ABIP 014

Assistance technique aux ABC

Strategic Environmental Assessment

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EXECUTIVE SUMMARY

The MCA Agribusiness Investment Project (ABIP) is promoting the development of commercial of agriculture through Agribusiness Centers offering services to growers and companies in six regions of Madagascar; Amoron'i Mania, Atsinanana, Boeny, Diana, Menabe, and Vakinankaratra. In the fall of 2007, Chemonics International was brought in to offer technical assistance to ABIP. This project, ATABC (Assistance Technique aux ABC), is working in a few subsectors in each region, helping farmers move from a subsistence economy to one that is market driven. At the same time, the project is supporting the private agricultural business sector in creating linkages between the sector and the farming community.

When ATABC began, the subsectors to be supported in each region and the form that support would take were not known, so it was not possible to project ABIP's impacts on the environment. Six months into it, however, the subsectors have been chosen, work is underway, and it is appropriate to consider environmental impacts. This report is the result of the strategic environmental assessment (SEA) of the ABIP project.

The term "strategic" in this context means several things. First, the assessment is designed to identify types of impacts that might occur in project subsectors rather than the specific impacts actually occurring at individual project sites. Second, because the activities of the project will continue to evolve for its duration, the SEA provides guidance that will enable project staff to anticipate and respond to the issues that can come up in the future, as well as those that are occurring now. Third, the assessment places emphasis on the impacts likely to be of greatest importance, rather than calling for detailed responses to every possible impact. Fourth, it is important to consider whether project activities will have cumulative impacts beyond the sum of the parts, either across subsectors within a region or across regions. Fifth, while the assessment focuses primarily on the biological environment and on human health, it also considers impacts on gender relations, on how incomes are spent, and on how increases in income may affect beneficiary households or communities from a development perspective.

Because environmental impact assessments – strategic or otherwise – developed out of a concern to prevent harm to the environment, there is a tendency in all such assessments to focus on the negative. To a significant extent, this report is no different, especially as we consider the project's approaches to crop protection and soil erosion. However this project should also have significant positive impacts on the environment. Where we find them, this report will highlight them, and make suggestions for how they can be maximized.

The SEA took as its point of departure the scoping study carried out by Aquaterre in collaboration with Chemonics, which provides the legal and institutional context and flags the full range of environmental issues that could arise in each place. This information was complemented with information in the ABIP action plan and discussions with ATABC staff in Antananarivo to identify the most important issues that might arise from each ABC subsector. This provided a framework for interviews conducted in the six project regions, with ABC staff, government officials, other projects, and project beneficiaries. As we gathered information about the activities and environmental issues in each region, we designated the possible problems we identified as low, moderate, or high priority, based on several criteria:

- Scale – risks arising from activities in which only a few people are participating are of lower priority than those arising from widespread activities

- Risks to human life or health are considered more important than those to the natural environment. This is a subjective assessment on the part of the SEA team but one that we consider in keeping with social priorities.
- Issues likely to affect a wider group of people or a larger spatial area are considered more serious than those that will affect only a few people or a very small area.

Five environmental issues emerged as the most important ones from this process:

Crop Protection: The project's approach to crop protection places primary emphasis on biological rather than chemical methods of pest control. Where agrochemicals must be used, it focuses on teaching beneficiaries how to choose less toxic products and how to use pesticides safely, without risking themselves, their communities, or the environment. This requires close monitoring to verify whether the practices taught are being followed, and to reinforce the messages where needed.

Soil Erosion: This is a problem throughout Madagascar, and the areas of ABIP work are no different. Where crops supported through the project are grown on steep slopes, as is often the case for corn and sometimes the case for other subsectors, the ABC staff are introducing erosion control techniques such as growing hedges and intercropping other plants with the crop that help stabilize the soil. In the ABIP regions several other projects are working directly on soil erosion; these include the German-funded Projet de Lutte Anti-Erosive and the French and World Bank-funded Programme de Bassins Versants et Périmètres Irriguées. Where possible, ABC staff is encouraged to work with these projects to take advantage of complementaries with ABIP work and benefit from their greater knowledge of effective local erosion control techniques.

