in the area mentioned the lack of plant materials which was seasonal corresponding with rainy season. Thus, composting using plant materials was not reliable. Also farmers complained that Massai manure sold on local market was low in nutrients as compared to Boma manure.

The review team questions if the relationship of 2 days classroom versus 1 day field training was optimal. It recommends paying close attention to this aspect in the follow-up to assess the impact of the training. Training of trainers (ToT) could be an alternative to classroom teaching. Another strategy that has been successful worldwide is exchange visits. Farmers will learn faster during exchange visits or field days organized within or outside of their village communities.

It will be important to implement mechanisms for following up the impact of training as mentioned in the planning document. In principle, this is best done by the partner providing the training, but the Project may assist in methodology. Simple, qualitative tools should be favored, but it should be ensured that critical distance is conserved. The main objective of this follow-up is to learn for future activities (both training and research).

Recommendation:

- The Project should continue to team up with strategic partners and favor training in the field (e.g. exchange visits) over classroom.
- Use farmer trainers to train other farmers.
- Establish mechanisms for a follow-up of trainees in use of knowledge and skills acquired as planned.

3.6. Efficiency

All interviewees pointed out that the farming systems comparison project is complementary to other projects of partners. At the outset, the team responsible for Project design made an effort with all partners on similar research initiatives and to take into account their experiences. This holds especially true for long-term trials, soil fertility issues (including green manure etc.) and organic value chains. However, the interaction has been weak with other actors in agricultural research, notably those working on varieties, disease control and commercialization (e.g. with ASARECA-EU snap bean project). The review team proposes to strengthen links with these actors in East Africa (other universities, other KARI stations, CG projects, ASARECA projects).

The Project has the right partners. Their inputs are congruent with their roles and responsibilities and they all invest their own resources. The Steering Committee should not be further enlarged, as this could hamper efficiency. Collaboration with further partners, as recommended by the review team, should not automatically lead to inclusion of them in the Steering Committee.

Working modes are transparent, participatory, interactive, empowering. When asked about improvements in the Project, several partners mentioned that they had already made their suggestions and these had been dealt with by the Steering Committee or the management. In order to further enhance empowerment, training for technicians on pest and disease scoring and other issues that may come up during work should be foreseen.

In terms of resource efficiency, the review team could not identify opportunities to do the same things at lower cost. On the other hand, there is a need to foresee a budget to initiate the additional studies as soon as possible.

3.7. Project management

Although the Project structures appear rather complex at first view, the review team concluded that they are adequate and work well. A considerable share of the success of the Project is due to the *icip*e project coordinator and the responsible senior scientist. Equally important is the commitment, the ownership and the interest of the other partners. The FiBL coordinator was complemented as being highly inclusive, participatory and committed. She appears to be a good networker, crucial for setting up the project structure and the social fabric among the partners.

There exists a good balance between the five areas of management: Scientific input and coordination, administrative coordination and communication, networks and exchange, public relations, and acquisition of additional funds. There was a consensus among the interviewees that FiBL should focus specifically on the acquisition of additional funds and on providing scientific input and expertise. However, many donors favour partners from the South in their funding policy or restrict their programs entirely to them. Thus, even if FiBL can initiate the development of proposals and the identification of promising sources of funding, in the end the Kenyan partners will have to be in the driving seat for applying for funding and tailoring proposals to the specific donor programs.

Monitoring and critical assessment is ensured. (e.g. indicators are tracked in progress reports)

3.8. Risks and potentials

The review team identified a number of factors that could jeopardize the success of the Project:

1. A major fear of the Project partners is that funding for this long-term project could be reduced or even discontinued.
2. Staff fluctuation is to be expected in the course of this long-term project; proper, careful record keeping and handing-over is therefore crucial; as far as the review team could assess this, record keeping is well managed and procedures are documented properly.
3. Erratic rainfalls and drought is presently a hot topic in Eastern Africa; the Project already reacted to pronounced drought conditions by installing irrigation in the high input treatments. This corresponds to the practice of most commercial farmers. But it makes the experiment more difficult to understand for the stakeholders. In the medium term, drought may render vegetable production without irrigation impossible. The Project will have to monitor this development, as it plans to shift to alternatives to vegetables (and probably even to maize, especially in Thika) in the low-input systems. On the other hand, rainfall becoming more and more erratic bears also a potential for organic farming, as supposedly organic soils should be more resilient to drought due to expected build-up of organic matter in the soil.

4. Presently the Kenyan government is running a schedule of subsidized inputs; this could certainly act against organic farming; however, organic movements report that the farmers they had already trained did not go for these inputs; as for farmers getting more reluctant to convert to organic agriculture because of the subsidies for conventional inputs, the schedule will probably not reach that many small farmers.
5. Exponents of GMO crops are very active in Kenya. The Kenyan parliament passed the Biosafety Act which allows the commercialization of GMO crops in the country. There is no commercial cultivation of GMO crops currently, but laboratory and field trials with maize, cassava, and sweet potatoes are conducted. Growing GMO varieties along with organic cultivation of the same crops in a given country of district bears a considerable risk of genetic (cross-pollinators) and physical contamination (self-pollinators, clones). Especially organic baby corn could be affected by unintended genetic contamination by GMO pollen. The Project should therefore carefully study the present situation, assess the trends and analyze the potential risks for organic farming.
6. As evidenced by the subsidized inputs, in Kenya there is presently an intensive debate on the future of agriculture. Mainstream farming advocacy groups are very active. In this context, careless, unreflected communication about organic agriculture or the Project could severely hamper its credibility. Blaming "fertilizers and pesticides to poison our food" and similar undifferentiated statements could easily produce a backlash. Careful communication is crucial to ensuring credibility of the Project and its results.

Potentials (and some more risks) are outlined in the impact hypotheses developed by the Project partners (annex 3). The main potentials refer to:

1. Farmers using improved soil fertility technologies that increase production and maintain soil health
2. Organic movements using sound research results for advocacy work and communication and thus becoming stronger
3. Extension, who is expected to benefit from training material that translates the results and experience of the Project into extension contents useful for farmers
4. Universities that may use the Project outputs to develop building blocks on organic farming for their curriculae

3.9. Budget-relevant additional activities recommended

The review team recommends several additional studies or activities that will require additional funds. In the following table we give our idea on the priority of these.

Table 4: Summary of recommendations and priority by the review team

Recommendation	Costs	Priority
Get policy makers to the experiment in Chuka (or Thika)	Medium	High (as of 2011)
Link with plant breeders	Low	High
Additional trials in Chuka and Thika to clarify questions on best organic techniques (e.g. Tithonia composting vs. mulching)	Medium	Very high
Training on pest and disease scoring	Medium	High
Additional studies on produce quality (immediately) and soil dynamics (the idea is to start with MSc theses and save on expensive laboratory analyses)	Medium to high	Very High
Steering committee meetings in experiment	Low	High
Follow-up of training activities	Medium	Medium
Elaborating a coherent concept for technology development	Low	Very high
New on-farm technology development trials (as planned)	Medium	High
Proposal for validation studies	Low	High

4. India

4.1. Introduction

The review team consisted of Urs Scheidegger, who headed the reviews in all three countries, and Om Rupela as consultant for the Indian component. The review included field visits to the experiment at bioRe training center, as well as to organic farmers in the area and to farmers (conventional) participating in on-farm validation trials. An important part was interviews and extended discussions with Project implementation staff. The review team did a pre-analysis of the findings every evening and elaborated a synthesis structured along the "crucial questions" as outlined in the Terms of Reference for the review. This synthesis was presented to the Project team in a de-briefing meeting on August 14, 2009 at the bioRe training center and discussed. During this meeting, the team was invited to formulate impact chain hypotheses (annex 3). An interview guide (annex 2) was developed by the review team, which translated the crucial questions from the TORs into tangible questions that were discussed with the interviewees according to their interest and experience.

4.2. Relevance to stakeholders

The Project in India is significantly shaped by the bioRe training center in Madhya Pradesh. Although the network chart lists an impressive number of organizations to which the Project has contacts, the principal partners are FiBL and bioRe Association (the only one with an MoU) and, closely linked, the bioRe textile company. The other organizations on the chart are either providing services to the Project or are sharing common interests.

As for bioRe, the Project addresses one of their central questions: How does organic agriculture compare with conventional? Further, the training center hopes to benefit from a number of additional studies, carried out either in on-farm trials or within the long-term experiment. The review team concludes that the close linkage with a commercial actor is healthy for Project orientation.

The Project team managed to interest different stakeholder groups in the trial: The organic farmers visiting the training center are shown the experiment. Neighboring conventional farmers are invited to the site. During the review, a group of government extension agents was received to see and discuss the experiment. The review team was impressed by the openness of mainstream agricultural officers and farmers towards organic agriculture and the interest and competence with which they discussed the experiment. The Project appears to be highly relevant even to exponents of conventional (mainstream) farming. It appears that linking loosely to actors in the vicinity of the trial site works out well in the Indian environment.

Beyond such visits, contacts to other actors in agricultural research and development (ARD) are just being developed. One reason could be that the Project team, not being from a research organization, fears to get trapped between FiBL with its clear expectations on Project activities and an eventual partner from an Indian research institute or university who might have its own strong ideas.

The review team recommends that the Project reaches out to different scientists to conduct specific studies that can help to improve the long-term experiment, for instance in the area of soil science, entomology etc. This can help to build mutual trust and make the experiment known to the scientific community. Involving students in such studies will be a further way to reach out to universities. The long-term experiment should also have the function of a "field laboratory" where different institutions can undertake specific studies, as long as they do not affect the main objective of the experiment.

The Indian landscape of policy making is complex and thus multiple efforts, jointly between bioRe and FiBL will be needed to reach out to the crucial actors. The review team recommends assessing the feasibility to constitute a new body such as a "Board of Directors" or an "Advisory Board" to bring in key leaders of agricultural research. This body could include more institutions than the Steering Committee (too many members in the Steering Committee would hamper its efficiency) and would deal with strategic rather than technical questions.

One shortcoming of the Project is that it is limited to favorable environments. Ideally, a second long-term experiment on a more marginal site should be established, but this would probably almost duplicate the costs. An alternative is to conduct validation trials and some technology development on marginal sites. The project document of the validation trials plans with 50% of participating farmers on fertile soils and 50% on marginal soils. The review team recommends examining the feasibility selecting a few villages with marginal conditions (unfavorable soils, lower rainfall) and running on-farm trials there. This clustering will help to save costs (e.g. of transportation) and allow to conduct the on-farm trials with farmer groups.

Recommendation:

- Assess the feasibility of constituting an advisory body
- Involve ARD actors more through joint studies in the long-term experiment
- Approach the nearest university for short (3-6 months) student projects
- Assess the feasibility (costs, logistics) of a second project site under less favorable conditions

4.3. Effectiveness

The most important achievement to date is the establishment of a well-designed experiment. In spite of some criticism and suggestions for improvements below, this field experiment has a lot of potential. Its treatments are realistic, i.e. they correspond well with farmers' realities. For instance the level of nutrients applied in the organic treatments corresponds to the average that organic farmers presently give. Mainstream agriculturalists consider the comparison as "fair", meaning that there is no bias against conventional treatments. This is crucial for the credibility of the experiment and the broad acceptance of the results.

Ownership of the Project is high. The team is highly committed and capable to implement the scheduled activities. Farmers in the neighborhood as well as organic farmers working with bioRe appreciate the opportunity to see the different treatments in comparison. Therefore, the Project is well on track to achieve its objectives.

Results so far indicate that cotton and wheat yields are 20 to 30% lower in organic treatments, while soybean yields are comparable. It appears that the gap is closing from year one to year two. These yields were achieved with only about half the amounts of nutrients in the organic treatments. While cost were a bit lower in the organic treatments, these savings did not make up for the lower yield, even if the currently paid premium price was considered. An appropriate premium price is crucial for organic producers to cover up for the yield gap.

It will be interesting to see the evolution of the different treatments over time. A quite unexpected development is that when taking soil samples the Project team observed that the soil was already softer (easier to penetrate with the auger) in the organic plots.

4.4. Long-term experiment

The long-term experiment is certainly the core of the Project and the review team therefore dedicated considerable time to understand this experiment and to discuss possible changes to make it even more relevant.

The field experiment comparing four crop husbandry systems (organic, biodynamic, conventional and GM) in four replications is done in a rotation of cotton (year 1) and soybean-wheat (sequential cropping, year 2). It consist in fact of two adjacent experiments starting in 2007, one starting with the year 1 crop, the other with the year 2 crops.

The experiment is on scientifically sound footing for its layout design and treatments. Plot size of the four different treatments and the buffer zones were carefully planned and executed. The long-term study is crucial for answering questions of relevance to both, 'bioRe' and the scientific community worldwide, and is likely to achieve its objectives in due course. At the same time it serves as demonstration site for persons interested in organic farming. Suggestions and criticism to improve the study are shared below.

4.4.1. Water logging

A good number of plots had problem of poor plant stand in patches. This was due to damage by insects that cut the seedlings at ground level during early plant growth stage. Gap-filled plants, as expected, remained less grown and had more insect damage (largely sucking pests) than the timely sown ones.

The experimental field had some problems of water logging over several years, which were more accentuated in plots 7-9 and 11-13. These were also the plots that had more problems with poor plant stand. It appears that water logging resulted in some favorable conditions for some soil and/or insect factors that resulted in plant damage at seedling stage.

'Organic' treatment plots in general had more heterogeneity in plant stand than conventional (Bt plots had least problem). But since poor plant stand was noted in all the four treatments in water logging endemic area, it may not be due to treatment effects. Therefore solving the water logging problem is important before the plant stand heterogeneity problem can be addressed.

General slope of the experimental field is towards the neighbor's property and therefore the field cannot be drained unless the neighbor agrees. Making pits of sufficient size is suggested to drain water in the aquifer. Experience suggests that for well drained soils with Murram layer below one meter depth, one pit (size 6m length x 3m width x 3m depth) per ha is enough. Because the field having the experiment has deep Vertisol and most probably no Murram layer underneath, at least three pits (size 3m length x 1.5m width x 3m depth) are recommended. The number of pits may be increased if they fail to accommodate water from a rainfall event of about 50mm. Three likely locations for the pits were identified for action.

In addition, a nursery of cotton plants should be prepared (in tea-cups) when sowing is happening next year. These plants can be used to fill gaps as this may allow gap-filled plants to grow at the similar pace as the original ones.

Recommendation:

- Dig infiltration pits to solve the problem of water logging
- Raise cotton plants for gap-filling in a nursery

4.4.2. Organic fertilizers and bioagents

Inputs like compost in plots of 'organic' and 'biodynamic' treatments should be viewed as source of agriculturally beneficial microorganisms rather than as source of nutrients. Nitrogen

in these treatments can be accessed from air by the nitrogen fixing microorganisms found in the compost and in the traditional bioagents (Rupela 2006) known to the team at 'bioRe'. The quantities of compost presently used (20 t per ha for cotton, 12.5 t per ha for wheat and 5 t per ha for soybean) seem unrealistic because farmers in the neighborhood or in the rest of India generally lack such quantities. Indeed one important reason why the mainstream is presently hesitant to promote organic farming is the non-availability of large quantities of compost with farmers in India. Learning from the limited published work (Rupela et al. 2006), it appears that large quantities of the kind used in this experiment are not needed. This hypothesis, based on the assumption that microorganisms may make available nutrients already present in the soil but not available to plants, could be tested in separate trials. Also, some successful organic farmers in India apply compost when crops are about one month old, instead of incorporating it with land preparation, as widely practiced. This seems scientifically sound as biomolecules in compost like enzymes and beneficial microorganisms will survive better and would reach the root system with rain or irrigation water. In addition, these successful farmers leave any available plant biomass on the soil surface. Weeds that are presently taken out of the plots, can be left where they are uprooted, unless they have already produced seeds.

Presently, plots of 'organic' and 'biodynamic' treatments have mungbean as intercrop, but their population is too low to produce substantial quantities of plant biomass (need to be quantified in future) needed to sustain productivity without agro-chemicals. One option is to replace mungbean with other legumes of similar duration (e.g. cowpea) but having more vigorous growth than mungbean. The second option will be to grow 'Aurogreen crops' (see annex 7 for details) in early stages of cotton. This intervention can bring in diversity, which is urgently needed for better management of crop pests and is likely to provide up to 12.5t of wet mass per ha. This options should be tested in the spare trial land at bioRe Training Centre before being integrated in the long-term trial.

For any long-term study like this, it is important to calculate nutrient balances for each of the four treatments. Though the team made big efforts to get the nutrient contents, soil samples still remain for too long time at the laboratory. The team should make additional effort to find ways out of the situation and eventually test samples at another lab. If soil sample results can be obtained as soon as possible, nutrient balances may be established every year and shortcomings of the sampling procedure can be corrected in time. However, the review team admits that quick delivery of sample results depend much on the chosen laboratory.

Determining total concentration of different elements in the soil is as important as is the 'available' form of the elements. Presently these are not being measured. Indeed, total concentration of the different elements is more important in organic farming to address questions of soil nutrient depletion, which the mainstream scientists generally fear or comment on. Also, there seem some small issues on delays in getting soil analyses reports from the national laboratory. But still this relationship should be continued due to strategic reasons. If this laboratory cannot measure total concentration of the needed elements, services of some other laboratory should be explored. Crop Care laboratory of Excel Industries in Mumbai may accept to analyze these elements

The experiment has about 50% area under buffer zone or borders between plots of the different treatments. This was a good approach to restrict spillovers across treatments. But there seems scope to enhance the use of this area. The area between the plots is presently sown with some lines of Sesbania. The review team recommends to continue this, while increasing the density of Sesbania and practicing staggered planting so that the Sebania is always some 30 cm higher than the respective experimental crop.

Plots of 'organic' and 'biodynamic' treatments may be considered to grow cotton followed by wheat instead of cotton alone as is the case at present. This would, however, require short duration cotton along with a high temperature tolerant wheat. These two crops together may

have a better economic return than at present. Relevant research questions may be addressed outside the long-term experiment (under 'Technology Development') before making the proposed change in the long-term study.

Recommendation:

- Assess several alternatives for organic fertilizer management (other green manure, surface application of organic matter) aimed at reducing quantities of compost used for the different crops at present
- Determine total (in addition to available) nutrient concentration and explore laboratories with more timely delivery of results

4.4.3. General considerations

Surprisingly, first effects of organic farming are already visible: Staff of 'bioRe' involved in soil sampling noted that it was easier to introduce the soil auger in 'organic' and 'biodynamic' plots than in 'conventional'.

Extension staff of the Department of Agriculture Madhya Pradesh, during visit to the experiment, felt that similar growth of soybean across treatments was testimony to the fact that conventional soybean farmers should save on cost of production by withholding application of nitrogenous fertilizers. They also made the following comments that are worth considering: (a) the two treatments 'organic' and 'biodynamic' may benefit from drift of chemicals from the 'conventional' plots or (as expressed by others) natural enemies of pests may get killed by drifts or by moving into the conventional plots, (b) plot sizes for the different treatments are small, bigger plots would have been better, (c) the 'organic' and "biodynamic" treatments depend on market biopesticides which may increase the cost of production because some biopesticides in reality are costlier than chemical pesticides.

Indeed, drifts from 'conventional' plots are an issue but we would rather be worried by its negative than by its positive effects on the 'organic' and 'biodynamic' plots because they can kill natural enemies of insect-pests. To reduce the effect/threat of drift, spraying should be done when wind velocity is low and a fast-growing, tall annual crop like sorghum or maize may be sown between the different elementary plots. It is not feasible to further increase the present plot size (16m x 16m gross and 12m x 12m net) in a replicated long-term trial. It could, however, be useful to have one "validation trial" at the center, comparing just two treatments (organic and conventional) in large plots (0.2 ha), unreplicated, to address the criticism of small plots.

Successful organic farmers in India use some bioagents such as Amritpaani for enhancing soil health and 'Dashparni' sprayed on crops to protect them from insect pests. The same may be considered for use in the 'organic' and 'biodynamic' treatments. Relevant bioRe staff may visit selected successful farmers to learn about their ways of managing organic crops and to develop confidence.

While Economic Threshold Level (ETL) based decisions of plant protection is appropriate for 'conventional' production, it is risky for 'organic' and 'biodynamic' treatments. Prophylactic spraying is widely advised for organic farming, particularly during the conversion period until the beneficial insects have re-established.

Recommendation:

- Establish a "validation trial" at bioRe center to show the organic treatment in large, non-replicated plots
- Learn from successful farmers to make organic treatments more efficient

4.4.4. Long-term experiment as a learning site

As emphasized above, the methodology in a long-term experiment should remain reasonably stable over time. Hence, modifications to the methodology should be introduced with due care. We therefore recommend to test all modifications first outside the actual experiment and only introduce it if benefits are obvious. Such trials can be simple, basically comparing the present practice with one or two alternatives. Two replications will usually be enough. Such trials can be considered as learning ground for organic agriculture, making up for the fact that management of conventional treatments can draw from the experience of thousands of trials.

These small trials will be very interesting for farmers. In fact they are part of technology development and may be the starting point for new on-farm trials. We therefore recommend that farmers are invited systematically to evaluate these trials.

Recommendation:

- Test potential improvements on the organic treatments first outside the experiment at bioRe center
- Invite farmers to evaluate such trials

4.5. On-farm work

4.5.1. Technology development

In 2009 a new component was added to the Project, with the aim "to develop locally adapted technologies and innovations to address specific problems of organic farmers". Respective trials are to be conducted in a participatory way on-farm. The review team interprets the relationship between technology development and the long-term station experiment as follows: While in the long-term farming systems comparison proven or best-bet practices are applied, technology development should experiment with new ideas to enhance the yield or reduce costs (especially labor costs); the successful technologies may later be integrated into the long-term experiment.

In 2009 *Glyricidia sepium* and *Jatropha curcas* seedlings were supplied to 150 farmers for planting in the border areas of their fields. The purpose of such Glyricidia hedges is two-fold: Breaking the wind and producing biomass for incorporation into the field. While for the moment follow-up focuses on establishing the trees and get them well through the dry season, as of 2011 the effects can be measured: The windbreak effect can be assessed in studies, the effect of biomass in small trials inside the field.

The review team could observe the designing and preparation phase of trials with rock phosphate: Project staff in India considers to do trials in farmers' fields with 7 treatments:

1. No fertility-enhancing inputs
2. Rock phosphate alone
3. Compost alone
4. RP-compost: Rock phosphate mixed into the compost heap
5. RP-compost + Phosphorus Solubilizing Bacteria (PSB)
6. RP-compost + cow urine
7. RP-compost + cow urine + PSB

Rock phosphate would be applied at a rate of 300 kg/ha, compost at 20 t/ha and all the treatment inputs (including readymade RP-compost) will be provided by the Project. Plot size will be 25 m² and it is foreseen to do this trial in wheat with 15 to 20 organic farmers.

The review team acknowledges that the planning of the rock phosphate trial was yet at a very early stage at the time of evaluation. If implemented in the present design, the trial

would be too complex and would rather answer to researchers' questions than addressing farmers' concerns. Organic farmers have used rock phosphate, but abandoned it gradually over the past few years. Hypotheses for this include:

- Rock phosphate is not effective in these high pH (~8) soils
- Rock phosphate is only effective, if applied via compost (farmers applied it directly)
- Rock phosphate is not profitable, because it has to be applied via compost
- The effectiveness of rock phosphate can be enhanced by additives (PSB, cow urine)

Therefore, the review team invites the Project to re-visit the trial and break it down into smaller, simpler studies allowing for examining the above hypotheses. Some studies may be done on station, others on-farm and each study should respond to a clear objective. Scientific bases should be considered (e.g. the characteristics of the prevailing vertisols in the area).

The review team considers the "technology development component" as very important for the Project. Several stakeholders brought up questions that can be addressed by trials in this framework (annex 8) and most of the improvements for the long-term experiment recommended by the review team for consideration need to be tested first separately from this experiment to establish effectiveness, profitability and compatibility with the farming system (annex 8).

However, in order to exploit the potential offered by this component, a concept should be elaborated, defining its strategy and scope, as well as the mechanisms to identify the needs of organic farmers, collect ideas for potential solutions, screen these ideas and develop respective research protocols together with farmers (Tripp and Wooley, 1989). The Project team will have to learn more about the methodology of on-farm trials in general and participatory approaches in specific to benefit from the vast body of experience on how best to do research together with farmers (e.g. Bellon 2002, Werner 1993). It will have to become creative and react swiftly to new opportunities, problems and ideas, while maintaining focus and setting clear priorities. Most crucial for the success of this component will be that the reality of farmers is kept in mind when designing trials and studies.

A further challenge for technology development activities will be to conserve the idea of wholeness of organic farming. Conventional farmers and officials often see in organic farming a toolbox from which they would like to "borrow" certain practices to solve their problems, ignoring that the very principle of organic farming is to provide optimal conditions for crops to grow through a multitude of interacting measures and that curative actions should be only the last resort. It will therefore be crucial to select well which problems are to be addressed (actual problems of organic farmers) and which possible solutions are to be tested (those aiming at preventing rather than curing problems). Clues and ideas can be obtained from successful organic farmers who conserve the wholeness. This will also help to reduce the presently high dependence on external inputs for crop protection.

The review team concludes that the technology development component is crucial for developing improvements that can immediately benefit organic farmers.

Recommendation:

- Elaborate a concept document on technology development, outlining strategy, scope, and methodology
- Make sure that the necessary expertise is available in the team and that in spite of the multiple demands and ideas focus is not lost
- Preserve the idea of "wholeness" of organic farming

4.5.2. Validation trials

The idea of the validation trials is to compare two different crop husbandry systems – (a) organic, (b) conventional in farmers' fields (conventional farmers close to the center). Ten trials were established in 2009, nine starting with soybeans and one with cotton. We visited five different fields (including the cotton plot). The trials are well managed, simple, clear and relevant. Farmers seemed convinced that chemicals are not essential for soybean, even though it has to be considered that weather conditions did not allow them to apply the planned fertilizer to the 'conventional' plots. This might have affected achieving the objective of the trials.

Farmers observed that internodes in 'organic' treatment were shorter and thus flowers were closer together and closer to the ground than in the 'conventional' treatment. Some farmers pointed out that this means more flowers developed in the organic treatment since canopy height was the same. It is strongly recommended that observations made by farmers be noted and data be recorded to quantify these across treatments.

In the only validation trial with cotton, plants in the 'organic' treatment were clearly less developed than those of GM cotton. Since GM cotton is becoming the norm in the region, it makes sense to use it as a check rather than 'conventional' cotton. For the 'organic' treatment, it could be considered to add some of the possible interventions used by some organic farmers in the region.

Farmers in general showed a lot of interest in participation and were keen to learn the results.

Recommendation:

- Systematically collect farmers' observations in the validation trials
- Elaborate a concept document outlining rationale, objectives, strategy and trial protocols

4.5.3. Organic farming in general

Protocols of organic farming and the progress made are due to efforts of practitioners and promoters associated with this stream of agriculture. In the absence of support from the mainstream system, area under organic farming has remained low, despite high rates of growth in the recent past. Some other factors that have contributed to relatively slower spread than it deserves are – (a) it is laborious, (b) yield depression for the first 2-3 years after conversion (it may be true in the temperate climate but not in the tropics if the interventions used by successful farmers in India are practiced from year 1 – a testable hypothesis), (c) use of purchased bio-inputs make it expensive (traditional knowledge based bioagents such as 'Amritpaani' and 'Dashparni' can be prepared on-farm). A recent drive in India on the need of reducing cost of production in mainstream agriculture has amply sensitized extension officers of the local government for low external input production. The review team could witness government extension officers being open to organic ideas and ready for dialogue. Also, research and dialogue need to be better linked to grassroots level.

On the technical side, the review team strongly advocates focusing on direct application of organic matter rather than composting. Limited and indirect evidence in the semi-arid tropics suggest that mulching is likely to be more beneficial than composting the same quantity of plant biomass (crop residues, weeds, Glyricidia etc., Rupela et al. 2006). In addition, direct application will save labor. It was observed that farmers in their own plots favor direct application of biomass and research should take this into consideration.

Some villages in India have been made chemical free (see CSA 2009, NCSA 2009) due to the efforts and initiatives of NGOs. The idea of conversion of entire villages (through

incentives, group communication and rewards for more concentrated output) should be examined in the activity area of bioRe. It may be feasible because bioRe considers the following incentives to farmers.

- Secure market and premium
- Interest free loans
- Expectation of help in case of failure

On-farm production of inputs of the type used by successful farmers in India should help reduce cost of production while ensuring high yield. This would bring in more benefits to partner farmers. The hypothesis that intensive organic farming, making use of all the interventions presently used by the most successful Indian farmers, can be as profitable as conventional farming should be tested using a similar methodology (yet simplified and modified based on lessons learned) as in the present long-term experiment.

Recommendation:

- Focus on direct application of organic matter rather than composting
- Consider all potential interventions used by successful Indian farmers in the organic treatment in the validation trials

4.6. Efficiency

The Project is unique in three ways: In systematically comparing organic and conventional farming in a systems approach, doing it on the basis of resources available to farmers, and in doing this with a long-term perspective. It is therefore highly complementary to other research in India. The combination of a large, replicated on-station experiment with trials under farmers' conditions enhances further the efficiency of the initiative.

There is little scope for saving in the long-term experiment. While some of our suggestions aim at reducing production costs and labor requirement, this will hardly reduce running costs for the experiment. Quite the opposite, to implement these changes, additional testing will be required implying additional costs. In the technology development trials, some savings are possible by more carefully selecting the topics to address. Yet, again, while doing simpler trials may reduce costs, we recommend doing several small trials instead of one big one.

4.7. Project management

Project management is done well. The Project staff is committed, takes initiatives, assumes responsibility and is well organized to do the work. Interactions with FiBL are efficient, both face-to-face during the working visits of FiBL staff and through electronic media. Work is done in a climate of mutual trust. Decisions are taken jointly between bioRe and FiBL, are based on field experience and are made transparent.

Data collection and recording is well organized. Data recording was recently strengthened by developing a database tool for the purpose.

Data analysis is usually done jointly between bioRe and FiBL when FiBL staff is coming to India. However, there exists some scope for improvement. More frequent or longer visits would allow for more involvement of bioRe staff in the analysis and especially in interpretation of data. This would allow for on-the-job training of Indian staff and thus enhance ownership of the results.

Recommendation:

- Intensify the joint interpretation of trial data (between FiBL and bioRe staff)

4.8. Risks and potentials

The review team identified a number of factors that could jeopardize the success of the Project:

1. The groundwater table is dropping, which will affect irrigation, i.e. make it more and more expensive. Eventually, the present intensive system based on irrigation will have to be given up and replaced by rainfed production. While this will not directly affect the experiment, it could make its results less relevant for farmers (unless the Project adapts the rotation to the new context). On the other hand, the long-term experiment will allow to observe and document the effects of such environmental changes by the data series.
2. Due to climate change, rainfall is becoming more erratic, making rainfed production more risky. Including marginal sites in the Project will allow to find out, if organic farming can cope better with such a development.
3. Staff fluctuation is to be expected in the course of this long-term project; proper, careful record keeping and handing-over is therefore crucial; as far as the review team could assess this, record keeping is well managed and procedures are documented properly.
4. As Bt-cotton has become so important, there is hardly any breeding for non-GMO cotton anymore. Seed of non-GM-varieties may become increasingly difficult to obtain. And while GM-varieties will be continuously improved, non-GM-varieties will at best stagnate. The increasing gap in genetic potential will work against organic cotton. The review team recommends that the Project closely monitor this development.

Potentials (and some additional risks) are outlined in the impact hypotheses developed by the Project partners (annex 3). The main potentials refer to:

1. Farmers appreciating the solid data base on organic and conventional farming in comparison as well as new production technologies, both allowing them to enhance productivity while conserving the natural resource base
2. Development agencies using the Project outputs to mainstream environment-friendly production systems
3. Indian mainstream agricultural bodies finding in the Project new thrusts for resource-conserving agriculture
4. Organic movements using the results for better advocacy and policy dialogue in favor of safe options for food production

4.9. Budget-relevant additional activities recommended

The review team recommends several additional studies or activities that will require additional funds. In the following table we give our idea on the priority of these.

Table 5: Summary of recommendations and priority by the review team

Recommendation	Costs	Priority
Involving additional ARD actors	Medium	High
Constituting and advisory board	Low	Medium
Assess feasibility of second long-term site	Low	High
Infiltration pits and better gap-filling in cotton	Low	High
Determining total available nutrients	Medium	High
Changing laboratory to speed-up laboratory analysis	Medium	Medium
Trials to test potential improvements of organic treatments	Low-medium	Very high
Developing concept documents for on-farm work	Low	High
Systematic collection of farmers' feedback	Low	High
Joint interrelation of results	low	Medium

5. Bolivia

5.1. Introduction

The external review was done between October 18 and 24 by the two consultants Oscar Llanque and Urs Scheidegger. The methodology consisted of a visit to the Sara Ana site to understand the long-term experiment and several visits to farmers in the area to see the component of technology development and to understand farmers' realities. Present partners as well as potential allies of the Project were interviewed. The evaluators did a preliminary analysis each night and elaborated a synthesis of their findings that was presented to the local technical committee on October 24 and discussed. In the same meeting, participants elaborated impact chain hypotheses for the Project.

5.2. Relevance to stakeholders

5.2.1. Who are the stakeholders?

The idea of the Project is to generate solid data on yield, profitability, input-output relations and environmental impact of different organic and conventional treatments. This information will be useful in the first place to organic movements (to have sound arguments for promoting organic agriculture) to agricultural policy makers (to have a better basis for taking decisions) and for the same reason to international development agencies (who need to prioritize their support). The Project is also of interest to the scientific community and universities, as it aspires at understanding better, how the treatments influence the parameters mentioned above. On the other hand, a component of technology development for organic agriculture was included to solve the real problems of organic farmers in the area. In Bolivia we observed that organic farmers and especially actors that provide technical assistance to them have a lot of expectations in the long-term experiment: Farmers could see directly in the field, how the different treatments perform and which short and medium term effects they have. The experiment can serve as demonstration site and as object for training in the field. Thus, its show-case function will be more important than originally planned. The stakeholders of the Project include a wide array of interest groups. Table 6 summarizes the different interests.

Table 6: Relevance of the long-term experiment for different stakeholders: Importance of different outputs (** = important; * = very important)**

Outputs expected from the long-term trial	Show-case with tangible things	Scientifically sound data	Well-founded arguments	Concrete examples	Field laboratory
Stakeholder group					
Decision makers	***	***			
Development agencies	***	***			
Organic movements	***	**	***	**	
Extension agents (NGOs etc.)	***			***	**
Farmers	***			***	
Researchers, students	***	**			***

The most important challenges regarding the relevance of the Project are:

- to take into consideration the knowledge and experience of farmers
- to systematically communicate the objectives and limitations of the Project to all stakeholders
- to actively involve the target groups of the Project, especially policy makers, NGOs, universities and field schools, according to their specific interests
- to generate results useful to farmers and share them systematically

5.2.2. Key concerns in organic agriculture

The most urgent question in Alto Beni is how to maintain soil fertility (both in organic and conventional systems). In the agriculturally utilized area presently primary forest has almost disappeared. About half the area is under fallow, which is not enough to practice a sustainable slash-and-burn agriculture with annual crops. Cocoa plots are of course managed in a more permanent way, but they lose their productivity after some 15 to 20 years of cultivation, primarily because of soil fertility degradation. The Project addresses this problem, on one hand through the addition of nutrients from outside the plot in some treatments, on the other the successional agroforestry system (SAFS) claims to maintain soil fertility at the levels of a high-grown fallow.

Another concern, related to organic agriculture, is diseases and pests of cocoa, which are presently controlled mainly through system management and cultural practices. Here also, SAFS provides a low cost option, avoiding rather than solving these problems. At the same time, SAFS can control weeds efficiently.

Thus, SAFS appears to be a solution to the main problems of the area. The Project will examine in the long-term experiment, to what extent SAFS is actually living up to these expectations.

Farmers and technicians emphasized that the experiment as well as the first activities in technology development will provide information on varieties. The issue of varieties is important, but complex and thus deserves special attention.

A concern at a different level is the credibility of organic agriculture in the areas. The certification standards leave room for practices that are not fully sustainable. The productivity loss of cocoa plantations is one example, large-scale and mechanized organic quinoa production on fragile Altiplano soils is another. Here, the Project will give answers to questions regarding the sustainability of different organic farming practices that some exponents of organic agriculture maybe would prefer not to ask.

We conclude that the Sara Ana Project is addressing the most important concerns of organic agriculture in Alto Beni.

5.2.3. The Project partners

The partners of the Sara Ana Project are:

- FiBL: Research Institute of Organic Agriculture, Frick, Switzerland
- IE: Ecology Institute of San Andrés University, La Paz, Bolivia
- Ecotop: Consultancy firm specialized on ecological agriculture, Sapecho, Bolivia
- AOPEB: Association of ecological producers of Bolivia, La Paz
- PIAF – El Ceibo: Program for agroecological and forestry implementation of El Ceibo (association of cocoa producer cooperatives), Sapecho. Bolivia Programa de Implementaciones Agroecológicas y Forestales de la Central de Cooperativas de Productores de Cacao, Sapecho
- PROINPA: Foundation for research and promotion of Andean Products, Cochabamba, Bolivia (passive partner at the moment)

These partners show a high degree of motivation and commitment to the Project, except PROINPA who at present is not participating actively. The partners have complementary interests and competencies with regard to the Project. Their roles and responsibilities have

been defined on the go, as the Project evolved and new needs emerged, which has worked out well thanks to their high commitment. However, in the future the responsibilities and the mode of collaboration between the partners should be defined carefully to reflect the present situation. More information on the partners and their respective roles in the Project can be found in annex 9.

Recommendation:

- Define roles and responsibilities of Project partners to reflect the present situation

5.2.4. Linkages of the Project with other institutions

There exist other institutions or organizations that are directly related to the Project or show interest in developing linkages. The review team visited the following institutions:

- BanaBeni: Association of banana producers of Alto Beni
- FECAFE: Association of coffee producers of Caranavi
- CNAPE: (Consejo Nacional de Producción Ecológica) National council of ecological production (facilitated by the Ministry of Agriculture)
- COSUDE: Bolivian office of SDC (Swiss agency for Development and Cooperation)

However, there exist other institutions that have or could have interest in the Project's results. Among them, an Initiative of the Alto Beni area ("Interinstitucional Alto Beni" or IIAB) founded to coordinate all organizations in the area will be crucial for a sustainable institutional set-up of the Project.

5.2.5. Linkages with actors of agricultural research for development

Bolivia has as special ARD landscape. After two drastic changes in the setting of agricultural research in the last decade, the capacity has been weakened. The most experienced and most stable organization to date is PROINPA, who is a nominal partner of the Sara Ana Project. PROINPA withdrew from active participation in the Project stating that it does not have enough experience in Alto Beni. However, if this holds true for PROINPA, it is much more so for any other actor with a track record in agricultural and forestry research. The statement of PROINPA, who is familiar with the Project, emphasizes that any new partner who does not have a base in the area will be of little benefit to the Project.

There exists a certain potential and interest among the universities and within a few years INIAF could maybe play a more important role in the Project. One way the Project could interact with universities and INIAF is by establishing the "Consultative Council" (foreseen in the Project setting) and inviting them to it. Until now, the idea was rather to use existing platforms to this end.

Recommendation:

- Define, how best to interact with different ARD actors

5.3. Effectiveness

5.3.1. Achievements to date

Since the Project planted the key crop (cocoa) in 2008 only and several years will still pass until the first yield is obtained, at the moment the most tangible achievement is the established experiment itself. Another important achievement is that all the Project partners are working closely together with high commitment to the objectives of the Project. One

drawback is the recent withdrawal of PROINPA, which leaves the Project without a partner with a track-record in agricultural research. On the other hand, the Project successfully interested a series of movements, producers and their associations as well as NGOs.

The long-term experiment with emphasis on cocoa (as a perennial) is a formidable challenge for several reasons: The experimental plots to compare these agro-forestry systems need to be large, requiring considerable area for the experiment, which makes it difficult to find such an area while ensuring a maximum of uniformity among the elementary plots. Further, the main aspects of the treatments need to be defined at the very beginning and modifications over the next few years will be much more difficult than in annual crops. Added to this comes the fact that in Alto Beni, you can basically find only one cocoa production system, low-external input production with more or less shade. Thus, the basis for developing the different treatments is very narrow in the area.

Considering these challenges, the review team considers it an important achievement that the Project partners have come to an agreement on the details of the experiment. The review team concludes that this experiment has been designed very well, balancing scientific and practical criteria. The experiment has been managed well. There remain a few open questions about the different treatments that need to be addressed now urgently (see chapter 5.4), but it is obvious that the Project staff is well organized to do both, the management of the experimental plots as the data collection.

5.3.2. Probability to achieve the objectives

The Project has been initiated in a way that the probability of achieving its objectives is high. The review team bases this appreciation on the following observations:

- The long-term experiment is well designed and established in an appropriate field
- The partners have made extraordinary efforts to achieve this, showing high dedication and ownership
- Project staff is capable to perform the necessary work

There are a few weaknesses, but the partners are aware of them and there still remains time to look for solutions:

- Some technical-scientific issues of the experiment need to be defined
- In the experiment as well as in the technology development trials there is a need to consider and integrate farmers' knowledge in a participatory manner
- Coordination and leadership issues need to be clarified

These weaknesses and possible solutions will be addressed in the following chapters.

5.4. Long-term experiment

5.4.1. Design and installation

The long-term systems comparison is the heart of the Project. This experiment is comparing 5 treatments (actually 5 cocoa production systems), two conventional and 3 organic ones. It has 4 replications and elementary plots of 48 x 48 m. The experiment is located in a plot that had been fallow for 20 years up to 2007. It is slightly sloping and far enough away from the Beni River (about 300 m) so that the risk of inundation is minimal.

The plot is uniform as for slope. Although the soil characterizations have revealed a mix of soil types, the plot is reasonably uniform in terms of soil quality. At the moment when the plot was selected, part of it had already been slashed and burned. It was therefore decided to

slash and burn some further area to have enough land to accommodate replications 1 and 2. Land for replications 3 and 4 was just slashed and the remaining material chopped into 1 m logs and left *in situ*. 25 plots were then accommodated in a way to avoid all visible irregularities (gullies and road tracks). In these plots, soil samples were taken and maize was planted as a reference crop. However, since clearing of plots took some time, maize was planted over several months, as soon as a plot was ready. Therefore it was not maize yields but a score of maize performance that was used for trial lay-out. Allocation of plots to the four replications was done based on soil analysis and maize performance scores. Allocation of treatments to the plots was random except for a sixth treatment that was added, a type of check that will be left fallow during the entire duration of the experiment. This treatment was located in border plots of the experiment. The field plan looks somewhat irregular, with areas between plots and two entire elementary plots excluded from the trial, but in this way optimal uniformity was achieved within plots and within replications. The excluded areas were also planted to cocoa.

The review team concludes that the experiment was established on appropriate land and the experimental design was done with caution and efficiently. It makes sense and is convincing. It allows for analysis at different levels: 1) Some hectares of land in Sara Ana left untouched can be compared with the experimental plots in terms of biodiversity and other effects that can only be measured at landscape level. 2) Of course, at experimental plot level the treatments can be compared. 3) Within each plot, 12 different cocoa varieties are planted (three trees each within the net plots), which will allow for assessing varietal effects in some kind of a split-plot design.

5.4.2. Treatments

The idea of the experiment is to compare conventional and organic cropping systems that in essence exist in the area, but that will be managed in the best possible way in the experiment. Ideally, official recommendations will be followed in conventional systems, while in organic systems treatments would be based on recommendations of organic movements. In Alto Beni, cocoa is usually produced under shade (different species and shading of 10 to 70%) without any external inputs. The majority of cocoa (70-80%) in the area is certified organic. The balance is managed more or less in the same way, but not certified to avoid the high costs of certification. There exists a certain percentage (50% according to Schneider et al. (2009) and Miranda and Somarriba (2005)) of plantations with poor shade or no shade at all. The review team got the impression that this is rather an unfavorable development caused by ageing shade trees than a target of the growers. Schneider (2009, personal communication) reports that farmers prefer to plant their cacao trees without shade, as managing the shade is laborious and its advantages are not always obvious to farmers. (This issue should be looked at carefully). Diseases (in the first place witches broom) and pests are controlled through shade regulation and other cultural practices (witches broom by pruning of the cocoa).

Given these uniform farming practices in the area, it is difficult to identify distinct cropping systems. CATIE in Costa Rica has developed recommendations for cocoa intensification with addition of nutrients and optimization of cultural practices for managing diseases and pests, which is the basis for the treatment "conventional with agroforestry" (Table 7). El Ceibo provides technical advice to organic growers in the area and their recommendations can be taken as a basis for organic with agroforestry. During the last fifteen years, an agroforestry system has been developed that works with a high density of forestry species and pays close attention at shade regulation in accordance with the natural succession of these species. This system, referred to as SAFS (successional agroforestry system) is practiced successfully by about hundred farmers in the area and is promoted by Ecotop, one of the partners of the Project. Farmers' practice will be taken to guide the management of the shadeless organic treatment. The intensive, shadeless conventional system on the other hand does not have a correspondence in the area (Table 7).

Table 7: Treatments foreseen in the long-term systems comparison experiment

Name	Based on existing system	Weeding	Fertilization
Conventional shadeless	Intensive conventional in Brazil	Herbicide	Intensive mineral
Conventional with agroforestry	Recommendations of CATIE, Costa Rica	Herbicide	Minimal, mineral
Organic shadeless	Intensive organic in Asia or medium intensity shadeless practiced by some farmers in the area	Manual	Intensive with compost
Organic with agroforestry	Present system, recommendations of El Ceibo	Manual	None or minimal quantities of compost
SAFS (successional agroforestry system)	Practiced by farmers in the area	Manual	None

The review team identified the following questions regarding the treatments that need to be addressed urgently (see annex 10 for a more detailed discussion):

1. Who is the authority for the conventional treatments?
2. Are there alternatives to compost making for the organic treatments?
3. How can farmers' knowledge be considered, farmers be involved in the definition of practical aspects of the treatments?

Question (1) is important, because the Project staff is in the first place experienced in organic agriculture. Proponents of conventional farming could criticize the experiment, saying that the conventional treatments have not been properly applied. Therefore, it is worthwhile investing substantial effort in identifying and bringing on board prestigious groups regarding conventional cocoa production. CATIE (the headquarters in Costa Rica) has already been approached without reaching a formal agreement. CEPLAC (Comissão Executiva do Plano da Lavoura Cacaueira, Ministry of Agriculture, Brazil) has been contacted. Other bodies that may be evaluated are:

- PROCITROPICOS with its "Red de Investigación, Desarrollo e Innovación de Cacao"
- IIAP, Instituto de Investigaciones de la Amazonía Peruana, Iquitos, Peru

Question (2) is more of technical-agronomic nature: In the organic shadeless system, if the same amounts of nutrients as in "conventional shadeless" are to be applied, large volumes of compost are needed. This requires a lot of organic raw material (which is scarce in the area) and a lot of labor. This latter could be saved if organic material would be applied directly to the plots. Farmers in the area hardly use compost in spite of various efforts to promote it. The need for composting organic material in the (humid) tropics is subject to debate: The decomposition of organic matter under these conditions is fast. For soil biology it may be beneficial to apply the available organic matter directly to the field as mulch (instead of composting it), where it may have additional benefits (reducing run-off, increasing water infiltration, reducing soil temperature, suppressing weeds). The review team recommends revising the idea of composting and examining alternatives such as direct application of organic matter directly to the plot, material with a narrow C:N ratio slightly incorporated into the soil, material with a wide C:N ratio as mulch. An alternative could be to compost just the material with high N content (to avoid its volatilization, e.g. if storage is needed), with just the amount of strawy material necessary to get a good composting process, and applying the rest as mulch. A quantification of organic matter available off-farm may be useful. Farmers mentioned saw dust, rice husks and – less available – chicken manure.

Question (3) is crucial in three ways: 1) To explain the experiment to a wide public, it would be useful to point out, how the 5 treatments compare with the practice(s) of the farmers. 2) Embarking on a dialogue with farmers on details of the treatments will help to define these in a practical and realistic way. 3) Involving neighboring farmers in treatment definition will enhance their understanding of the trial objectives and their ownership for the experiment, which can be crucial for getting their support for the experiment in case of conflicts over the land.

An interesting idea in this sense was brought up during the synthesis meeting: Creating a "farmer advisory group" who would take a certain responsibility for the treatment "organic with agroforestry" (see annex 10 for more details). This group would include 3-6 farmers living near Sara Ana, who show interest in the issue and on their own farms achieve a high productivity in cocoa. Of course, the responsibility of this group will have to be carefully defined together with them and adequate compensation for their work would have to be foreseen. Certain rules for trial definition need to be maintained to guarantee comparability and to allow meaningful hypotheses that can be statistically tested. Done this, there is still a lot of freedom for the definition of management details. This leeway can and should definitely be used by farmers to bring in their knowledge.

The relevance of the different treatments is closely linked to the basic question, for whom the long-term experiment is done. For instance, the idea of shadeless cocoa production appears not to be coherent with organic farming. However, this does not *a priori* rule out the relevance of this treatment, as one can argue that the experiment should examine, to what extent such a system is sustainable. The medium to long-term results of this treatment can be an important contribution to the discussion on sustainability of organic agriculture, and what the minimum standards should be. We expect this treatment to be crucial for the further development of organic agriculture towards sustainability. There is another important and interesting aspect: Economic sustainability of farming systems depend on factors such as alternative economic opportunities, domestic migration, land prices, government policy on subsidies, input prices, relationship between market prices for various agricultural and forestry products including cacao, and many more. Within the time frame of the long-term trial, we can expect slow and abrupt changes in at least some of these aspects. Thus, our results in terms of relative economic viability of the various systems will reflect these changes. It may well be possible that the shadeless organic system becomes interesting under certain socio-economic conditions. Even if this system doesn't look convincing today, excluding it today would mean losing an opportunity to gain knowledge.

Originally, the treatments were conceptualized as a complete factorial with the two factors:

1. Cropping system (organic and conventional)
2. Production intensity (extensive, with little inputs and intensive)

This design would allow for analyzing interactions between these two factors and – more important – for interpolating between the two extreme levels of production intensity. The FiBL specialists consider that such a factorial experiment is understood and accepted more easily by scientists. As one of the purposes of the Project is to generate solid data that are accepted by the scientific community, this is a strong argument in pro of a factorial design.

Thus, the discussion on relevance of the cropping systems in the experiment boils down to the question, what should be weighed higher: Local or global considerations, i.e. treatments that are realistic for the area (like in India) or aspects of global relevance and ease of interpretation. Finding a compromise between these two extremes is a challenge the Project is facing when defining the details of the treatments in the coming few months.

Recommendation:

- Identify authoritative institutions for the conventional treatments
- Define treatment details
- Assess the feasibility of applying organic matter as mulch
- Integrate farmers' knowledge into treatment design, assess the idea of a farmer advisory group

5.5. On-farm work

5.5.1. Participatory technology development

In 2009, a follow-up of variety trials established by CATIE in 2006 was initiated. These are trials on 15 farms, but the Project focuses on only 4 of them, the ones that are in best shape. The design is somewhat complex, with a total of 17 varieties and 8 replications, with 7 trees in each elementary plot. Staff of PIAF-El Ceibo is doing the follow-up of these 4 trials and decides on the management of the trials. Unfortunately, the original protocol as established by CATIE was not available.

The review team visited one of the trials. We think that these trials have a lot of potential, because the growers can see the different varieties in the different localities and the observations on the varieties can complement the ones obtained from the long-term experiment. We recommend continuing with this activity, while correcting some weaknesses:

- Find the original protocol established by CATIE to understand the logic of the rather unconventional design of the trials and of variety selection for the trials
- Assess the feasibility of managing these trial according to on-farm trial methodology (Bellon, 2002), i.e. leaving the management of the trial to each farmer hosting a trial
- Revise agronomic data collection: Presently yield is determined based on data from just 2 out of 7 trees in each elementary plot. Given the heterogeneity of trees (and as a general principle of agronomic experimentation), fruit weight has to be obtained from the entire elementary plot or a net plot including the 5 central trees, while other yield components may be determined on a smaller sample. All should be done to exploit the potential of these trials and to make an analysis of the genotype-by-environment interaction possible.
- Learn and apply techniques for systematic evaluation of the technologies (varieties in this case) by farmers (Ashby 1990, Ashby 1992). Presently, data on the appreciation of varieties by farmers are not systematically taken.
- Establish a new, clear protocol that reflects these changes and defines the objective, the philosophy and data collection. It should also outline the intensity of the follow-up (frequency of visits) and the way systematic data recording and management is organized. This protocol will be the crucial tool for ensuring continuity of the activity in case of staff fluctuation.

These trials should continue for at least two more years (2010 and 2011). This in spite of the fact that the trials quickly provide production data, as they have already been established by others (the review team commends the Project for grasping this unique opportunity). After 2011, a decision needs to be taken how to continue with these trials (e.g. a low-cost follow-up), as they block funds needed for other activities.

For the future, we discussed several options for technology development:

1. Structured evaluation of varieties by farmers beyond the 4 trials that are already followed up: Such evaluations can be done in a short time and hence could include all the 15 trials established by CATIE. In each site about 10 interested neighbors are invited during peak fruit production. A well organized evaluation can be done within two hours (usually only one replication is evaluated). Maybe, the invited farmers will suggest a second key moment during the year when the varieties should be evaluated. The decision on this activity can be taken once the first such evaluations have been organized in the 4 trials.
2. Effective Micro-organisms (EM) in bananas and cacao: There exists the intention to initiate trials with EM in these two crops. BanaBeni expects EM especially to improve soil fertility and to control to a certain degree black sigatoka. Since thousands of trials have already been done with EM worldwide, with inconclusive or contradictory results, it is important not to raise exaggerated expectations among farmers regarding this practice.

In any case, if the Project decides to embark on EM trials, it will be crucial to establish simple and clear protocols for sound on-farm trials and discuss them with statisticians. Doing just another EM trial without a solid experimental design could compromise the credibility of the entire Project.

3. Study on high cocoa yields: In the areas there are a few (organic) farmers who regularly have high yields. It is proposed to study the factors responsible for these high yields. What distinguishes these few farmers from the vast majority? What can be learned from them to enhance productivity of others?
4. Concept for cocoa variety management: In the area different types of varieties are in use: Introduced varieties, including hybrids, multiplied by seed or vegetatively, local varieties, normally propagated vegetatively. Varietal change is done with new plantlets or by grafting on existing trees. First observations suggest that cloning the best-performing genotypes from the same plot gives the best results. In addition, variety management needs to consider issues of genetic diversity at plot level (to ensure good pollination), and at the level of the farm or the community (to enhance resilience of the crops). As the Project works on varieties in the long-term experiment and on-farm, it would have a good basis for developing variety management concepts for farmers and for trying them on some farms. In addition, El Ceibo has a track record of cocoa breeding and variety management.

It is obvious that the Project will not be able to address all these topics at the same time. It has to prioritize and adapt to the resources available. Independent of the subject however, it will be important to observe two general points in future technology development with organic farmers:

Strengthening the staff's capacity regarding on-farm experimentation and participatory research: During the last 30 years, the methodology for on-farm research has advanced considerably. It started out with classical on-farm trials. Later more participatory approaches were added, involving the farmers in all stages of the research process (from the decision on objectives and the identification of research hypotheses to the analysis, interpretation and dissemination of results). The review team recommends that the Project staff get familiar with the principles of both, classical on-farm trials and participatory approaches. To this end, the extensive literature may be consulted (for instance Tripp and Wooley 1989, Bellon 2002, Ashby 1992, Hildebrand and Poey 1985, Horton 1984, Werner 1993). However, we propose that the Project involves PROINPA to enhance its capacities: Specialists of PROINPA should provide support during planning and implementation of trials and studies and in this way provide on-the-job training on key principles of on-farm research and how to apply them in the real life with farmers.

Link technology development with the long-term experiment:

1. During conceptualization and discussion of treatments in the long-term experiment, questions are and will be brought up that can only be answered through trials. Such trials (as simple as possible) can be done either in Sara Ana (in areas excluded from the elementary plots) or on farm. If the question might be of interest to farmers, on-farm trials are favored. If trials are done in Sara Ana, it is suggested that farmers are invited to evaluate them. In this way, farmers could derive their own conclusions.
2. Technology development may feed into and enrich the long-term experiment with new ideas or topics for studies that might be done in Sara Ana.
3. Socio-economic aspects are difficult to address in the long-term experiment, since it is on-station. Here, the on-farm trials provide an opportunity to obtain socio-economic information which can be linked to physical results from Sara Ana.

To best exploit synergies between on-farm trials and the long-term experiment, it will be useful if the same staff participates in both components.

Recommendation:

- Improve data collection and obtaining farmers' feedback in present cocoa variety trials in farmers' fields and elaborate a comprehensive trial protocol
- Continue these trials for two further years
- Strengthen staff's capacity to plan, prioritize and implement on-farm trials according to time-proven methodology
- Link technology development to the long-term experiment

5.5.2. Validation trials

The validation trials are subject to additional funding that has not been identified as yet for Bolivia and hence no such trials have been initiated yet. The review team suggests that the Project start thinking about a proposal for such trials, which will facilitate looking for funding.

The review team considers SAFS the only treatment in the long-term experiment that qualifies for comparison with the farmer's practice. It would be difficult to find farmers interested in trying conventional treatments, the "organic with agroforestry" treatment corresponds more or less to what farmers are doing already and the "organic shadeless" treatment is not realistic for the area (profitability, access to required inputs).

SAFS holds the promise of solving the major problems of cocoa production and can accommodate other crops in view of diversification. It is worthwhile verifying these assumed advantages of SAFS in well structured trials. In addition, internationally there is a lot of interest in systems as SAFS and experimental data, both from Sara Ana as from farmers' realities, will be a pre-condition for scaling-out the idea to other countries.

The trials would have a simple design: An appropriate farmer's plot would be divided into two parts, one to be managed by the farmer as usual, and the other according to the SAFS principles (Figure 2). If part of the plot is different from the rest, it may be excluded from the trial in view of good uniformity between the trial plots.

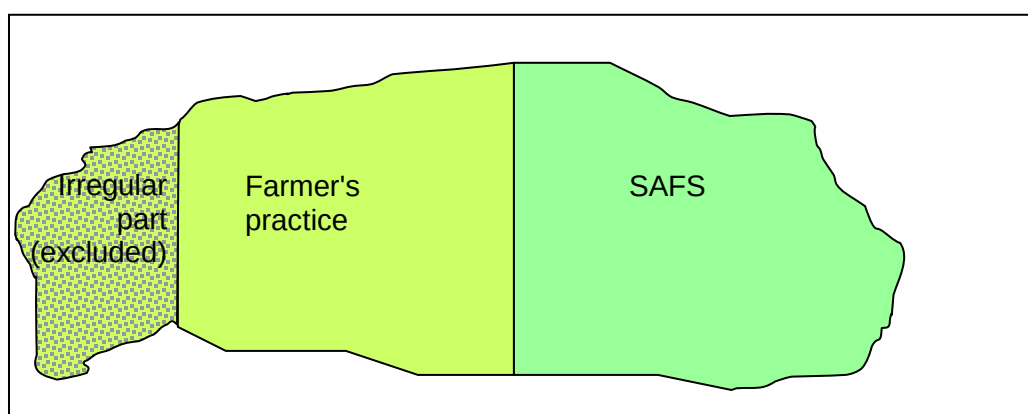


Figure 2: Design of validation trials

Ten trials on ten different farms will be needed in case that farmers' conditions are more or less uniform. If differentiating target groups is envisioned (by ecological or socio-economic conditions or by status of the cocoa crop at the outset), ten trials per target groups should be planned.

For each trial the initial situation should be carefully characterized for both trial plots separately. Later, data collection will focus on quantifying the inputs (including labor), on describing the agricultural management and on yield and economic parameters of the

treatments. After some years (when the systems have stabilized) special studies could look at soil fertility, biodiversity and disease and pest pressure.

The most important challenges of such trials will be:

- Finding interested farmers who will agree to follow on with the trial for at least four years
- Finding cocoa plots in a status that allows for conversion to SAFS
- Develop a way to train the farmers about principles and practices of SAFS that can later be replicated (scaled out)
- Quantify inputs and harvests with a minimum presence of technical staff on the farms

Recommendation:

- Develop a proposal for validation trials comparing SAFS to farmers' current practice (organic cocoa production) and search for respective funding

5.6. Efficiency

The Project staff works efficiently. Field staff was making an extra effort to comply with all the work planned. While this extraordinary effort was possible for a certain time, motivated by the initial enthusiasm at the beginning of the Project, it can not continue like that for long. The work overload could compromise efficiency and scientific rigor. A solution has to be found, that is, improve the conditions for field staff (communication, infrastructure, transport etc.), increase funding for the partners or reduce activities.

It will be crucial to develop a strategy to maintain and renew the present enthusiasm of the partners beyond financial compensation. The review team sees the following components of such a strategy:

- Publication of results in scientific journals and conferences (where already the Project set-up and experimental design may be presented)
- PR activities such as interviews in electronic media, web-page, articles in national and regional journals, receptions in Sara Ana. Yet, non-biasedness and scientific credibility of the Project must have highest priority. Preempting results and advocating for one specific system or another would severely hamper the Project's reputation. The message thus will have to be "this is the first time that something like this is seriously studied. We are very curious what we will find."
- Concept of guided tours in Sara Ana (differentiated for farmers, scientists, lay persons etc.) including field demo material, demonstration plots in border areas to show specific practices, feedback sequences in the shade: This concept could be drafted, tested and fine-tuned by a communication specialist, for instance a student in communication or PR in the context of her/his thesis
- Systematic identification of topics for thesis (MSc) on agronomic, bio-ecological and socio-economic aspects and their publication on the Project's Web-page to attract students
- Capacity development activities for Project staff
- Information on and exchange with the other Project sites (in India and Kenya). It might even be envisaged that one or two Project staff visit the other sites. To keep up momentum, it will be crucial to create among the three Project teams a spirit of working together, towards a common goal.

In the same line it will be important that data analysis and interpretation is done jointly by FiBL and the Project staff most involved in the experiment.

In general, Project funds are used efficiently. The review team could not identify simple ways of saving. The infrastructure built in Sara Ana is basic, but functional. The Project partners are exploiting synergies with their other activities and use funding from other sources. This however, is not really sustainable and may eventually backlash if these other sources dry up or the respective donors impede the creative use of their funds.

The long-term experiment has a series of peculiarities that increase its costs in comparison with the other countries and with the budget:

- The large plots imply higher labor costs
- The location of the activities in Alto Beni means that staff based in La Paz is spending two days plus costs for transport and overnight stay each time they go there
- The location of the experiment in Sara Ana and the lack of communication facilities increases the volume and cost of transport between Sapecho and Sara Ana
- In 2009, salaries for field workers increased because of oil prospecting in the area that absorbed a lot of labor.

We therefore recommend analyzing in detail the running costs for the basic operations of the Project to ensure its funding.

Recommendation:

- Develop a strategy to maintain and renew the present high motivation of partners
- Ensure funding of the core Project activities

5.7. Project management

Partners are working well together for project management. Presently, coordination and leadership of the Project works well. The Technical Committee plays an important role. Responsibilities and roles of the different partners have been defined on the go, in a pragmatic way, with good results so far.

However, Project coordination at local level is strongly depending on the person of Joachim Milz, without him having the respective mandate.

Presently, none of the partners has the institutional and scientific capacity to assume leadership and coordination of the Project, neither is there another institution in Bolivia that could take this role. The only actor having staff with the necessary qualifications (PhD or MSc with broad experience in the management of agricultural research projects) is PROINPA, who reduced its involvement with the Sara Ana Project for lack of experience in the area and on cocoa.

The review team concludes that in the short term, the Project is best served if leadership remains in the hands of Joachim Milz and this setting is duly formalized. In the medium term attempts should be made to strengthen other Project staff for assuming this role or PROINPA has to be brought on board again to assume leadership institutionally.

We estimate that leadership and coordination requires some 30 to 35% of a staff with the research experience and contacts in the Project area of Joachim. This corresponds to one week per month of work in Sapecho and some additional working time in La Paz. In addition, secretarial support should be arranged for. It is obvious that the Project lacks an administrative base in Bolivia. The most efficient solution appears to be seconding a secretary of AOPEB with good logistic support (Internet) part time to the Project.

FiBL is providing good support in planning, implementing and monitoring of the Sara Ana Project. The interviews revealed that partners in Bolivia appreciate in the first place FiBL's vast scientific experience, which will be crucial to comply with international standards of experimentation and to ensure credibility of results in the scientific community. In the second place, partners expect FiBL to ensure appropriate funding, firstly for the basic work in the long-term experiment and secondly for special (additional) studies as stipulated in the project document.

FiBL also plays an important role at international level in information exchange and facilitating contacts regarding the Project. In the short term, it should focus on facilitating contacts for clarifying and fine-tuning the treatments in the experiment. At medium term, it will have to satisfy the vivid interest in Africa and Asia in more sustainable cocoa production systems. Further, Bolivian partners showed a lot of interest in exchanging information and experiences with the sister projects in Kenya and India. The review team recommends that FiBL examines ways of fostering such exchange, as this can be an asset to keep up momentum of the projects and improve quality of the work.

Regarding coordination and leadership, FiBL contributes through the person responsible for the Bolivian Project, Monika Schneider. Yet, her limited presence in Bolivia does not allow her to take full responsibility for these tasks. The review team recommends that all Project partners together examine the need and feasibility of FiBL increasing its presence in Bolivia. This analysis has to consider the new setting of coordination and leadership at the level of the Bolivian partners.

Recommendation:

- Find a short term solution for mandated local leadership and coordination
- Develop and implement a strategy for medium-term institutional leadership and coordination at local level
- Clarify the role of FiBL in Bolivia regarding leadership and coordination as well as identifying new sources of funding

5.8. Dissemination of results and communication

One important aspect of the Project is raising the awareness of all stakeholders about the possible role of organic agriculture in sustainable development. To this end we recommend developing a communication strategy by target group. This should allow communicating immediately the Sara Ana Project (its setting, objective, targets and beneficiaries). The inauguration of the experiment in Sara Ana, foreseen for 2010, will be key to reach out to many target groups.

The communication strategy needs to include a plan to continuously share the results. The partners will easily find ways to share the results with farmers and extensionists and discuss the findings in the scientific community of Bolivia and Latin America. The review team recommends that the partners strengthen the dialogue on local knowledge, i.e. combine the dissemination of Project results with seeking feedback from farmers and extension agents to achieve a true two-way dialogue. Similarly, getting feedback from the scientific community will be crucial for the acceptance of the results.

It will be a special challenge to get and keep up the interest of policy and decision makers (in the Ministries of Bolivia as well as in the international development agencies). The SDC office in Bolivia offered support in linking with these stakeholders.

The review team recommends constituting the "Consultative Council" of the Project. It can serve to share information and results of the Project with both, decision makers and scientific

bodies in Bolivia and get their feedback. If well managed, it can be an excellent platform for lobbying.

Recommendation:

- Develop a strategy to communicate the results of the Project to different stakeholders
- Make use of different bodies ("Consultative Council", SDC office) for reaching out

5.9. Risks and potentials

Risks that could affect the Project or the relevance of its results exist at different levels:

- Loss of the plot in Sara Ana with the long-term experiment
- Conflicts among partners
- Changes in the ecological or socio-economic context that make the results obsolete or less relevant (but that may also constitute new potentials)

The review team discussed these risks (and potentials) with the interviewees and drew the following conclusions:

5.9.1. Loss of the plot in Sara Ana

The long-term experiment is a substantial investment, both in financial resources (until the first results will be available, more than one million US\$ will have been spent) and in enthusiasm of the partners (intellectual and conceptual investment). It would be fatal for the Project if for any reason the plot with the experiment would be lost or affected in a way that would compromise the experiment. We think that this would be the end of the Project.

We see the following reasons that could lead to the loss of the Sara Ana plot (or to have it affected in such a way that the scheduled activities cannot be implemented anymore)

- Social conflicts in the neighborhood of the Finca Sara Ana (movements occupying land, blockage of access roads etc.)
- Not honoring or termination of the land use contract by the owner (PIAF – El Ceibo)
- Continued oil exploration or oil findings in the Finca or in its immediate neighborhood

The review team shares the view of the Project staff that to minimize those risks it is crucial to gain the support of the neighbors of Sara Ana as well as the members of El Ceibo in general. Therefore, we recommend embarking on lobbying to promote empowerment and ownership among these stakeholders. This should include guided visits to the experiment, the creation of the farmer advisory group for the experiment, the employment of staff from the area for work in the experiment as well as strong communication about the on-farm trials for technology development.

It is equally important to clarify the terms of the contract between the Project and PIAF – El Ceibo on the continued use of the land dedicated to the experiment. All the bodies of decision making need to understand that the experiment will yield results only in the long run, that these results will not all be directly useful to the farmers, but only if considered by decision makers and scientists, and that any deviation from the original work plan would put at risk the continuation of the Project.

If the support of the farmers in the area and of the owner of the land is assured, the risk of losing the plot will be minimal.

Referring to oil exploration, we support the idea of the partners to launch a joint effort among Project partners and collaborating farmers to negotiate with the national bodies responsible

for this exploration, aiming at conditions that will avoid that the long-term experiment is affected.

5.9.2. Conflicts among partners

Presently there is no evidence at all of conflicts between the Project partners, but this is a universal risk for a project of this complexity.

In the first place, the review team sees the risk of erosion of the motivation with time. To avoid this, we recommend establishing meaningful milestones (intermediate targets) that will help to re-vitalize the motivation.

Unrealistic expectations regarding the Project may cause frustration for some stakeholders, if they cannot be met. It is therefore important to identify, clarify and make known the limitations of the Project.

In the same sense it will be important to clarify the roles and responsibilities of each partner towards the Project. These do not fully correspond anymore to the MoUs signed at the start of the Project.

5.9.3. Changes in the context

The review team considers the risk as low that the political instability in Bolivia will affect the Project. It is, however, important to establish coordination mechanisms between the Project and IIAB.

Along with all the changes presently occurring in Bolivia, the institutional context of the Project changes rapidly as well. For instance, the government is presently restructuring agricultural research and extension in the newly founded INIAF (Instituto Nacional de Innovación Agropecuaria y Forestal). Another example is CNAPE (Consejo Nacional de Producción Ecológica) that aims at strengthening organic food production and reducing the costs of certification as a strategy to supply healthy food to the people of Bolivia. This may result in an increase of demand for organic produce and thus constitutes a potential for organic farmers in the Project area.

Presently, the profitability of cocoa production is low (statement of several interviewees). Even if at global level an improvement of cocoa prices is expected in the medium term, the current low prices may make some cocoa producers in Alto Beni shift to other crops. In such a case, the relevance of the Project would be less as for cocoa, but at the same time it constitutes a potential, if the Project manages to include diversification in its strategy. We therefore recommend that the Project closely monitors prices and profitability of cocoa so that it may shift its emphasis in time to other commodities. In the long-term experiment, however, cocoa should be maintained.

The Project partners developed impact chain hypotheses during a meeting in La Paz (annex 3). They outlined, how they imagine that the Project will have impact and what could impede this impact, and thus identified more potentials and risks.

Recommendation:

- Create ownership among farmers and farmer associations for the long-term experiment to check the risk of losing the experimental site in Sara Ana
- Establish meaningful milestones to reduce the risk of motivation loss

Potentials outlined in the impact hypotheses mainly refer to:

1. Farmers counting with validated and evaluated production systems and agronomic improvements allowing them to using enhance their income in a sustainable way
2. Grassroots organizations being able to provide more solid advisory services to the farmer clients based on Project outputs
3. Local governmental bodies using the Project outputs to take informed decisions regarding sustainable agricultural production
4. The scientific community taking advantage of the long-term experiment to do additional studies and building on Project results to do further research on sustainable production systems
5. Consumers benefiting from a wide range of healthy organic products that are affordable thanks to mainstreamed marketing and certification systems oriented towards the broad public

5.10. Budget-relevant additional activities recommended

The review team recommends several additional studies or activities that will require additional funds. But first of all in Bolivia it will be important to ensure adequate funding of the core activities. In the following table we give our idea on the priority of these.

Table 8: Summary of recommendations and priority by the review team

Recommendation	Costs	Priority
Adequate funding of core activities	High	Very high
Identify authoritative institutions for conventional treatments	Medium	Very high
Integrate farmers' knowledge into treatment design	Low	High
Improve on-farm variety trial management	Low	High
Strengthen staff's capacity regarding on-farm methodology	Medium	Very high
Maintain and renew motivation	Low	High
Find solutions for local coordination and leadership	Medium	High
Create ownership among farmers and their associations for the Project	Low	High

6. Important conclusions and recommendations

Aspect	Type ³	Conclusion or recommendation	Importance ⁴		
			Kenya	India	Bolivia
Relevance - stakeholders	C 1	Project partners are highly committed to the Project and its objectives	xx	xx	xx
	C 2	Sound information on organic agriculture is relevant to most stakeholders	xx	xx	xx
	C 3	Getting the interest of policy makers and development agencies is a special challenge for the Project	xx	xx	xx
	C 4	The Project has managed to involve or link with important ARD stakeholders	xx		x
	C 5	Farmers and local extension agents show high interest in the experiments as "physical reference points"	x	xx	xx
	R 6	Nurture and expand linkages with strategic partners	x	xx	xx
	R 7	Involve ARD actors more through joint studies in the long-term experiment		xx	
Effectiveness - technical aspects of experimentation	C 8	Well designed long-term experiments were established and have been managed well, which is an important accomplishment and a sound basis for achieving the objectives	xx	xx	xx
	C 9	The systems comparison is considered as fair by exponents of conventional agriculture	x	xx	
	C 10	Credibility of the Project has been well established	xx	xx	x
	C 11	The Project fully achieved most of its expected results	xx	x	x
	C 12	Monitoring of progress and of data collection in long-term experiment is well organized	xx	xx	x
	C 13	During the first two years, yields in the organic treatments were 20-30% lower than in the respective conventional ones, with costs not or only slightly lower	xx	xx	
	R 14	Initiate measuring the effects on parameters other than yield to allow for presenting a more holistic picture of the different systems	xx	xx	
	R 15	Conduct simple trials aiming at making the organic treatments in the long-term experiment more effective and more relevant	xx	xx	xx
	R 16	Conceptualize the technology development component and develop staff capacity for on-farm research	x	xx	xx
	R 17	Initiate additional studies in the long-term experiment	xx	xx	x
	R 18	Clarify the interface between the different components of the Project		x	x
	R 19	Revise the formulation of Objective 1 (advocating OA), as it may compromise credibility of the systems comparison	xx	xx	xx
	R 20	Revisit the crop portfolio in the rotation of the long-term experiment and link up with breeders to take full advantage of varieties	xx		
	R 21	Examine the use of mulch in the long-term experiment and other innovations for soil fertility enhancement	xx	xx	x
	R 22	Optimize the use of commercial organic crop protection products	xx	xx	x
	R 23	Ensure the participation of authoritative partners regarding conventional treatments			xx
	R 24	Settle the details of treatments in the long-term experiment			xx
	R 25	Strengthen farmer evaluations in on-station and on-farm trials	xx	xx	xx

³ C = conclusion; R = recommendation

⁴ xx = applies fully, x = applied partially to this site

	R	26	Establish mechanisms to build on farmers' knowledge	x	xx	xx
	R	27	Embark on a dialogue on how to best validate the results of on-station work on farm (validation trials or other options)	xx	x	xx
Efficiency	C	28	The Project is unique for the tropics and hence highly complementary to other research initiatives	xx	xx	xx
	C	29	The Project is working with the right partners	xx	x	x
	C	30	Partners assume roles and responsibilities in a complementary manner and pragmatically	xx	x	xx
	C	31	Working modes are transparent, participatory, interactive, empowering	xx	xx	xx
	C	32	The local Steering Committees play a key role in coordination	xx	x	xx
	R	33	Find a medium term solution for institutional leadership and coordination at local level			xx
	R	34	Examine the feasibility to constitute an advisory/consultative body for the Project in view of expanding linkages <i>versus</i> using existing platforms	x	xx	xx
	R	35	Better balance the expertise in the local Steering Committees (socio-economy, agricultural research)	xx	x	x
	R	36	Foster exchange of experience and approaches between the three Project sites to enhance team spirit and keep up the momentum	x	x	xx
Project management	C	37	Project management is well organized, both at local level and in interaction with FiBL	xx	xx	x
	C	38	FiBL's contribution is highly appreciated by the local partners, especially for scientific expertise	xx	xx	xx
	R	39	Put high priority on securing adequate funding for the essential activities as well as for special studies, with FiBL coordinating	xx	x	xx
	R	40	Enhance the participation of local staff in data analysis and interpretation	x	x	x
	R	41	Develop a conscious communication strategy	x	x	xx
Risks and potentials	C	42	Project partners are concerned that funding for the Project is not secured in the long term	xx	x	xx
	C	43	Water stress (due to climate change or other factors) is both a risk (hampering trials) and a potential (organic management enhancing resilience) for the Project	xx	xx	xx
	C	44	Staff fluctuation could affect effectiveness, yet record keeping and handing-over is well organized	xx	xx	x
	C	45	International and especially domestic demand for organic products is increasing	x	x	xx
	C	46	The Project has potential to turn out results that will help to make mainstream agriculture more sustainable	xx	xx	xx
	R	47	Monitor relative commodity prices and other context variables to react in time to shifts in farmers' cropping portfolio	x	x	xx
	R	48	Monitor closely the evolution of GM crops, as these may affect organic agriculture in different ways	xx	xx	
	R	49	Invest in gaining support of farmers and farmers organizations in the vicinity of the long-term experiment to secure the land	x	x	x
	R	50	Develop indicators related to the impact hypotheses (impact pathways) and design studies to assess these indicators in collaboration with concerned stakeholders (partners, farmers)	xx	xx	xx

Recommendation:

- **Overall, the Project has been very successful and the review team recommends to the donors to continue and expand their financial support**

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Annexes

Annex 1: Terms of Reference for External Evaluation	64
Annex 2: Interview guide	72
Annex 3: Impact chain hypotheses (white = positive; shaded = negative or no impact)	63
Annex 4: Impact chain hypotheses for different stakeholder groups	63
Annex 5: Mulching in the experiments in Kenya	66
Annex 6: Shrubs in the experiments in Kenya	67
Annex 7: Aurogreen – a new method of green-manure	69
Annex 8: Additional ideas for technology development.....	71
Anexo 9: Institucionalidad del proyecto Sara Ana.....	73
Anexo 10: Discusión sobre los tratamientos	87

Annex 1: Terms of Reference for External Evaluation

What is the contribution of organic agriculture to sustainable development?

- Long-term farming systems comparisons in the tropics

1 The project in brief

The concept of organic agriculture is regarded as a promising option for sustainable agricultural intensification in the tropics. It combines low-cost technology, environmental conservation, input/output efficiency and access to premium price markets through branding. It is now increasingly being taken up by farmers, NGOs, national programmes and agricultural development agencies in tropical countries as a means to improve food security and rural livelihoods in a sustainable way (Kilcher 2007, Pretty et al. 2006). In Europe, numerous studies have proven the advantages of organic agriculture in terms of ecosystem services and economic impact (Pimentel et al. 2005, Mäder et al. 2002, Offermann und Nieberg 2000, Stolze et al. 2000). However, few attempts (e.g. Eyhorn et al. 2007, Blaise 2006, Rasul und Thapa 2004) have been made so far to systematically compare this farming system alongside conventional practices on a medium to long term perspective under tropical conditions. The long-term perspective is important when comparing organic agriculture to other approaches, since soil structures and processes take time to develop.

To respond to the demand for reliable data on the environmental and socio-economic performance of organic agriculture, FiBL and its partners in the developing world are running long-term farming system comparisons in Africa, Asia and Latin America. Replicated field trials allow monitoring the effects of organic agriculture on yield, yield stability, product quality, soil fertility and biodiversity, as well as on natural and economic resource efficiency. The following systems are under study:

In Kenya, investigations focus on largely subsistence-oriented cultivation of maize, common beans and vegetables on two trial sites under the sub-humid conditions of Central Kenya. The treatments – conventional and organic, at two levels of intensity in each case – were applied for the first time in March 2007. Local partners are the Institute of Insect Physiology and Ecology (icipe), the Tropical Soil Biology and Fertility Institute of International Center for Tropical Agriculture (TSBF-CIAT), the Kenyan Agricultural Research Institute (KARI) and the School of Environmental Studies and Human Sciences of Kenyatta University (KU). Since January 2009, the Kenyan Organic Agriculture Network (KOAN) and the Kenyan Institute of Organic Farming (KIOF) are also part of the local steering committee.

In India, the comparison of farming systems is based on an export product – cotton – and is located in semi-arid Central India (Madhya Pradesh). Soyabean and wheat, another two important cash crops, are also included in the study. The trial comprises an organic (ORG), a biodynamic (BD), a conventional (CONV) and a GMO (BT) treatment. Operations commenced in the 2007 cotton season. The main local partner is bioRe Association India, a social organisation working with the bioRe India textile chain company. Appraisal of national or international research partners is currently under way.

In Bolivia, the trial site is being established in a cacao agroforestry system in humid Alto Beni. The treatments represent conventional and organic farming systems at various three levels of agrobiodiversity. Tree planting was done in October 2008. The following institutions have joined forces: Instituto de Ecología de la Universidad La Paz, Asociación de

organizaciones de productores ecológicos de Bolivia (AOPEB), El Ceibo, Ecotop, and Promoción e investigación de productos andinos (PROINPA).

The overall goal of the project is to contribute to agriculture becoming more sustainable. The project's strategic objectives are:

- To bring the discussion about the benefits and drawbacks of organic agriculture on a rational basis
- To create physical reference points for all stakeholders in agricultural research and development, which can be used in policy dialogue and decision making
- To identify the challenges for organic farming so that they can be addressed systematically
- To give an impulse to the development of the organic sector in tropical developing countries
- To increase acceptability of sustainable intensification, and thus to contribution towards conventional farms becoming more ecological

The project intends to reach directly or indirectly, stakeholders on all levels of international agricultural research and development, i.e. policy makers, research, advisory, development agencies, NGO's, producer organizations, and individual farmers.

The project started out on a small scale in August 2005, building up the site in Kenya, with Biovision Foundation as the first donor. Coop Fund for Sustainability joined in January 2006, followed by SDC in May 2007 and LED in January 2009. Since February 2007, the donors coordinate themselves in the Coordination Committee of Donors (CCD). Through the increasing of the funding partners, the long-term trial sites in India and Bolivia could be established. Most recently, i.e. since January 2009, we additionally embarked on developing technologies together with organic farmers in the areas of the trial sites. In July 2008, a scientific advisory board (SAB) was constituted, which counsels the project on scientific relevance and credibility.

The impacts of organic agriculture on livelihood systems – i.e. on farm income, education, health, gender relations and farmers' social mobility – will be studied in (longitudinal) farm surveys once respective funding sources are secured.

2 Objectives and leading questions for the external evaluation

The external evaluation is to be carried out as a mid-term review, as the project is now ongoing for 4 years (2.5 years with SDC funding), and SDC requires a basis on which a decision for further funding from 2011 onwards can be taken. The external evaluation shall also serve as a source of information for other present and potential future donors to base their funding decisions upon. In addition, it is expected that the findings of the external evaluation can be used as a planning basis for the next project phase. So far the project has not undergone any external evaluation.

The objectives of this first phase evaluation are the following:

- Assess the project with regard to its relevance for stakeholders, effectiveness, efficiency and risks/potentials for the mid-term future, as described below
- Provide relevant and feasible recommendations, including country-specific and global strategies and activities for subsequent project phases

The following questions are considered to be the most crucial in view of project orientation and implementation in the coming years. They shall thus guide the evaluation and the recommendations:

Relevance for stakeholders:

Project relevance shall be assessed with regard to the stakeholders' needs and interests in sustainable agriculture. The specific questions to be addressed are:

- Who should be the stakeholders and beneficiaries, for each of the five strategic objectives? Directly and indirectly? How does this relate to the actual stakeholders and beneficiaries?
- Does the project address questions which are relevant to the stakeholders? In theory and in practise? Where are the limitations? Which additional questions would be of interest to the stakeholders?
- How is the project linked with other stakeholders of the agricultural research and development (ARD) sector? Are quality and quantity of interaction appropriate to turn theoretical relevance into actual relevance?

Effectiveness:

Project effectiveness shall be assessed in relation to the project's objectives and expected results, measured by the indicators proposed in the log-frame. The following questions shall be addressed:

- To what extent have the expected results been achieved so far? What are the internal and external underlying factors for (likely) success or failure? Should the expected results be adapted for a next project phase? If yes: why and how?
- Which unexpected results have been achieved?
- What is the likeliness that the project objectives will be met? What are the internal and external underlying factors for likely success or failure? Should they be adapted for a next project phase? If yes: why and how?
- Which project areas (existing and new) should be given priority in development and acquisition of additional funds?
- What can so far be concluded from the trial data?
- Is a monitoring system in place that allows tracking and critical assessment of achievements?

Efficiency:

The leading questions for project efficiency evaluation shall be if the expected results and objectives are addressed in the best possible way, which are in particular:

- Is the project complementary to other research projects? Does it interact with other research projects in an appropriate way?
- Are the most suitable partners cooperating? Do roles and responsibilities of partners take into account their respective comparative expertise? Is the intellectual, organisational and administrative input of each partner congruent with the intended roles and responsibilities?
- Do project structures and working modes support efficient use of human resources? Are project structures and working mode participatory, transparent, interactive, iterative and empowering? Do they allow for learning processes?

- Were the financial means used in the most efficient way? Would it have been possible to achieve the same results at lower costs? Which budget adaptations should be made in the next project phase?

Project management:

The project is implemented by FiBL, and guided by the two international bodies CCD and SAB. Coherent with the two sections above, the assessment of the project management aims at ensuring that the institutional set-up of the project management ensures effective and efficient project implementation. More specific questions are:

- How are roles and responsibilities divided among FiBL, project field units in the three countries, CCD and SAB? What are the strengths and weaknesses of FiBL project management? How well can CCD and SAB take up their guiding and advising function? Is any adjustment in the institutional set-up required?
- Are the priorities set appropriately across the fields: scientific input and coordination, administrative coordination and communication, networks and exchange, public relations, acquisition of additional funds? Are the general directions and quantitative achievements in these five management areas in line with the project idea and objectives, and with the expectations of donors and local partners?
- How can structures and working processes of project management at different levels be made more effective and efficient?

Risks and potentials:

The project building on a long-term approach, it is of great benefit if risks and potentials can be identified early in the project life cycle. The first two questions below are kept open, in order to take care of all aspects that are not covered by the questions above. The core piece is to develop an impact pathway together with all partners, and possibly additional stakeholders:

- What are the risks that may negatively affect project success as per the current project proposal in the next one to five years? How can they be addressed and minimised?
- What are the potentials of the project that help to have an impact towards sustainable agriculture in the mid- and long term? What is required in order to realise these potentials? What would be a realistic pathway to achieve impact?
- What is the resilience of the project towards adverse effects (political changes, social unrest, natural disasters, regional infrastructure degradation, financial shortfalls, institutional changes, staff fluctuation, etc.) that may occur during a long-term time period of 10 years?

3 Expected results of the evaluation

Report

The evaluation team has to furnish a final report. The draft of the evaluation report is sent SDC, to all local partner institutions and to FiBL for consultation at least four weeks before the final report is submitted. While the general language of the draft report is English, the parts concerning the site in Bolivia are written in Spanish. The final report will be made available in both languages in full length four weeks after the final workshop, at latest.

The final evaluation report (max. 50 pages) contains an executive summary, a brief introduction, a description of the procedure, a comprehensive main part split into country reports, addressing the leading questions (above) based on cited evidence, logically derived conclusions and justified recommendations. Supporting information, including a travel report, a list of persons with whom talks were held, and a list of sources used, is attached. The reactions of the local partners, FiBL and SDC on the draft will be addressed by the evaluation team and considered where appropriate during finalization of the report.

Discussion of final report

The final report will be discussed among donors, evaluation leader and FiBL.

4 Methods to be used in the evaluation

The evaluation will be carried out by an independent evaluation leader with international experience. In each project country, the evaluation leader will be assisted by an independent local consultant. The overall responsibility for the mandate lies with the evaluation leader.

It is strongly wished by all project partners that participatory and transparent approaches be used, in order to ensure joint learning and mutual understanding. Such approaches will also support the implementation of the recommendations.

After a consolidated draft of the terms of reference (TORs) have been made available to the evaluation team together with the documents listed below, SDC and FiBL will jointly brief the evaluation leader. The evaluation leader will be asked to finalise the TORs together with SDC and FiBL within approximately two weeks. At the same time, the evaluation leader will propose a work plan showing how and when the various questions will be addressed, and who will be involved.

The evaluation will involve a four days' visit to each country hosting a project site. In each country, the evaluation team will first assemble at the project headquarters (Kenya: *icipe* in Nairobi; India: bioRe Association India near Kasrawad; Bolivia: Instituto de Ecologia in La Paz or Ecotop in Sapecho) for half a day to review project documentation and discuss the procedure of the coming days with the local steering committee, project responsible, and trial coordinator. The two days may be used to visit specific project sites, and to consult with various project partners and stakeholders. After that, the review team will reassemble at the project headquarters for a half day of wrap-up meeting together with the local steering committee, including the project responsible and the trial coordinator, to brief them on their findings and recommendations. The minutes of this meeting will be signed by both parties.

For questions to the project coordination, the evaluation team can call for meetings in Switzerland according to need.

The evaluation team will send a draft of the report to SDC, FiBL and the local steering committees for consultation by mid November, latest. The evaluation leader will meet with SDC and FiBL to discuss the draft report. Project partners (FiBL, local steering committees) will respond to the draft in written within two weeks' time. The evaluation team submits the final report, including the partners' views, to the CCD and to FiBL within 10 days after reception of the comments on the draft report, i.e. in early January 2010. About 10 days later, the external evaluation will be concluded with a meeting in Switzerland to discuss the final report among evaluation leader, CCD and FiBL in mid January.

FiBL and the local steering committees will come up with a proposal on the implementation of the recommendations before July 2010.

5 Roles and responsibilities in the evaluation

Evaluation leader / evaluation team:

- Clarify and finalise terms of reference together with SDC and FiBL
- Establish a work plan: How will the various questions mentioned above be addressed? When? Who will be involved?
- Briefing of the local steering committees on the procedure and content of the evaluation
- Carry out the evaluation according to the work plan
- Present and discuss preliminary findings with the local steering committee
- Write draft report (see above)
- Send the draft report to the local steering committees, to FiBL, and to SDC, for consultation
- Meet with SDC and FiBL to discuss the draft report
- Address comments on draft report in the final report, submit final report to CCD, FiBL and local steering committees
- Hold a meeting to present and discuss results, conclusions and recommendations of the final report, for CCD and FiBL, in Switzerland
- Evaluation leader: Administers evaluation budget and issues sub-contracts with local consultants

CCD:

- Commissions the external evaluation and provides respective financial means (lead: SDC)
- Develops terms of reference (lead: FiBL)
- Identifies independent external evaluators (lead: SDC and FiBL)
- Each member institution is available as resource person to evaluation team
- Comments on the draft report and participates in meeting with evaluation leader and FiBL to discuss comments (SDC)
- Reads through the final report and comments on it at the occasion of the respective meeting

FiBL:

- Provides documents (see below)
- Provides logistic and organisational support
- Project staff is available as resource persons to evaluation team
- Comments on the draft of the evaluation report
- Participates in the meeting to discuss the final report
- Suggests together with the local steering committees how recommendations will be implemented

Local steering committees (SCs):

- Contribute to developing the terms of reference
- Can suggest independent evaluators
- Are responsible for local logistic and organisational matters
- Act as social facilitators
- Are available as resource persons
- Comment on the draft of the evaluation report
- Participate in the discussion with FiBL how recommendations will be implemented

SAB:

- Members are available as resource persons

7 Timeframe

Activities	Responsible	Involved	Time period
Develop TORs	FiBL	CCD, local SCs	May/Jun 09
Select evaluation team	SDC, FiBL	CCD, local SCs	Jun 09
Make documentation available	FiBL	Evaluation team	Early Jul 09
Briefing	SDC, FiBL	Evaluation leader	Mid Jul 09
Finalising TORs	Evaluation leader	SDC, FiBL	End Jul 09
Evaluation in India	Evaluation team	Indian SC	Aug 09
Evaluation in Bolivia	Evaluation team	Bolivian SC	Oct 09
Evaluation in Kenya	Evaluation team	Kenyan SC	Dec 09
Evaluation in Switzerland	Evaluation leader	FiBL, CCD, SAB	Aug – Dec 09
Draft report for consultation	Evaluation team	SDC, FiBL, local SCs	Mid Dec 09
Discussion of draft report	Evaluation leader	SDC, FiBL	Early Jan 10
Final report submission	Evaluation leader	CCD, FiBL, local SCs	Mid Jan 10
Meeting on final report	Evaluation leader	CCD, FiBL	Late Jan 10
Proposal on implementation of recommendations	FiBL, local SCs	CCD, SAB	Late Jun 10

8 Documents to be made available to the evaluation team

It is expected that the evaluation team treats information contents of all documents with the necessary care. Documents with an asterisk (*) are strictly confidential and should not be shared with any outsider.

- Project document (version 2)
- Operational reports since 2007
- The project in brief: powerpoint presentation as pdf
- Trial documents (Kenya, India, Bolivia)
- Organisation chart with structures and institutions
- MoUs with partner institutions, including roles and responsibilities
- Guiding principles of partner institutions involved
- Address list of contact persons
- Minutes of meetings between FiBL and partners*
- Minutes of internal evaluations*
- List of publications and press releases
- Timeline 2005 to 2010
- Network charts
- Self-appraisal of achievements as per objectives and expected results
- Mid-term compilation of trial results*
- Data inventories (Kenya, India)
- Accounts 2005-08*
- Concept notes on future potential activities*

9 References

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Annex 2: Interview guide

Project staff, partners, stakeholders etc.	Farmers
Relevance for stakeholders:	
Who is affected how by the project, who benefits, who loses?	Do you see that you can eventually benefit from the project?
What are important questions for organic farming? Does the project address these? Which are not addresses?	What questions/problems do you have regarding organic farming? What do you expect from the project?
Who are other important actors in ARD? How does the project interact with them? Is this appropriate to make the project relevant?	
Effectiveness:	
Has the project obtained the results you expected? Which ones? Which ones not and why? Any results you did not expect?	What did the project achieve?
Is the project on good track to reach its objectives? Which ones? What could hinder it to reach its objectives? Possible modifications for next phase?	What do you think the project can achieve in the next 5 years?
How could the long-term trial be made more relevant	
What can so far be concluded from the trial data?	What have you learned from the trials?
Efficiency:	
Is the project complementary to other research projects? Does it interact with other research projects in an appropriate way?	
Is the project working with the right partners? Which other partners should be involved?	
Are people working in the project used efficiently? What could be improved? Staff: Are decisions transparent, do you have a say?	
Is money used efficiently? Where could you save?	
Project management	
How do you see the role of ICIPE in the project? Is this satisfactory?	
Where would you like to put more, where less emphasis: • Scientific input • Project coordination • Networking and exchange • PR • Acquisition of new funds	
How could management be made more effective? Is the steering committee well composed? Who is missing?	
Risks and potentials:	
Where do you see risks for the project in the next 5 years? How to address them?	
What could affect the project over the next 10 years (make it useless, stop it)?	

Annex 3: Impact chain hypotheses developed by partners

White = positive impact; shaded = negative or no impact

a) India

Stakeholders	Outputs	Utilization	Effects	Benefits/ Drawbacks	Impacts
Organic farmers	Solid data base for organic and conventional production. New technologies for organic (better systems).	Organic farmers adopt new technologies because they participated in their development (and saw).	Cut cultivation costs (and labor) or increase production. Maintain soil fertility.	Increased income from organic farming as demand for organic products is high.	As farmers were involved in PTD, they continue to experiment on their own and thus can solve new problems. Sustainable livelihood through sustainable farming with reduced risks.
		Technologies are too complicated or too labor-demanding to be adopted. Botanical is not available everywhere.	Botanicals are overexploited and disappear. Traps may reduce beneficial insect. Women and children have more work.	As everyone will produce organically, premium price will disappear. As farmers depend on only one technology, costs of obtaining the inputs increase. Risks will increase.	Due to higher income, farmers become lazy and the sustainability decreases.
Conventional farmers	Solid data on conventional versus organic production. New technologies and new systems of farming.	Farmers analyze their practices. Cut costs. Convert to organic farming.	Gradually increased areas under more sustainable system, good experience incites neighbors to do the conversion.	Increased income. Healthier soils.	Improved livelihood for a large number of families.
		Farmers see that GMO cotton is highly profitable. More GMO is planted.	Farmers who convert feel that production is too hard to follow. Shift back	When areas under new system is increased, management problems can occur. Decrease the area.	High nutrient demanding crops are planted and fertilizer will be used again.
International development agencies, community.	Sustainable high yields with the OA.	Policies in favor of OA.	Reduce environmental pollution.	Reduce expenditures on health services.	Better health.
		No investments in projects related to OA.			
National mainstream agricultural bodies (MoA, R+E, universities).	Sustainable high yields with the OA.	Farmers friendly agriculture practices.	Reduce cost production.	More profit for the farmers.	More prosperous villages.
Organic movement (NGO, National bodies connected with Organic).	Healthy soil.	Stronger advocacy to change policies of national and international development agencies.	Change policies towards safe options of food production.	Increase area in OA.	Reduce environmental pollution.

b) Kenya

Stakeholders	Outputs	Utilization	Effects	Benefits/ Drawbacks	Impacts
Farmers (both organic and conventional)	Improved soil fertility technologies	Farmers use the improved technologies in their farms/production systems	Increased production Maintain their soil health	Food availability Increased income	Food security Sustainable farming systems Improved livelihoods
		Incompatibility with the farming or production system → no impact	Climate/weather Technology not well used → no impact (or even negative)	Poor market prices Market saturation → lower income	Income not reinvested back to agriculture Income misused
Organic movements (advocacy groups)	Supportive data on organic farming	Advocacy work Publications (manuals, papers) Reference data	Strong, visible movement	More membership More publicity Recognition	Well developed organic agriculture sub-sector
	Inconclusive data	Strong anti-OA advocacy e.g. agrochemicals, bio-technology	Fragmentation Lack of coordination Unhealthy competition	Dis-economies of scale Elite membership Exclusive conditions Political interference	
Extension (general and specific for OA, including NGOs)	Training manuals on AO available	Manuals used by extension staff to train farmers	Improved farmer knowledge on OA Improved OA knowledge by extension staff Improved extension service	Increased productivity Improved quality of service	Improved livelihoods Well informed farmers Sustainable farming systems Extension staff empowered
		Lack of facilitation Manuals do not fit in their mandate → no impact	Manuals are complicated → no impact	External factors (climatic and socio-economic) Lack of interest to apply → no impact or even negative	Lack of market Lack of certification → no impact
Researchers and education/ training	OA integrated in the curriculum in learning institutions	Trainers utilize the developed curricula	Graduates have the knowledge on OA More graduates specialize in OA	Improved productivity Sustainable agricultural systems	Improved livelihoods Increased economic growth (GDP)
		Lack of training facilities and materials Lack of expertise	Conflict with student interests	Graduates do not get the opportunity to use their knowledge	Misuses of income Higher taxes
Policy makers	Supportive information	Formulation of policies on organic agriculture	Favorable environment for OA sub-sector development	Increased production, acreage, consumption Increased economic activities	Sustained environment, food security and better health Improved livelihoods
	Non-convincing information	Conflict of interest Political interference	Poor policy enforcement	Lack of conducive environment (infrastructure, credit facilities, high cost of certification, no premiums)	More stringent regulations on safety of conventional produce
Marketers, processors	Organic products available at affordable cost ((this project component is not yet funded))	Volume of organic products sale increased	Increased number of organic marketers within the country and region	Food availability and sustainability of organic farming	Food security and increased income
Consumers	Quality of organic products improved ((no activities funded yet to this end))	More consumers of organic products	Improved in health of consumers	Less money invest in treating diseases	Improved likelihood

c) Bolivia

Stakeholders	Outputs	Utilization	Effects	Benefits/ Drawbacks	Impacts
Farmers of the area and of similar areas	Profitable, validated farming systems, cocoa varieties with higher productivity identified	Farmers validate results and adopt them, applying and trying them on their farms	Higher cocoa yields with enhanced sustainability and profitability due to diversification	Higher income Better marketing opportunities Higher food security	Less soil-degradation-induced migration, less dependency on technical assistance, inputs and projects
	The experiment demonstrates the feasibility of maximizing profits with the shadeless conventional system	Intensified production with maximum yields disregarding medium and long term effects	Higher cocoa production disregarding sustainability criteria	Weakening of organizations (El Ceibo), increasing risks, input dependency	Negative environmental, social and economic impact
Grassroots organizations (cooperatives, associations)	Farmers' organizations strengthened technically and economically	Organizations have clear and validated extension contents that are widely promoted	They commercialize more cocoa Organizational strengthening	Distribution of economic surplus to members	Organizations are models for organic production at regional and international level
	The experiment demonstrates the feasibility of maximizing profits with the shadeless conventional system	Intensified production with maximum yields disregarding medium and long term effects	Higher cocoa production disregarding sustainability criteria	Weakening of organizations (El Ceibo), increasing risks, input dependency	Negative environmental, social and economic impact
Technical staff of NGOs and other service providers	Organizations and technicians strengthened	Development of extension contents with short and medium term benefits	Higher credibility and acceptability of contents	Sustainable production strategies attract new financial players	Higher demand for technical advice
		Technical staff not convinced of organic, sustainable production			
Consumers	More abundant and more diversified offer of organic produce	Certification, distribution and promotion mechanisms targeting the general public are created	Higher domestic demand Affordable organic products	Healthy food for healthy families	Higher demand for organic products stimulates sustainable production, less environmental impact
		Lack of certification and distribution mechanisms for organic products			
Municipalities and government	Municipalities count with relevant information for decision making	Municipalities include in their work plans activities based on this information	Producers are aware of sustainable production practices	Healthy and protected environment	People live better Production in the municipality is sustainable
		Decision makers don't use the information, as it is not interesting			
Organic movements (national and international)	The organic movement profits from validated technical information and demo plots	Different bodies use the information and visit the plots	More trust in organic production	Increased volume of and demand for organic production	Organic movement strengthened
	Results don't show benefits of organic production				
Scientific community	Central research plots and on-farm trials for further research Enhanced scientific knowledge generated in a participatory process	Results are disseminated appropriately through different media Studies are replicated and adapted in different regions	Researchers get interested in the topic and take it further The idea spreads in the scientific community	Information relevant to the national and international scientific community exists	Institutional strengthening
		Research results are not well disseminated			
Marketing agents	Increased volume of organic production	Increased marketing of organic products	Increased turn-over	Increased income	Organization (El Ceibo) strengthened
	Demand does not increase				

d) FiBL

Stakeholders	Outputs	Utilization	Effects	Benefits/ Drawbacks	Impacts
Research community	Scientific publications showing some convincing positive effects of OA	As project is well known in scientific community, other researchers build on these results	More research projects on organic farming in the tropics (verification, gap filling, solving key problems)	Broad and detailed knowledge on OA in the tropics is widely shared (more prominent in global reports)	As more "green" solutions are available, agriculture in general becomes more sustainable
	No convincingly positive effects of OA are found → death of OA	Results are not used due to incredibility of authors Results are misused by notorious skeptics of OA → donors loose interest	Contradictory results are found under different conditions → FiBL experiments are discredited	As some projects lack experience and manage organic treatments poorly, OA is discredited	
IFOAM	Solid data published in peer-reviewed journals	IFOAM uses positive results for PR and member acquisition, negative ones for internal agenda setting	Organic concepts and standards are critically revised	Environmental friendliness of OA and profitability for farmers are enhanced	Better ecosystems services on more area (expansion of organic farming)
		IFOAM ignores or neglects negative results → opportunity to learn is missed (no impact)		OA may sell less as communication becomes more difficult with the new standards	
MoA, development agencies	Trials as physical reference points Solid data in scientific publications	Because policy makers saw the trials, they use the results for outlining the role of OA in agricultural policies and action plan	Role of OA in policies and action plans is clearly defined and transparent	More targeted project proposals Subsidies biasing against sustainable production are abandoned	A greener world Sustainable livelihoods
		Results are not in favor of OA Trial sites are not convincing (bad presentation) Policy makers are not interested in this project			
International development agencies	Data permitting to quantify ecosystems services of OA	Development agencies elaborate mechanisms for PES	Thanks to PES, OA becomes more profitable for farmers	More organic farming	A greener world
			Transactions costs are so high that farmers can't derive benefits from PES → no impact	As PES mechanisms do not consider landscape level standards, the higher profitability of OA leads to land use changes → negative environmental impact	
Farmers	Data permitting to quantify ecosystems services of OA	Lobbying for ecosystems service compensation Farmers (organic movements) use the data for campaigns among consumers	Mechanisms for PES Farmers can realize premium prices for organic products	Higher income Higher income	Sustainable livelihood
Consumers	Trials as physical reference points and meeting place	Exchange with farmers and NGOs on production practices	Consumers develop a positive attitude towards OA or even become advocates	Build-up of public pressure for more sustainable agriculture	OA is a broadly appreciated production system
			Critical questions on low yields or the use of copper are raised → negative attitude of consumers General climate of corruption in the country impedes building up of trust		

Stakeholders	Outputs	Utilization	Effects	Benefits/ Drawbacks	Impacts
Consumers	Solid data on production costs and yields, as well as on ecosystems services and health benefits	Data are used to raise awareness among consumers for fair prices through fair trade labels (internationally) and producer-consumer organizations (nationally)	Higher prices for organic products are accepted	Consumers become frequent buyers	Healthier and happier consumers
Universities, MSc and PhD students	AO is integrated in curriculum Capacity building (students get degrees)	Universities take advantage for enhancing their reputation Graduates exploit new career opportunities	Interesting international contacts Young scientists with OA/ecosystems expertise	Subsequent involvement in international projects Promising working context(subjects, institutions)	Vibrant research on ecosystems with strong institutions and staff
		Universities are too bureaucratic and not enough innovative (OA, methods) to exploit the opportunities			
Staff involved in the project	Capacities for research work developed Exposure as active members of an international network	Further employment in research projects Staff use this network for future projects	Increased volume of international projects Increased probability of working in international projects		Strengthening of partner institutions Job satisfaction (work content and salary)
		Poor working conditions (e.g. job rotation, bad reputation of the institution) prevent success stories			
Rural development actors (NGOs etc.)	Solid data concerning sustainability issues of OA Sustainable production methods	Use the data for lobbying and information of the public Integrate the solutions in their extension material	Sustainable management practices are widely used by farmers	More sustainable land use	Mainstreaming of sustainable production methods
Extension	New training contents and manuals on sustainable production	As extension staff was involved in trials, they trust in the manuals and use them	Training becomes more attractive and attracts more participants	Better trained farmers operate more sustainable systems	Enhanced food security
Market actors	Solid data on produce quality and environmental benefits	Market actors use the data as arguments for marketing organic products	Demand for organic products increases and premium price can be achieved	Profitability of OA increases and area expands	A greener world Sustainable livelihoods
			Production does not meet demand (in terms of product, volume, time and space) Certification is expensive and lacks credibility	Developing new value chains is expensive and eats up the price differential Farmers loose out in benefit sharing	

Annex 4: Impact chain hypotheses for different stakeholder groups

Synthesis of the different workshops in Kenya, India, Bolivia and Switzerland

1. Stakeholder: Organic farmers (of the area)

Link	Positive impact	Negative or no impact ¹
Output	New technologies (or strategies) for organic farming	
Utilization	Farmers adopt new technologies because they participated in their development and saw	Technologies are too complicated or too labor demanding → no adoption Botanical is not available everywhere
Effect	Farmers cut costs or labor or increase yield Soil fertility is maintained or enhanced Higher profitability encourages new farmers to go organic	Botanicals are overexploited and disappear Traps reduce also beneficial insects Women and children have more work
Benefit/drawback	Increased income as demand for organic produce is high	Market saturation due to expanded organic production reduces premium price As few technology options were developed, costs for obtaining the respective inputs and risk increase
Impact	Secured livelihood through sustainable farming with reduced risks Farmers continue to experiment on their own as they gained confidence through PTD	Due to higher incomes, farmers become lazy and stop innovating

2. Stakeholder: Conventional farmers (of the area)

Link	Positive impact	Negative or no impact
Output	Solid data on conventional versus organic production and innovations for organic farming	
Utilization	As farmers visited the experiment and know about the results, they analyze their practices and cut costs, some convert to organic farming	Farmers see in the trials that a conventional system (e.g. GMO cotton or high input cocoa) is highly profitable and plant more of it
Effect	Gradually, the area under more sustainable farming increases and good experiences incite neighbors to follow	Farmers who convert feel that organic production is too demanding and shift back
Benefit/drawback	More sustainable farming systems with increased incomes, healthier soils and reduced risks	After a widespread shift to new practices, some management problems become acute and practices disappear again
Impact	Improved livelihood for large number of families	Due to healthier soils, nutrient demanding crops are planted and mineral fertilizers are again used

3. Stakeholder: Farmers

Link	Positive impact	Negative or no impact
Output	Data permitting to quantify the effects of OA on ecosystems and produce quality	
Utilization	Organic movements use the data for campaigns among consumers	Certification is too expensive and hence farmers do not certify
Effect	Farmers can realize premium prices for organic products	Consumers are not willing to pay for ecosystems services
Benefit/drawback	Due to higher profitability, OA is spreading	
Impact	Sustainable livelihoods	

¹ These hypotheses were developed by answering the question: If the intended impact link above is achieved, what could still go wrong so that no impact or even a negative impact results?

4. Stakeholder: International development agencies

Link	Positive impact	Negative or no impact
Output	Data permitting to quantify ecosystems services of OA	
Utilization	Development agencies elaborate and advocate mechanisms for payments for ecosystems services (PES)	Transaction costs are so high that farmers cannot derive benefits from PES
Effect	Thanks to PES, OA becomes more profitable for farmers	
Benefit/drawback	More organic farming and other sustainable production systems	As PES mechanisms do not consider landscape level standards, the spread of OA leads to land use changes with negative effects on the environment
Impact	A greener world	

5. Stakeholder: Agricultural policy makers (and development agencies)

Link	Positive impact	Negative or no impact
Output	Solid information showing positive effects of OA	Positive effects of OA are not convincing (too small or inconsistent)
Utilization	Because policy makers saw the trials, they use the results in shaping policies and actions plans	Policy makers are not interested in the Project and its results
Effect	Subsidies biasing against sustainable production are abandoned and well targeted policies are developed	Evidence that OA can contribute to attenuate the food crisis is not strong enough
Benefit/drawback	Production becomes more sustainable	
Impact	A greener world for all and sustainable livelihoods for farmers	

6. Stakeholder: Scientific community

Link	Positive impact	Negative or no impact
Output	Scientific publications showing some convincing positive effects of OA	No convincing positive effects of OA are found and OA disappears from the agenda
Utilization	As the project is well known in the scientific community, other researchers build on these results	Because credibility of authors was compromised, results are ignored Results are misused by notorious skeptics of OA and donors loose interest
Effect	More research on organic farming in the tropics is done (verification, solving key problems)	Contradictory results are found under different conditions and FiBL experiments are discredited
Benefit/drawback	Broad and detailed knowledge on OA in the tropics is widely shared and appears more prominently in global reports	Because some projects lack experience and manage organic treatments poorly, OA is discredited
Impact	As more "green" solutions are available, agriculture in general becomes more sustainable	

7. Stakeholder: Extension agents and service providers for OA

Link	Positive impact	Negative or no impact
Output	Extension material on OA are available	
Utilization	Because farmers were involved in shaping the material, it is useful for extension	Material is inappropriate (too complicated, not adapted to farmers' realities)
Effect	Improved knowledge of extension staff and farmers on OA	
Benefit/drawback	Improved extension services and enhanced productivity	External factors (climatic, socio-economic) make the knowledge irrelevant
Impact	Empowered extension staff and farmers and improved livelihoods	Inaccessibility of market or certification lead to frustration among farmers and extension

8. Stakeholder: Extension agents

Link	Positive impact	Negative or no impact
Output	Innovations solving key problems of mainstream agriculture in a sustainable way	Innovations are not suitable for conventional farming, as they depend on premium prices
Utilization	Because extension is in close contact with the Project, they use the results in their work	
Effect	Sustainable improvement of farming practices (environment-friendly, low-cost)	Subsidies of synthetic inputs bias against sustainable practices
Benefit/drawback	Higher incomes and less negative environmental impact	
Impact	Confidence of extension in sustainable intensification is enhanced	

9. Stakeholder: Education and training actors

Link	Positive impact	Negative or no impact
Output	Solid results on AO	
Utilization	AO is integrated into the curriculum	Exponents of conventional farming discredit results and jeopardize curriculum change
Effect	Graduates are knowledgeable about OA, some specialize in OA	Students find OA contents unattractive
Benefit/drawback	Agriculturalists competently promote sustainable improvement of agricultural practices	Graduates do not get the opportunity to apply their knowledge
Impact	A greener world and a better reputation of agricultural experts	The environment is not conducive to OA (lack of infrastructure, affordable certification, premiums)

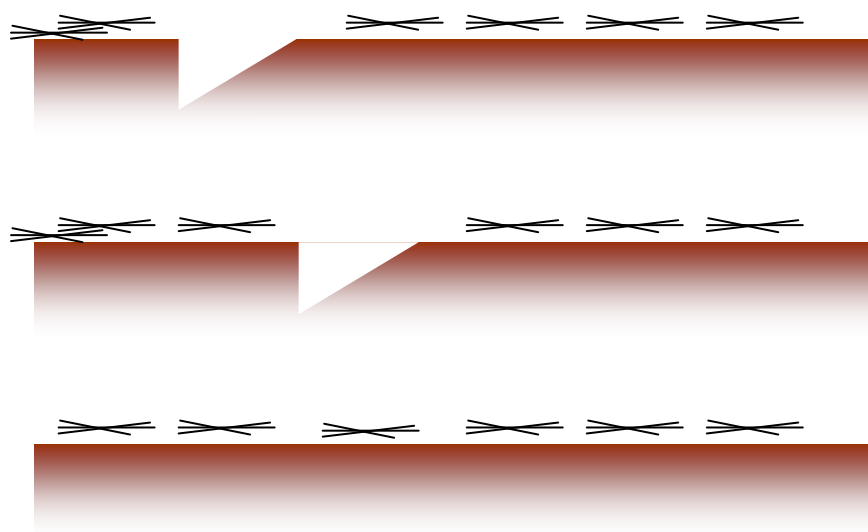
10. Stakeholder: Organic movements

Link	Positive impact	Negative or no impact
Output	Solid experimental results that are linked to show-cases in the field	
Utilization	Movements use the information wisely for advocating the cause of OA	Movements preempt results to get short-term attention and thus discredit the Project
Effect	Enhanced confidence of consumers, the general public and farmers in OA	The general public has other priorities, results are not useful to farmers
Benefit/drawback	Enhanced demand for organic products and increased volumes	Consumers cannot afford organic products, production and demand are not well linked
Impact	A greener world and strengthened organic movements	

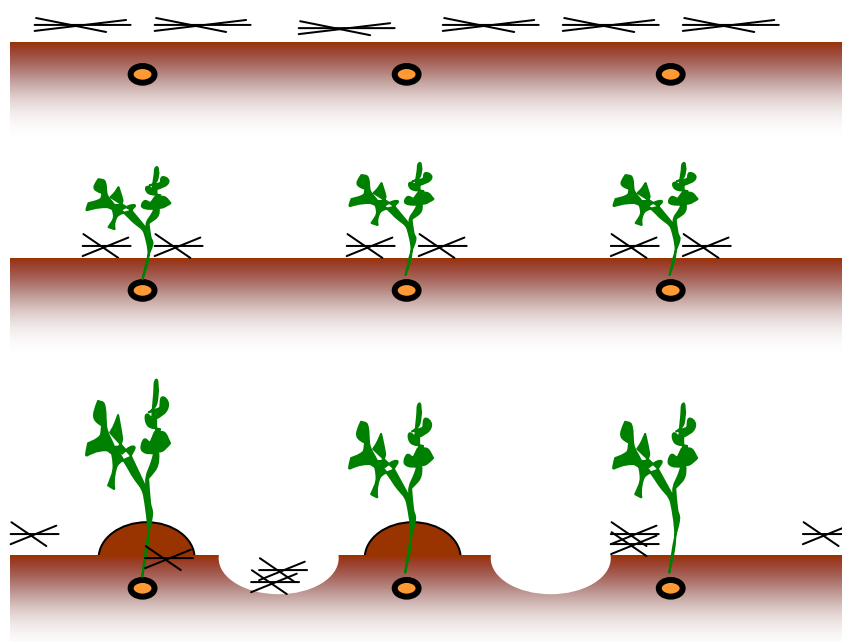
Annex 5: Mulching in the experiments in Kenya

Keeping the crop residues on the soil surface is a challenge for tillage, hilling-up and weeding, but with a bit of organization, additional labor required for these operations can be kept low. The principle is work row by row and move the organic material to the rows already done. Another principle is to concentrate the organic material e.g. along the planted rows, so that it suppresses weeds there completely. The mulch-free surface may then be howed for weeding with relative ease. If a second weeding is necessary, the mulch can be moved to the centre between two rows.

Leaving crop residues on the surface during soil tillage



Managing maize straw in potatoes



Plant potatoes through the mulch

Align mulch along the rows

For hilling-up move mulch to one side and finally leave it in the furrow

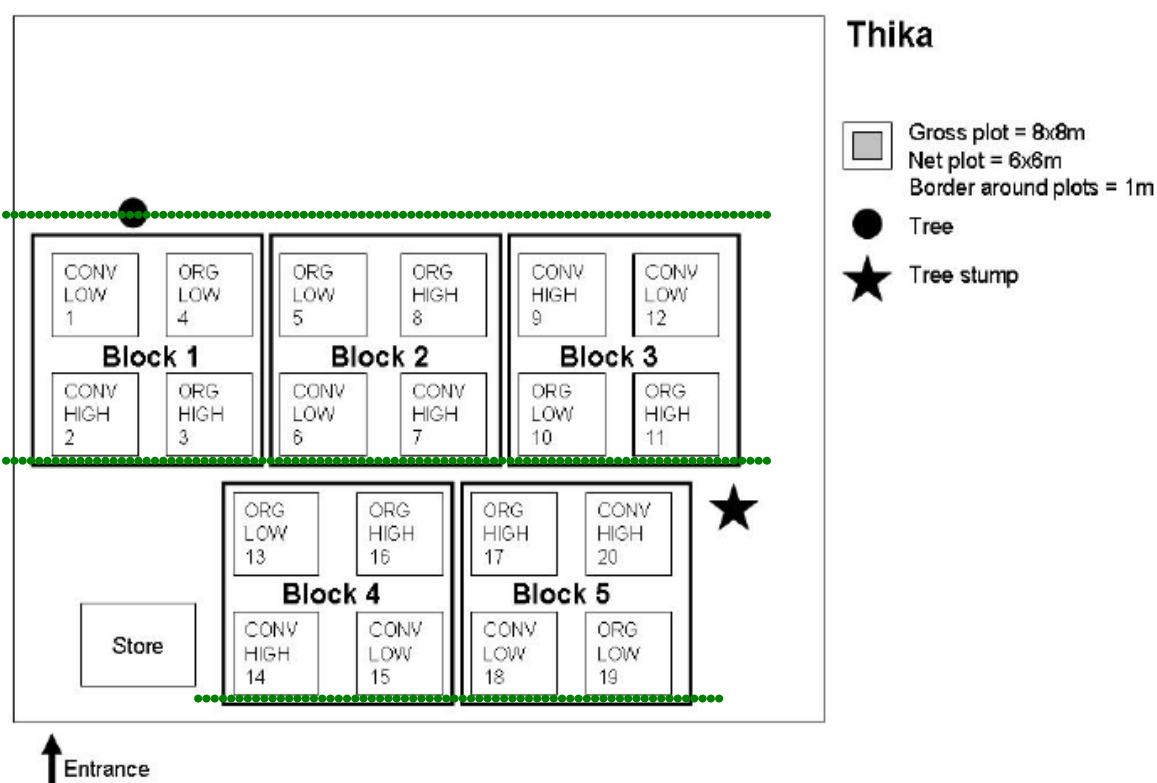
Part of the material may be incorporated in the ridge.

Annex 6: Shrubs in the experiments in Kenya

Integrating shrubs in the experiments is certainly a challenge. Incorporating them into the trial plots is not recommended, as this will be an undue competition to the crops and will further complicate analysis. Yet, when planting them outside the plots, in the border area, any foliage obtained from these shrubs will have to be accounted for as "external" input. In this case, the value of the shrubs will be more aesthetic than agronomic. Still, shrubs may change the micro-climate in the plots. We could imagine planting *Tithonia* shrubs above each plot (also the conventional ones) and keeping them low by pruning and lopping so as to minimize their influence on the trial plots.

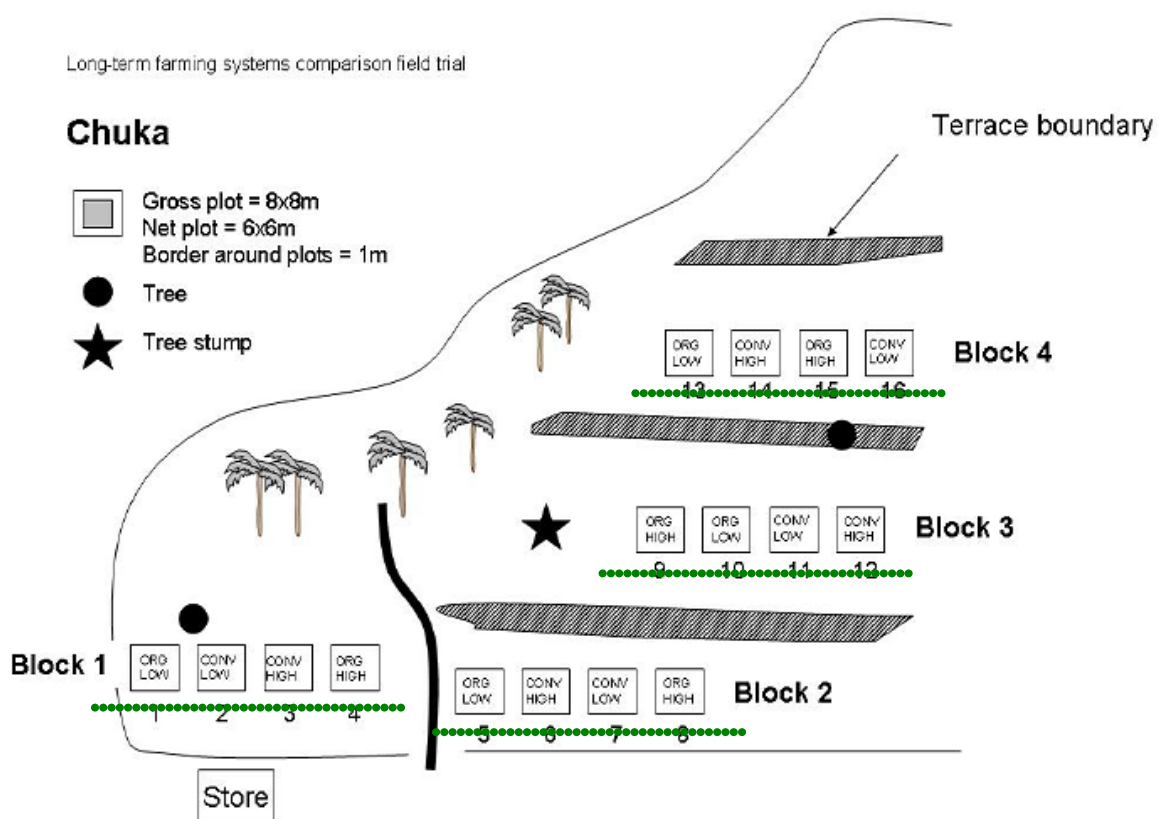
In Thika, there is not much space for shrubs. We recommend planting them right at the edge of the ditches, which will be as close to the theoretical edge of the gross plot as 50 cm. Pruning will have to be done in the rhythm of crop development, i.e. the *Tithonia* shrubs should be kept at about the same height as reached by the crops, to avoid undue competition for light. Root competition will have to be carefully monitored by assessing the performance of border rows in comparison with the net plot.

In the following figure, possible arrangement of a *Tithonia* hedge in the experiment is indicated by the green dotted line.



In Chuka, there is considerably more border space and the hedge may be placed at a distance of 1.5 to 2 m from the theoretical edge of the gross plot. Here, more growth can be tolerated and the hedge can make a sizeable contribution to provide *Tithonia* foliage for the organic treatments. Also here, we recommend close monitoring of the influence of the hedge on border rows.

If any competition is observed or suspected, the hedge needs to be removed again. Interaction of the hedge plants with pest and disease dynamics in the trial plots should be assessed for instance in a MSc thesis by observing pest (and antagonist) incidence and disease severity on a gradient with increasing distance from the hedge.



Annex 7: Aurogreen – a new method of green-manure

The positive effect of this practice is hypothesized due to a) enhanced above ground diversity that potentially brings in pests of different crops and therefore the natural enemies of these pests (provided no chemical pesticide is used), b) enhanced soil biology activity due to multiplication of highly diverse population of agriculturally beneficial microorganisms on root-rhizosphere of the different crops (note that one g of root rhizosphere soil can have at least one million agriculturally beneficial microorganisms), c) enhanced population of rhizobia of the different legumes that multiply on the root rhizosphere of the relevant legume (thus obviating the need of purchased rhizobial inoculants except where native soils lack it), d) amelioration of soil temperature due to plant biomass as surface mulch, e) reduced moisture loss from soil due to the resultant surface mulch. Scientists/research institutions with relevant resources are encouraged to test this hypothesis. The different steps of this method are described below.

Note: As per experience of CG institutes in Asia, the practice of 'Green-manure' in general, has not been accepted by farmers. But 'Aurogreen' is a different concept where the recommended diverse crops can be grown along with the main crop and therefore substantially enhancing the scope of acceptability by farmers.

1. This is a new type of green manure method for me. It was perhaps developed by the Auroville community of Pondicherry, India.
2. In this type of green manure, diverse crops (see the section on seed requirement) are sown along with the main crop(s).
3. Mix the different types of seeds and broadcast them to achieve maximum possible germination. Note: Beejopchar² – ie. treating the seeds with a traditional recipe (see it in the footnote) will be a good idea for better emergence. Broadcasting time can be critical in a rainfed system and would require local skill/experience.
4. Smother the 'Aurogreen' crops at about 30 days age using reverse 'Bakhar' – a local tool used for interculture in Maharashtra and Madhya Pradesh.
5. Experienced practitioners tell that up to 5 t (wet mass) per acre (ie. 12.5 t ha⁻¹) has been measured in about 30 days. This practice has also been reported to help manage weeds better than otherwise.
6. Smothering is important because it provides biomass as surface mulch. Incorporation can potentially have issues of immobilizing crop nutrients and is therefore not recommended.
7. It is a highly convenient practice for wide-sown crops such as cotton. For other crops where smothering with interculture is not feasible, other options have to be considered.
8. Sowing of another round of 'Aurogreen' crops at any next opportunity should also be attempted before the main crop grows big to cause excessive shade on the Aurogreen crops.
9. Close-sown crops such as groundnut (rows 30cm apart) can take advantage of 'Aurogreen' concept by growing it before sowing the main crop. A modification of 'Aurogreen' that has been noted used by some practitioners. They call this Beej-Sanskaar which is potentially suitable for close sown crops and is described elsewhere.

² Make about one liter paste by mixing 250g each of ash, soil (from the field being sown), fresh (and not old) cow dung (has been reported to contain agriculturally beneficial microorganisms). Add old cow urine as much as needed to obtain a thick paste. Smear the 10kg seed with this paste a day before sowing and dry in shade. The treated seed can be used within a week.

Seeds used for the 'Aurogreen'

1. A total of 10kg seed is needed per acre = 6kg legumes, 2kg cereals, and one kg each of oilseed and fiber crops.
2. Attempt must be made to use locally adapted crops/varieties. Also, seed grown/preserved by farmers themselves should be used for the purpose. There is no need to purchase these from seed store. If a farmer does not have seed of the required crops it can be borrowed/purchased from neighbor farmers or even from a grocers, provided they have good germination percent. It is estimated that the required 10kg seeds may cost well within Rupees 150/- (one hundred and fifty only). Examples of the different types of crops/seeds are given below.
3. Legumes (6kg): mungbean, blackgram, cowpea, moth, chickpea
Cereal (2kg): pearl millet, sorghum, maize, wheat, raagi
Oil seed (1kg): mustard, linseed, safflower, sunflower, sesame, soybean
Fiber crops (1kg): kenaf (*Hibiscus cannabinus*), cotton, sunhemp

Important: total quantities should remain around the recommended, but include as much diversity as feasible. For example, for one kg of oil seeds one can take 200g seed each of five of the six crops listed above. Thus one would ideally sow 10 to 15 different crops.

Summary written by Om Rupela in April 2009, based on discussion with Mr Manohar Par-chure (phone: 9422152824, e-mail: manohar_bhau@yahoo.com) Chairman Advisory Committee of Maharashtra Organic Farming Federation (MOFF).

Annex 8: Additional ideas for technology development

The evaluation team collected the following ideas for testing and fine-tuning from different stakeholders in India:

- Many new ideas for crop protection (Pheromone and sticky traps, nuclear polyhedrosis virus (NPV), different botanicals) should be tested in organic farming (groups of governmental extension officers)
- Different organization of composting ("daily composting") to reduce workload should be tested with farmers and spread (project team member)
- One organic farmer observed more flower drop after abandoning the use of RP-compost; this could be followed-up in different trials and studies done for other purposes

The evaluation team proposes to consider other, more vigorous legumes to intercrop in cotton in the organic treatments. Especially cowpea could be interesting as a substitute for the presently used mung bean. Important in the choice will be that the legumes are not climbing. The testing of cowpea could include the following steps:

1. Discuss with farmers, if cowpea would be an option for them
2. Obtain several cowpea genotypes that are supposedly adapted to climate and soil of the area and are not climbing (e.g. from ICRISAT)
3. Plant them out in a non-replicated observation-cum-multiplication plot at the Centre for qualitative assessment; especially paying attention the following possible problems:
 - Is it easy to plow it into the soil before flowering?
 - Does it die after incorporation or does it grow on?
 - When left to mature, does it compete with cotton, does it interfere with cotton harvest, can the stalk easily be plowed in or gotten out of the way somehow else?
4. Organize farmer evaluations at the Centre
5. Conduct on-farm trials with interested organic farmers
6. Consider introducing one new legume genotype into the long-term experiment; this may be done first in a split-plot or strip-plot design by dividing the present elementary plots into two sub-plots, one planted with mung bean, the other with the new legume; for 2-3 years the differences between these sub-plots would have to be monitored before joining them again.

Other possible legumes could include Jack beans (*Canavalia ensiformis*), Lab-lab etc. But cowpea would have the advantage that its grains can be harvested for food, a strategy that organic farmers presently practice with mung beans and which makes intercropping of a legume more interesting.

Anexo 9: Institucionalidad del Proyecto Sara Ana

Informe elaborado en el marco de la Misión de Evaluación Externa
por Oscar Llanque y Urs Scheidegger
La Paz - Bolivia, Octubre 2009

Contenido

Introducción.....	74
Sobre los Socios	74
FiBL	74
Instituto de Ecología	75
AOPEB	75
ECOTOP.....	76
PIAF – El Ceibo	76
PROINPA.....	77
Otras Instituciones.....	78
BANA BENI.....	78
FECAFEB	78
CNAPE	79
COSUDE	79
IIAB	79
Manejo del proyecto	80
Esquema de funcionamiento del proyecto	80
Comité directivo técnico local	81
Coordinación Internacional	82
Coordinación Nacional.....	82
Personal de campo	82
Fondos.....	83
Pertinencia	83
Difusión y comunicación	84
Riesgos	84
Factores internos	84
Factores externos	85
Cambios en el contexto institucional.....	85
Conclusiones Generales	85
Referencias	86

Introducción

El presente documento relaciona las principales apreciaciones del contexto institucional en que se encuentra el Proyecto en Bolivia. Este proyecto hace parte de un Programa de ensayos de comparación de sistemas de producción a largo plazo en los trópicos promovido por el Instituto de Investigación en Agricultura Orgánica FiBL, y ejecutado en tres países: Kenia, India y Bolivia, en base a su experiencia desarrollada en producción agrícola orgánica en Europa. En Bolivia el proyecto se viene ejecutando en la región de producción de cacao de Alto Beni. En particular el ensayo de comparación de sistemas agroforestales, actividad central del proyecto, se localiza en la Región de Sara Ana, por lo que en este documento se denomina “Proyecto Sara Ana” o simplemente “Proyecto”.

La metodología aplicada por la misión de evaluación externa (MEE) consistió en:

- una visita a Sara Ana para evaluar el ensayo de comparación de sistemas, diversas visitas a productores a fin de valorar el desarrollo tecnológico y la realidad de los productores,
- entrevistas a socios y aliados potenciales,
- síntesis preliminares cada noche y una síntesis general de la evaluación presentada en reunión al comité directivo técnico local CDTL el 24 de octubre
- elaboración de hipótesis de cadenas de impacto del Proyecto por parte del CDTL

La elaboración del presente documento sobre el contexto institucional del Proyecto, como parte de la evaluación, contiene apreciaciones sobre las reglas y roles de actuación de los socios, el manejo del proyecto, pertinencia del proyecto, difusión y comunicación, riesgos y cambios en el contexto institucional.

En cada apreciación se analiza la situación del tema correspondiente concluyendo sobre los principales problemas para los cuales se presentan recomendaciones pertinentes.

Sobre los Socios

En Bolivia los socios de FiBL para el Proyecto Sara Ana son: el Instituto de Ecología IE de la Universidad San Andrés de la Paz, la consultora local ECOTOP, la Asociación de Organizaciones de Productores Ecológicos de Bolivia AOPEB, el Programa de Implementaciones Agroecológicas y Forestales de la Central de Cooperativas de Productores de Cacao PIAF – El Ceibo, y en carácter potencial la Fundación PROINPA (Zundel et al., n.p. 2008(a) y 2008(b)).

FiBL

FiBL es coordinadora internacional de proyecto y responsable final ante los donantes. Además de sus responsabilidades administrativas FiBL viene liderando las actividades científicas del proyecto (Zundel et al, 2008, Schneider et al, 2009). Su mayor experiencia es en rendimiento agronómico y económico, eficiencia de recursos naturales y económicos, servicios de ecosistemas y calidad de producto. En lo que respecta a Bolivia, FiBL desempeña un rol importante en la planificación, implementación y monitoreo de las actividades relacionados con los resultados esperados y los objetivos del marco lógico. Sin embargo, la coordinación de FiBL en relación a Bolivia se dificulta por limitaciones de su presencia temporal.

Recomendación: Mayor presencia de FiBL en Bolivia a fin de disponibilizar con más frecuencia la gran experiencia del FiBL en el área científica de manera a cumplir con los requisitos internacionales de experimentación y asegurar la credibilidad de los resultados en la comunidad científica, y también asegurar una buena gestión del proyecto incluyendo los fondos necesarios para los trabajos básicos del experimento a largo plazo y el apoyo en la búsqueda de fondos para estudios especiales.

Instituto de Ecología

El Instituto de Ecología IE dependiente de la Universidad Mayor de San Andrés, según antecedentes del FiBL, esta considerado como un socio clave del proyecto en Bolivia. No es para menos puesto que en el IE más de un centenar de biólogos, zoólogos, especialistas en ecología y conservación investigan distintas áreas de la biodiversidad en el país. Respecto al Proyecto Sara Ana, el IE cuenta con una coordinación general de proyecto para el IE en la persona de R. Seidel y un asistente de investigaciones, en la persona de F. Alcón. Además dispone de la participación en el proyecto de otros investigadores del Instituto con investigaciones relacionadas al ensayo de Sara Ana. Su enfoque es bastante holístico tratando de vincular al ensayo Sara Ana con diversas investigaciones ecológicas en diversos ecosistemas y situaciones con la producción y las relaciones sociales en beneficio de los pequeños productores. Este enfoque es claro en la posición de los responsables generales del IE como Cristina Ruiz, directora general, S. Beck director del herbario, y Renate Seidel, pero no tanto de parte de los otros y otras investigadoras. Al momento de la evaluación la directora del IE fue enfática en su posición de atender con mayor énfasis la parte social del proyecto en armonía con la económica y ecología.

Recomendación: Mayor difusión de las características del Proyecto al interior del IE y de la propia UMSA.

Otro problema que enfrenta el IE es la limitación de fondos necesarios para cubrir los costos de las investigaciones complementarias al proyecto. La ventaja del IE como parte de la UMSA es la disponibilidad de financiamiento de investigaciones de otras fuentes diferentes al del Proyecto mediante tesis de maestrías y doctorados.

Recomendación: FiBL y los socios del Proyecto hagan un esfuerzo adicional en gestión de recursos específicos ligados al Proyecto para asegurar la implementación de un programa integral de investigaciones y capacitación en torno a Sara Ana que permita constituir la en un Centro de Investigaciones o una Estación Bio-Eco-Social al servicio del desarrollo de los pequeños productores.

AOPEB

La Asociación de Organizaciones de Productores Ecológicos de Bolivia AOPEB es un socio interesante y único para el proyecto. AOPEB agrupa a 69 organizaciones representando a 60 mil productores ecológicos y en transición (AOPEB, 2009). Por esta razón AOPEB es considerada una organización de base pero por opción práctica prefieren el reconocimiento institucional como organización no gubernamental. De esta manera consideran más efectiva su misión de contribuir a la producción, transformación, comercialización y consumo masivo, de productos ecológicos bolivianos, de alta calidad para mejorar las condiciones de vida de los productores. Para su logro, AOPEB se dedica al fortalecimiento institucional en el campo de la normativa y certificación ecológica, mercadeo, comunicación social y de relacionamiento, por medio del asesoramiento, capacitación, e incidencia política. Dentro del Proyecto Sara Ana, el rol de AOPEB se orienta a la incidencia política y la capacitación. No obstante, debido a que J. Milz, uno de los principales gestores del Proyecto Sara Ana, es funcionario de AOPEB, este socio también viene asumiendo roles que competen a la

coordinación general del proyecto particularmente en la implementación y seguimiento del ensayo, y sus relaciones institucionales.

Recomendación: Aprovechar el rol de incidencia política y capacitación además del rol de coordinación general de AOPEB para articular el contexto institucional del entorno del Proyecto, tanto gubernamental como no gubernamental con el contexto interno del proyecto a nivel de coordinación nacional.

ECOTOP

La consultora ECOTOP es también socia importante para el Proyecto Sara Ana debido a su significativa contribución especializada en sistemas agroforestales sucesionales SAFS. Su rol dentro del Proyecto es la responsabilidad de la implementación y control de las repeticiones precisamente de SAFS. Actualmente, ante la excusa de PROINPA, también asumió el rol de coordinación administrativa. Su especialidad es el desarrollo de investigación y capacitación sobre manejo de los referidos sistemas agroforestales. Sus investigaciones son innovadoras puesto que se basan en observaciones empíricas de experiencias desarrolladas en la región por los propios productores y por los investigadores de la institución que también son productores, aliadas a teorías académicas que sintonizan con sus experiencias. Un resultado destacado al respecto es precisamente el desarrollo local de los SAFS. Asimismo cabe destacar durante la evaluación una de sus investigadoras (O. Mayta) comunicó sus iniciativas innovadoras de investigación en desarrollo de tecnología al probar diversas variedades de cacao injertadas en un solo pié resultado de las observaciones de su aplicación por parte de muchos de los productores pero sin haber sido sistematizadas aún. ECOTOP también ejecuta un proyecto piloto de promoción de desarrollo rural, con recursos de la Fundación Inter Americana FIA, que genera un marco general para el desarrollo de tecnologías complementario al ensayo Sara Ana, a cargo de un profesional del lugar, F. Velásquez. Especial interés existe en relación al uso de microorganismos efectivos para el control de enfermedades que afectan el cacao y las bananas o plátanos. Así también dentro del proyecto de desarrollo se viene enfrentando con iniciativas de SAFS, el problema de deficiencia hídrica en los suelos de algunos sitios de producción de cacao. En este marco, ECOTOP presta servicios de asistencia técnica a los productores de la zona con técnicos promotores que trabajan medio tiempo en sus propias parcelas como estrategia de apropiación real de los sistemas. Sus técnico(a)s, mayormente mujeres, son altamente comprometido(a)s con los intereses de los productores y las productoras dentro de la promoción e implementación de alternativas más compatibles con la ecología de los ecosistemas naturales de la región. Un problema general que enfrentan es la mentalidad de la mayoría de los productores de intensificación de la producción para generar los mayores ingresos. Esta situación se manifiesta en la poca pero creciente adopción de los SAFS.

Recomendación: Considerar alternativas intermedias que faciliten el proceso de adopción de los sistemas agroforestales secuenciales considerando la mentalidad de la mayoría de los productores y las variaciones que se presentan en cada caso.

PIAF – El Ceibo

PIAF – El Ceibo es el brazo técnico de la Central de Cooperativas de Productores de Alto Beni El Ceibo Ltda. PIAF - El Ceibo desarrolla y ejecuta un Programa de Implementaciones Agroecológicas y Forestales dirigido a atender las necesidades y demandas de los productores de la región. PIAF-El Ceibo está conformado por cuatro subprogramas: Agroforestal, Manejo Forestal, Desarrollo Organizacional y Administrativo Financiero. El programa participa en el Proyecto mediante su Subprograma Agroforestal que tiene por objetivo promover técnicas para la implementación de sistemas agroforestales en las parcelas de los productores, diversificando e incrementando la producción dirigida a la

seguridad alimentaria familiar en primera instancia y a la producción biológica hacia los mercados. Actualmente, se encuentran a cargo de una investigación sobre variedades de cacao instalada en cooperación con CATIE en las áreas de los propios productores. De 16 Bloques (cada bloque en el sitio de un productor) solamente cuatro cumplen las especificaciones originales del ensayo. En su primer año del ensayo se pudo verificar que los técnicos del PIAF – El Ceibo tienen alta experiencia para valorar sin contar aun con los datos, la alta diferencia entre clones extranjeros y clones desarrollados localmente en términos de producción, resistencia a enfermedades y variación de sitio. Los técnicos del PIAF – El Ceibo además realizan un monitoreo a parcelas demostrativas de sistemas agroforestales con cacao instaladas en diferentes modalidades en los sitios de los productores: multiestrato, orgánicos simples y complejos, etc. Los técnicos responsables del Subprograma, que también son productores, destacan el carácter participativo de los ensayos de variedades. No obstante, la participación de los productores aparentemente se restringe a una contribución con mano de obra para la implementación y cuidado de las repeticiones. En el caso del ensayo de comparación Sara Ana se tiene antecedentes que hubo participación en la definición de los tratamientos y su implementación por parte de los productores en el marco institucional del PIAF – El Ceibo. Durante la reunión de presentación de síntesis de la MEE, los socios debatieron y consensuaron la alternativa de conformar un "Grupo Consultivo de Agricultores" GCA que asumiría cierta responsabilidad del tratamiento orgánica con agroforestería.

Recomendación: Aprovechar la experiencia de los productores, no solamente de los técnicos de PIAF – El Ceibo, para que participen directamente y de manera sistemática en valoraciones y percepciones de las diferencias de los ensayos, tanto del de comparación en Sara Ana cuanto de los clones. En lo que concierne a la definición y acompañamiento del tratamiento orgánico con agroforestería del ensayo de Sara Ana es importante seleccionar tres a seis productores experimentados con alto rendimiento que viven entorno del área a fin de constituir el Grupo Consultivo de Agricultores GCA. Para el efecto se deberá definir participativamente la responsabilidad de este gremio con los mismos integrantes del GCA y prever una compensación adecuada por su trabajo.

PROINPA

PROINPA es una Fundación que tiene por objetivos: promover la conservación y uso de recursos genéticos, desarrollar tecnologías para la competitividad y seguridad alimentaria, y promocionar y difundir tecnologías a través de metodologías participativas como las Escuelas de Campo de Agricultores (ECA's), los Comités de Investigación Agrícola Local (CIAL's) y el Enfoque Participativo de Cadenas Agroalimentarias (EPCA). Su experiencia se desarrolla en productos andinos y altoandinos, no así en productos del trópico como el cacao. Dentro del proyecto estaba considerado con un socio potencial para los asuntos administrativos además de su aporte con su experiencia en investigación y transferencia de tecnología. No obstante, debido ante todo a su falta de experiencia en cacao y las limitaciones de su presencia en el lugar del ensayo, PROINPA se limitó a participar en algunas de las reuniones del comité técnico - científico. Tendría competencias a contribuir, por ejemplo en microbiología de suelo, pero hasta ahora no ha presentado una propuesta respectiva.

Recomendación: Involucrar a PROINPA para mejorar sus capacidades en planificación e implementación de los ensayos y estudios de manera que se pueda aprovechar su experiencia sobre los principios básicos de ensayos a nivel de finca y como aplicarlos en la realidad de los productores.

Otras Instituciones

Existen otras instituciones y/u organizaciones relacionadas directamente o con interés de relación con el proyecto Sara Ana. A continuación se relacionan algunos aspectos con aquellas que fueron entrevistadas durante la presente evaluación externa, incluyendo una descripción de la Interinstitucional Alto Beni que agrupa a la organizaciones de Alto Beni en la que hace parte el CEIBO, y por ende el Proyecto.

BANA BENI

BANA BENI, una organización de base que aglutina a los productores de banana del Alto Beni, tiene alto interés de participar dentro del Proyecto en el campo de desarrollo de tecnologías. Sus actividades productivas de banana están fuertemente relacionadas con la producción de cacao. Presentan serios problemas de ocurrencia de enfermedades y plagas en ambos productos. La alternativa que consideran viable para su control es la aplicación de micronutrientes y microorganismos efectivos. Su interés es participar directamente en la planificación, implementación y monitoreo de los ensayos de aplicación. Destacan que no conocen detalles sobre el Proyecto en general, y menos sobre el ensayo de comparación de sistemas agroforestales.

Recomendación: Por el potencial de beneficio de los resultados del Proyecto en beneficio de los productores de la región, se recomienda una mayor difusión al interior de BANA BENI sobre las características del Proyecto particularmente sobre desarrollo de tecnologías de manera que puedan combinadas las actividades de investigación del mismo con las demandas y participación de este sector productor de bananas. Asimismo, recomendamos la inclusión en el Proyecto de las demandas de investigación de los productores de BANA BENI por su condición de extrema relación entre la producción de banana y cacao.

FECAFEB

FECAFEB es una organización de base que aglutina a los productores de café de la región de Caranavi. Conocedores del Proyecto Sara Ana de Alto Beni, manifiestan su alto interés en ser beneficiados por los resultados del Proyecto. En principio, valoran la relevancia de esta iniciativa de manera que les gustaría contar con algo similar en el campo de la producción del café. La Federación, en el marco de la Interinstitucional Alto Beni IIAB tienen desarrolladas con El Ceibo y ECOTOP, Pastoral CARITAS, entre otras, actividades de transferencia de tecnología en sistemas agroforestales en multiestrato y sucesionales que poco a poco esta despertando interés de adopción entre sus asociados. Sus principales problemas son la notable disminución de producción de café, la falta de semillas e insumos como abono y controladores de plagas, la falta de manejo en las parcelas, deterioro y reducción de la fertilidad de los suelos. Actualmente se encuentran probando la aplicación de “agua miel” proveniente del procesamiento del café como abono foliar y controlador de algunas plagas y enfermedades. Además, en cooperación con el DED, se encuentran realizando la sistematización de experiencias exitosas de los productores de café. Su interés es desarrollar un programa de investigaciones similar al de Sara Ana, a fin de determinar las mejores alternativas de manejo y control de los sistemas de producción de café, sus costos y beneficios.

Recomendación: Mayor interacción entre los Socios del Proyecto con la FECAFE a fin de incidir en su proceso de construcción de su sistema de investigaciones sobre sistemas agroforestales orgánicos.

CNAPE

El Consejo Nacional de Producción Ecológica CNAPE, es una instancia pública-privada encargada de articular la promoción y desarrollo de la producción ecológica para fortalecer la participación de Instituciones Públicas, y Privadas. Se desarrolla en una aparente contradicción de las políticas públicas bolivianas sobre producción de alimentos. Por un lado existe un fuerte empuje del gobierno a favor de la producción ecológica y orgánica. Por otro lado, hay fuerte promoción de la mecanización agrícola a fin de intensificar la producción. En el concepto de CNAPE ambas estrategias no son contradictorias sino complementarias cuando se aplican adecuadamente, rechazando completamente la mecanización indiscriminada que ocasiona erosión y degradación del suelo como la que se viene dando con la quinua en la región Sur del Altiplano. Consideran que el Proyecto Sara Ana es una excelente iniciativa que refuerza los objetivos de producción ecológica a nivel nacional destacando que es una de las mejores formas de articular la participación y acción de varios actores con el mismo propósito.

Recomendación: Se considere la importancia de socializar con mayor repercusión los alcances del proyecto. Así mismo, ante la consideración del riesgo que representan los conflictos sociales que puedan presentarse se recomienda que se promueva con mucho énfasis la apropiación del proyecto por parte de los productores.

COSUDE

Por su parte la Agencia Suiza para el Desarrollo y la Cooperación COSUDE en Bolivia, en medio de sus objetivos de mejorar las condiciones de vida de las personas más desfavorecidas en el planeta, destaca la importancia de la potencial contribución con insumos académicos y prácticos sobre producción orgánica del Proyecto Sara Ana en la incidencia para la toma de decisiones. Muestran un alto conocimiento sobre todo el esquema de funcionamiento y la importancia del alcance del Proyecto, por lo que resolvieron participar en forma mas activa a partir del 2010 particularmente en generar una dinámica de socialización del Proyecto y su contribución paulatina a las autoridades gubernamentales.

Recomendación: Considerar el rol importante que puede jugar COSUDE como articulador con tomadores de decisión en políticas públicas y cooperación internacional.

IIAB

La Interinstitucional Alto Beni IIAB es una red de organizaciones e instituciones que desarrollan actividades en la región del Alto Beni (DED, 2009). La IIAB a través de sus organizaciones asociadas promueve con éxito la producción mediante la implementación de sistemas agroforestales SAF con el propósito de recuperar la fertilidad de los suelos, recuperar la biodiversidad, incorporar especies para la producción de masa orgánica, especies valiosas forestales, frutales y cultivos del bosque primario como el cacao, café, achachairú, palmas y otras. El Proyecto Sara Ana se desarrolla también en el marco institucional de la IIAB debido a que parte los socios locales del Proyecto Sara Ana: PIAF-El Ceibo, ECOTOP hacen parte del IIAB, y tienen una fuerte relación con AOPEB. El efecto inmediato es la generación de una relación más profunda entre sus asociados, como se pudo constatar durante la evaluación externa respecto al interés demostrado por FECAFE en desarrollar similar iniciativa en el campo de la producción del café. No obstante, detalles de funcionamiento del Proyecto y los resultados a lograr aun son poco conocidos.

Recomendación: Un esfuerzo mayor en la socialización del Proyecto al interior de la IIAB procurando aclarar los aspectos importantes del proyecto y generar sinergias que puedan resultar de acciones conjuntas.

Manejo del proyecto

Existe un buen entendimiento entre los socios del proyecto para el manejo del proyecto. Los roles y responsabilidades de los socios se vienen definiendo y consolidando en proceso de construcción, de manera pragmática, con buenos resultados hasta ahora. No obstante, aún no están totalmente claros.

Esquema de funcionamiento del proyecto

Falta claridad en la mayoría de los socios sobre el esquema de funcionamiento y manejo general del proyecto. Existe en muchos casos confusión entre los socios sobre algunas de las relaciones y diferenciaciones entre el rol del ensayo de comparación de sistemas de Sara Ana, el programa de desarrollo de tecnologías, el esquema de validación, y las iniciativas de capacitación y difusión del proyecto (ver figura 1: esquema de funcionamiento).

También se pudo apreciar de parte de los socios una falta de claridad en relación a los beneficiarios del proyecto particularmente sobre los tomadores de decisiones en políticas públicas relacionadas a la producción orgánica de alimentos. Una de las metas estratégicas explícitas de los socios del proyecto es identificar los retos de la agricultura orgánica en los trópicos y de enfrentarlos de manera enfocada ((Zundel et al., n.p. 2008(a) y 2008(b)).

Recomendación: Que los socios socialicen, en talleres internos, con mayor amplitud sobre el esquema general de funcionamiento y manejo del proyecto, destacando claramente la orientación del proyecto en relación a los beneficiarios (productores, tomadores de decisión, capacitadores, etc.). Asimismo, se recomienda que por su parte cada socio socialice al interior de su institución u organización los objetivos, características y resultados del proyecto, así como el reporte de los avances.

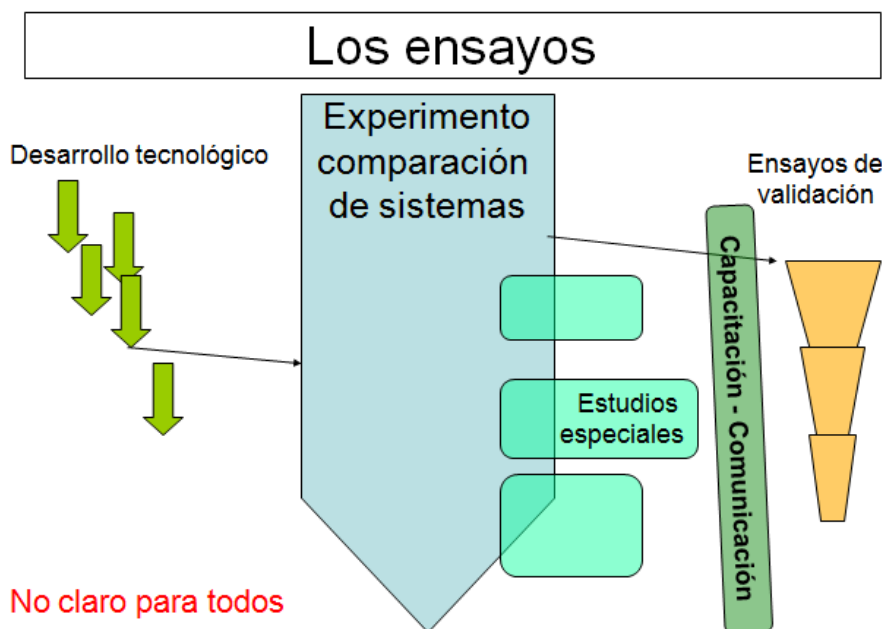


Figura 1. Esquema de funcionamiento y manejo del proyecto

Comité directivo técnico local

Conforme se especifica en antecedentes del Proyecto (Zundel et al., n.p. 2008(a) y 2008(b), Schneider et al., n.p. 2009), los comités directivos técnicos locales CDTL tienen facultades de toma de decisiones estratégicas en aspectos conceptuales del ensayo, la planificación anual y monitoreo de las actividades, la admisión de socios nuevos y el desarrollo de una estrategia de comunicación común a nivel local. Sugieren también que socios complementarios locales tendrán que hacer parte en el comité directivo técnico local: (a) Universidades, o instituciones de investigación nacionales/internacionales con conexiones con universidades, facilitan involucrar estudiantes de doctorado e investigadores de post doctorado, y con eso formar las capacidades en los países trópicos en desarrollo. (b) ONGs locales, agencias de desarrollo, servicios consultores nacionales o empresas de comercio que tienen contacto directo con los agricultores, con los participantes en el mercado y con diseñadores políticos en el sector agrícola son cruciales para el desarrollo del sector orgánico en un país (Zundel et al., n.p. 2008(a) y 2008(b)).

En caso de Bolivia, el comité directivo técnico local se restringe solo a la participación de los socios originales incluyendo PROINPA en algunas reuniones. A la fecha este comité directivo viene funcionando satisfactoriamente superando las limitaciones de falta de claridad inicial en varios de los socios sobre las características y alcances del Proyecto. Sin embargo, en procura de cumplir a cabalidad las funciones del Comité como se describe en párrafo anterior, se pudo evidenciar la necesidad de completar el Comité con dos tipos de actores importantes. Por un lado, en la parte técnica se nota la falta de un socio boliviano con trayectoria en investigación agronómica-forestal. Por otro lado, el Comité no cuenta con la participación de otras entidades como Universidades y agencias de desarrollo que le permita el contacto directo con los productores y con tomadores de decisión en políticas públicas.

Recomendación: En el primer caso, sobre la investigación agronómica-forestal reiteramos la recomendación de examinar si existe una institución boliviana con trayectoria en investigación agronómica-forestal que puede fortalecer el proyecto. En todo caso, ante la dificultad de encontrar este tipo de institución es importante considerar el involucrar a PROINPA debido a sus capacidades en planificación e implementación de los ensayos y estudios de manera que se pueda aprovechar su experiencia sobre los principios básicos de ensayos a nivel de finca y como aplicarlos en la realidad de los productores.

En el caso de participación de entidades que permitan al Comité un mayor contacto con los beneficiarios del Proyecto se tiene las siguientes consideraciones. En lo que respecta a las Universidades la participación del IE es fundamental pero muestra un ambiente de actuación un tanto aislado del propio contexto general de la Universidad que pertenece (UMSA) debido a que no se conecta con fines del Proyecto con entidades de la misma Universidad como la Estación de Sapecho de la Facultad de Agronomía que trabaja con clones de cacao, ni tampoco con su Departamento de Ciencia y Tecnología. Además existen otras entidades como el Instituto Nacional de Innovación Agropecuaria y Forestal INIAF, el Servicio de Cooperación Suiza para el Desarrollo COSUDE, y el Consejo Nacional para la Producción Ecológica CNAPE que pueden contribuir ampliamente en el cumplimiento del rol del Comité. No obstante, existe la preocupación en algunos de los socios del Proyecto que por el carácter deliberativo y de toma de decisiones estratégicas del Comité, la participación de algunas de las entidades mencionadas resulte en algunas contrariedades.

Recomendación: Crear o conformar una instancia estrictamente consultiva y no deliberativa como el Consejo Consultivo del Proyecto a fin de poder ampliar la base de interesados como las Universidades (en caso de la UMSA con la Estación Sapecho y el Departamento de Ciencia y Tecnología), el Instituto Nacional de Innovación Agropecuaria y Forestal INIAF, el Servicio de Cooperación Suiza para el Desarrollo COSUDE, el Consejo Nacional para la Producción Ecológica CNAPE, entre otros. En este sentido, se reitera la recomendación de

considerar el rol importante que puede jugar COSUDE como articulador con tomadores de decisión en políticas públicas y cooperación internacional.

Coordinación Internacional

FiBL en la persona de M. Schneider, tiene la responsabilidad de la coordinación internacional del Proyecto para Bolivia, y se encuentra contribuyendo sustancialmente en la planificación de las actividades y elaboración con el Comité Directivo Técnico de Bolivia de propuestas anuales para la consideración por parte del Comité Coordinador de Donantes CCD ((Zundel et al., n.p. 2008(a) y 2008(b)). Además FiBL viene cumpliendo satisfactoriamente con su responsabilidad científica, una de las mayores contribuciones al Proyecto, y, juntamente con el Comité Directivo, la implementación de las actividades aprobadas y la organización de los recursos financieros necesarios. No obstante, la coordinación de FiBL enfrenta dificultades ante todo por la limitada presencia en Bolivia.

Recomendación: Mayor presencia de FiBL en Bolivia en la persona de Mónica Schneider, en función de los nuevos arreglos de liderazgo y coordinación a nivel de los socios Bolivianos.

Coordinación Nacional

Falta claridad sobre cómo se realiza la coordinación general del proyecto a nivel nacional. Falta un liderazgo claro dentro del proyecto que sea definido por mandato de los socios. En principio PROINPA fue considerada como socio potencial para la coordinación nacional administrativa pero no fue posible debido a su decisión propia de asumirla por parte de PROINPA. Por tanto, resulta urgente la definición de una institución líder que asuma la coordinación general del Proyecto, a fin de facilitar todo el proceso de articulación con la institucionalidad externa al mismo. El propósito es hacer efectiva la posición del Proyecto como un referente nacional en la producción orgánica de alimentos, de manera que FiBL no tenga la necesidad de presentar los avances y resultados del proyecto a las autoridades nacionales a falta de una coordinación nacional bien establecida.

Recomendación: Es fundamental clarificar la coordinación y el liderazgo institucional a nivel nacional en el proyecto y priorizar la definición de la entidad líder por mandato de todos los socios.

La coordinación del Proyecto a nivel local se apoya fuertemente en la persona de Joachim Milz, sin que él tenga un mandato claro para asumir este rol.

Recomendación: Formalizar dentro del Comité Directivo Técnico Local la función de coordinador local del proyecto en la persona de Joachim Milz de parte de AOPEB y asegurar su presencia sistemática de por lo menos una semana por mes en la región del ensayo y facilitar la logística administrativa pertinente (secretaría, internet, etc.).

Personal de campo

El personal de campo del IE, AOPEB, PIAF-Ceibo y ECOTOP que trabaja en el Proyecto actúa en forma eficiente y se involucra más en el trabajo de lo que el proyecto puede financiar. Gracias a esta entrega laboral el Proyecto pudo ser implementado en forma eficiente. No obstante, durante la reunión de síntesis se destacó que este esfuerzo extraordinario fue posible motivado por el entusiasmo inicial al arrancar con el proyecto. Por tanto, es una situación temporal que no podrá seguir de esta manera por mucho más tiempo. La sobrecarga podría comprometer la efectividad y el rigor científico en el trabajo.

Recomendación: Mejorar las condiciones para el personal de campo (comunicación, infraestructura, transporte etc.), aumentar el financiamiento para los socios o reducir las actividades.

Fondos

Por la magnitud del Proyecto, los fondos disponibles no son suficientes para asegurar las tareas básicas del ensayo de comparación de sistemas y las otras actividades complementarias del proyecto en investigación, desarrollo de tecnologías, difusión, intercambio de experiencias, etc. de investigación. A la fecha, el personal técnico de las entidades socias del Proyecto vino contribuyendo a la implementación del Proyecto con esfuerzos al límite de sus posibilidades. Sin embargo, no es conveniente esperar que esa modalidad de trabajo continúe de esa manera si se quiere efectividad y rigor científico del Proyecto.

Recomendación: Desarrollar estrategias conjuntas entre FiBL y los socios del Proyecto para la adquisición de nuevos fondos con el objetivo de asegurar la tarea básica del Proyecto y la implementación de estudios y actividades adicionales y/o complementarios.

Pertinencia

El Proyecto Sara Ana se constituye en una alternativa de investigación integral de alto beneficio para tomadores de decisión política, agencias de desarrollo, grupos de interés de la producción orgánica de alimentos, ONGs, productores y estudiantes e investigadores. Todos estos actores serán beneficiados con un sitio de demostración y resultados palpables de investigaciones y validaciones en torno a la producción orgánica en medio de un ambiente real de una región con su economía basada en la producción de cacao. El beneficio a favor de los tomadores de decisión política y las agencias de desarrollo se expresará en insumos de información sólida de los resultados probados de las investigaciones. Los grupos de interés en producción orgánica serán beneficiados con argumentos sólidos sobre las ventajas y desventajas de la producción orgánica. Por su parte, las organizaciones no gubernamentales y los propios productores de campo pueden ser beneficiados con ejemplos concretos que pueden ser palpables en los ensayos de comparación y los de validación. Los estudiantes e investigadores serán beneficiados con la disponibilidad de una laboratorio de campo ligados a varias iniciativas de investigación y capacitación resultado del diálogo de saberes locales y académicos.

Los retos más destacados para la pertinencia del Proyecto son: la importancia de tomar en cuenta conocimiento y experiencia de productores, la correcta y sistemática comunicación de los objetivos y limitaciones del Proyecto. Así mismo, es importante y urgente involucrar activamente a los grupos meta beneficiarios del Proyecto: políticos, ONGs, Escuela Ecológica, Universidades, etc., de acuerdo a sus intereses especiales.

En relación a lo productores un reto importante para la pertinencia del Proyecto es producir resultados útiles para productores en el campo del Desarrollo de Tecnologías y compartirlos sistemáticamente.

Un beneficio palpable del Proyecto Sara Ana a la capacitación viene a constituir en base para conformar una Escuela Ecológica en beneficio de la población estudiantil local.

En el campo de la investigación la pertinencia del Proyecto se expresa en las condiciones favorables para una fuerte integración con diversos tipos y niveles de investigación complementaria que tienen condiciones de efectuar los socios del mismo.

Difusión y comunicación

Un aspecto importante del Proyecto es la creación de conciencia en todos los actores para un posible papel de la agroforestería orgánica en el desarrollo sostenible y el rol que juega el Proyecto Sara Ana.

Recomendación: Desarrollo de una estrategia comunicacional por grupo meta que permita hacer conocer en forma inmediata la iniciativa: características, objetivos, metas, beneficiarios, beneficios y desventajas.

Así mismo, se recomienda considerar y fortalecer el diálogo de saberes locales y académicos sobre la agroforestería orgánica al interior de las instituciones y organizaciones socias del Proyecto. Una demanda importante que emerge de parte de los propios socios del Proyecto, es estrechar la relación con los otros ensayos de Kenya e India de manera a hacer posible un intercambio vivencial de experiencias. Finalmente, se recomienda compartir los resultados continuamente con otras instituciones académicas, de promoción del desarrollo y tomadores de decisión sobre políticas públicas en el rubro. Al respecto, COSUDE puede apoyar para articular el proyecto con tomadores de decisiones.

Riesgos

El mayor riesgo del Proyecto sería la pérdida de sitios del ensayo de comparación. Se pudo detectar que existe al respecto mayor riesgo por factores internos que por externos.

Factores internos

En efecto, el Proyecto presenta alta vulnerabilidad en el ámbito interno frente a posibles conflictos sociales emergentes de los propios socios productores de El Ceibo. En su caso, estos conflictos pueden resultar cruciales si es que no se involucra adecuadamente a los productores a nivel de hogar, en el entorno del ensayo de comparación de sistemas, y a nivel de organizaciones de base en general. Existe por ejemplo un sentimiento de susceptibilidad en algunos miembros de El Ceibo que el ensayo es de ECOTOP o de IE. Asimismo, se pudo verificar que PIAF – El Ceibo puede tomar determinaciones o decisiones sobre el área de ubicación del ensayo comparativo de sistemas que pongan en riesgo al mismo como el caso de su acuerdo con la empresa de exploración petrolera que resolvió hacer pruebas pasando por encima del ensayo. Por tanto, se recomienda desarrollar una estrategia de cabildeo para promover el empoderamiento y apropiación del Proyecto por parte de los productores de El Ceibo y del PIAF – El Ceibo. Una propuesta interesante al respecto emergió en la reunión síntesis de la presente evaluación que consiste en delegar la responsabilidad del tratamiento de Agroforestería orgánica a un gremio de los productores seleccionados por el CEIBO en base a un convenio específico y protocolos definidos en forma conjunta entre todos. La propuesta contempla que los criterios e indicadores del tratamiento de AF orgánica, que a la fecha no cuenta con estándares definitivos, sea definido por este gremio de productores así como de su control y seguimiento. El objetivo sería involucrar a los responsables en todas las actividades de coordinación. De esta manera se reduciría sustancialmente el riesgo de los conflictos sociales de parte de los productores en relación al Proyecto.

Recomendación: Establecer por parte de todos los socios del Proyecto las condiciones favorables que viabilicen la participación efectiva de gremio seleccionado de productores (tres a seis productores con alto rendimiento que viven alrededor del área de ensayo) como Grupo Consultivo de Agricultores GCA de El Ceibo en calidad de responsables del tratamiento de Agroforestería Orgánica dentro del ensayo de comparación de sistemas.

Por otra parte, un factor interno importante de riesgo constituye el desgaste de la motivación con el tiempo.

Recomendación: Para evitar un debilitamiento del Proyecto por desgates en el tiempo se recomienda que se establezcan metas intermediarias (milestones) que permitan re-energetizar las actividades del Proyecto.

Asimismo, las expectativas exageradas en torno al Proyecto pueden resultar un importante factor de riesgo tanto a nivel interno como externo.

Recomendación: Es importante establecer, clarificar y socializar las limitaciones del experimento.

Factores externos

En relación a los riesgos por factores externos cabe destacar que la inestabilidad que emerge del ambiente político aparentemente afecta poco la continuidad del Proyecto. Es más preocupante que el ambiente desfavorable por falta de claridad dentro de la Coordinación Interinstitucional Alto Beni IIAB podría deteriorar la continuidad del Proyecto.

Recomendación: Es importante establecer los mecanismos necesarios para aclarar los aspectos del Proyecto y su relación con la IIAB.

En lo que respecta al proceso de exploración de petróleo en la zona del Proyecto, representaría alto riesgo si no se toman acciones conjuntas de prevención en caso de encontrar petróleo.

Recomendación: Esfuerzo conjunto de parte de todos los socios y productores involucrados en el Proyecto para gestionar condiciones que eviten que el ensayo resulte afectado.

Cambios en el contexto institucional

Los socios del Proyecto se encuentran en una etapa de consolidación de sus roles y responsabilidades en medio de un alto grado de motivación, identificación y complementariedad de intereses y acciones. No obstante, debido al intenso proceso de cambio que se vive en Bolivia, el contexto institucional en que se desarrolla el Proyecto también está cambiando rápidamente. Se cuenta actualmente, por ejemplo, con iniciativas de estructurar las Investigaciones y Asistencia Técnica en el campo agroforestal por parte del Gobierno en el reciente creado Instituto Nacional de Innovación Agropecuaria y Forestal INIAF, que de alguna manera deberá relacionarse con el andamiaje del Proyecto. Por su parte, el Consejo Nacional de Producción Ecológica CNAPE se encuentra en un proceso dinámico de fortalecer las iniciativas de producción de alimentos orgánicos, la promoción la baja del costo de la certificación como estrategia de Estado para abastecer con alimentos sanos a la población interna nacional. En consecuencia puede incrementarse sustancialmente el consumo interno de productos ecológicos y la probable disminución de los costos de certificación. Por otra parte, también se prevé la posibilidad de mudanzas en la economía de la región respecto a los rubros de producción. Por tanto, se recomienda a los socios del Proyecto desarrollar una estrategia de alerta y prevención ante los posibles cambios en el contexto institucional de la región.

Conclusiones Generales

En general el proyecto ha arrancado bien. La buena instalación del experimento es un logro grande y un capital importante. Fue posible gracias a esfuerzos grandes y un enfoque

pragmático de muchos de sus miembros socios del Proyecto debido a que existe entre ellos un alto grado de motivación, identificación y complementariedad de intereses y acciones. No obstante, los socios del Proyecto se encuentran en una etapa de consolidación de sus roles y responsabilidades como continuidad del proceso de construcción e implementación inicial del proyecto. Los roles y responsabilidades de los socios se vinieron identificando y definiendo en el camino, de manera pragmática, lo que funcionó bien gracias a la buena voluntad y el compromiso de todos. Sin embargo, la MEE considera que para el futuro se definan las responsabilidades y las maneras de interactuar entre los socios, reflejando el paisaje actual.

Se pudo verificar que existen limitaciones en la orientación y articulación de las investigaciones agronómicas y forestales que vienen realizando y que se pretende realizar en el marco de la integralidad del proyecto, dentro y fuera del mismo. Por tanto, hace falta definir varios aspectos técnicos-científicos como los estándares del tratamiento de agroforestería orgánica y convencional. Por otra parte, falta considerar e incluir participativamente conocimientos y experiencias locales de los productores. Así mismo, falta aclarar preguntas de coordinación y liderazgo. Finalmente, en medio de las limitaciones presupuestarias y limitaciones de orientación del proyecto es importante desarrollar estrategias específicas de comunicación y difusión, incluyendo educación, así como de reducción de riesgos y de alerta y prevención de cambios institucionales que puedan afectar el éxito del Proyecto.

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Anexo 10: Discusión sobre los tratamientos

Monocultivo orgánico

Si se quiere implementar el tratamiento "monocultivo orgánico", hay que basarse sobre experiencias del Asia. Esto nos parece un riesgo alto. Si ya es difícil transferir conocimientos y experiencias de Costa Rica o Brasil al Alto Beni (para los tratamientos convencionales), será mucho más difícil una transferencia a través de continentes, con idiomas, conceptos agrícolas y culturas diferentes. Sabemos que si queremos trasladar una práctica de un contexto a otro, surgen un sin número de problemas y hay que hacer modificaciones para adaptarlo al nuevo contexto. Si esto es cierto para tecnologías simples, es mucho más el caso si se quieren trasladar sistemas enteros. Habrá fracasos. Mientras que en la agricultura convencional se pueden, hasta un cierto grado, aislar los problemas y solucionarlos con insumos externos, en la agricultura orgánica se tiene que ver el conjunto, evitar los problemas y trabajar hacia un entorno favorable para la producción. Proponemos considerar bien, si todo este trabajo de adaptación y búsqueda de equilibrios se puede hacer dentro de un experimento a largo plazo.

Tratamiento participativo

Durante la evaluación surgió una nueva idea para un tratamiento orgánico: Invitar a un grupo de productores innovadores y exitosos de manejar un tratamiento según su propio criterio. Se base en la idea de convocar un "grupo consultivo de agricultores" GCA, incluyendo 3-6 productores de los alrededores de Sara Ana que obtienen altos rendimientos en sus propias parcelas. Ellos definirán juntos el tratamiento. Aquí un análisis de diferentes opciones para definir la responsabilidad :

Opciones para definir un tratamiento "orgánico participativo"

Tratamiento	Características	Ventajas y desventajas
Orgánico pragmático	Manejar el rebrote natural Aplicar materia orgánica disponible en la región en cantidades que los productores pueden encontrar	V: Es un tratamiento realista, que los agricultores pueden realmente aplicar V: Se puede definir ante mano D: Se basa solamente en best-bet prácticas de los investigadores D: Distribución no planificada de árboles de sombra
Orgánico participativo 1	El GCA define el tratamiento. Las grandes líneas se podrán definir ante mano, para los detalles habrá que consultar el GCA cada cierto tiempo. Los trabajos necesarios los realizará el personal de Sara Ana.	V: Es verdaderamente participativo, se basa en la experiencia de los productores, inicia un proceso de dialogo continuo y de apropiación del experimento por productores D: Requiere abstracción de parte del GCA y una comunicación eficiente con el equipo de Sara Ana D: Pérdida de control de FiBL D: Distribución no planificada de árboles de sombra
Orgánico participativo 2	El GCA define el tratamiento y realiza los trabajos directamente. Lleven registro de todo lo que hacen y aplican (mano de obra, insumos etc.). Puede delegar ciertos trabajos al personal de Sara Ana	V: Es verdaderamente participativo, se basa en la experiencia de los productores, inicia un proceso de dialogo continuo y de apropiación del experimento por productores D: No se puede planificar ante mano D: Requiere una comunicación eficiente entre SGA y el equipo de Sara Ana D: Pueden surgir problemas entre encuentros del GCA y no será claro para el personal de Sara Ana, como solucionarlos D: Pérdida de control de FiBL D: Distribución no planificada de árboles de sombra

Referente al problema de la distribución no planificada de árboles de sombra: Es una desventaja común de todas las opciones. A nuestro modo de ver no es un mayor problema: Ya se ha visto que los bananos (sembrados en el mismo tiempo y a una distancia uniforme) mostraron mucha heterogeneidad. Será lo mismo con los árboles de sombra sembradas en los tratamientos AF. Hay tantos factores que influyen sobre el desarrollo de estos árboles. Trabajar con el rebrote natural puede hasta ofrecer una posibilidad de uniformizar condiciones de sombra: Como habrá tantas plantas, de las cuales escoger, se pueden

eliminar aquellas que afectan demasiado al cacao (según criterio del GCA). Se podrán podar árboles que se desarrollan demasiado.

El único problema es que esta práctica de regulación de sombra es difícil de describir, de cuantificar y de estandarizar. Habrá que inventar entonces una metodología que permite medir al menos el resultado (grado de sombra para cada planta de cacao por ejemplo). Si se hace esto en todos los tratamientos, se podrá ver si realmente la sombra es menos uniforme en el tratamiento participativo que en los otros.

Consideramos que la opción participativa (sobre todo participativa 1) ofrece grandes ventajas tanto para hacer más pertinente el experimento, como para empoderar a los productores.

SAFS

SAFS es un sistema difícil a describir y entender. Ecotop provee asistencia técnica a productores que quieren practicar SAFS y normalmente tienen que acompañar a estos productores durante al menos un año. En el experimento a largo plazo, el tratamiento SAFS es manejado por personal experimentado (de Ecotop). Será un reto especial de describir este tratamiento de manera científica. Para una disseminación ulterior habrá que diseñar y probar nuevas formas de capacitación a productores que son menos exigentes en términos de personal y tiempo.