Agricultural Extensification: Threats to Madagascar's forests and biodiversity come in part from the extensification of agriculture into "hotspots" and other areas targeted for conservation. To ensure that the ABIP activities do not contribute to the encroachment of protected areas, monitoring should be done when beneficiaries are being selected to determine the potential for such encroachment. As much as possible, the ABC should avoid working adjacent to or within protected areas or zones. ABC directors must be in routine communication with government agencies and NGOs responsible for protected areas, forests, and conservation in their regions, in order to be aware not only of existing protected areas, but also of those proposed through the new Système d'Aires Protégées à Madagascar, or SAPM. Where ABIP activities are already adjacent to or within conservation areas of any sort, the ABC staff must work with organizations managing the protected areas to ensure that the ABC activities are compatible with conservation.

Fuelwood Use by Distilleries: Distilleries of essential oils consume substantial quantities of fuel wood in Amoron'i Mania and Atsinanana. While at present fuel wood consumption for distilleries is not significant in relation to total quantity consumed in the region, if the output of the subsector increases substantially, it could create local wood shortages. Neither the ABCs nor the MCA has the authority to require the distillers to replace their consumption through reforestation; however if local shortages appear, they should encourage them to take actions to improve efficiency of their equipment and to increase availability of wood through plantations.

Wastes from Plant Processing: Distilling essential oils creates liquid and solid wastes that are discharged into the environment. ABC staff working on these issues should ensure that liquid wastes possibly high in organic matter are not discharged into surface water, and that solid wastes are composted or dried and burned, rather than being left to decay.

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ACRONYMS

ABC	Agribusiness Center
AECA	Association d'Epargne et de Crédit Autogérée (self-managed credit and savings association)
AFD	Agence Française de Développement (French Development Agency)
ANDEA	Autorité Nationale de l'Eau et de l'Assainissement (National Water and Sewer Authority)
ANGAP	Association Nationale pour la Gestion des Aires Protégées (agency responsible for parks and protected areas)
ATABC	Assistance Technique aux Agribusiness Centers
BIPM	Birdlife International Madagascar Programme
BOD	Biological oxygen demand
BVBI	Programme de Bassins Versants et Périmètres Irrigués
CI	Conservation International
DRDR	Direction Régionale du Développement Rural
GAP	Good agricultural practice
GELOSE	Gestion des ressources naturelles terrestres (used to refer to community-based natural resource management)
FJKM	Fiagonan'i Jesoa Kristy eto Madagasikara (Church of Jesus Christ in Madagascar; the major Protestant church in the country)
HIPC	Heavily Indebted Poor Countries
MAEP	Ministère de l'Agriculture, de l'Elevage, et de la Pêche (Ministry of Agriculture, Livestock, and Fisheries)
MAP	Madagascar Action Plan
MSDS	Material Safety Data Sheet
M&E	Monitoring and evaluation
MECI	Ministère de l'Economie, le Commerce, et l'Industrie (Ministry of Economy, Commerce, and Industry)
MECIE	Mise en Compatibilité des Investissements avec l'Environnement ; the decree setting out rules for environmental impact studies
MEEFT	Ministère de l'Environnement, des Eaux et Forêts et du Tourisme
ODDIT	Organe de Développement du Diocèse de Toamasina
ONE	Office Nationale de l'Environnement
ONN	Office Nationale de Nutrition
PADR	Plan d'Action pour le Développement Rural
PLAE	Projet de Lutte Anti-Erosive (Project to Combat Erosion)
PNAE	Plan National d'Action pour l'Environnement (National Environmental Action Plan)
PRD	Plan Régional de Développement
PRSP	Poverty Reduction Strategy Paper
RTSO	Responsable technique et socio-organisationnelle
RUP	Restricted use pesticide
SAF/FJKM	Sampan'Asa Fampandrosoana / Fiangonan'i Jesosy Kristy eto Madagasikara (Department of Development / FJKM)
SEA	Strategic environmental assessment
SRA	Système de riziculture améliorée (improved rice cultivation system)
TBE	Tableau de Bord Environnemental (State of the Environment Report)

MALGACHE TERMS

baiboho	river bank land that floods during the rainy season and is cultivated during the dry season
fokontany	local jurisdiction below the level of a commune (or municipality)
kaloina	security patrols designated by a local chief to enforce a community agreement or rule
lavaka	steep, highly erodible gully
niaoli	a variety of eucalyptus used for essential oils
savoka	secondary forest
tanety	steep slopes
tavy	slash and burn agriculture

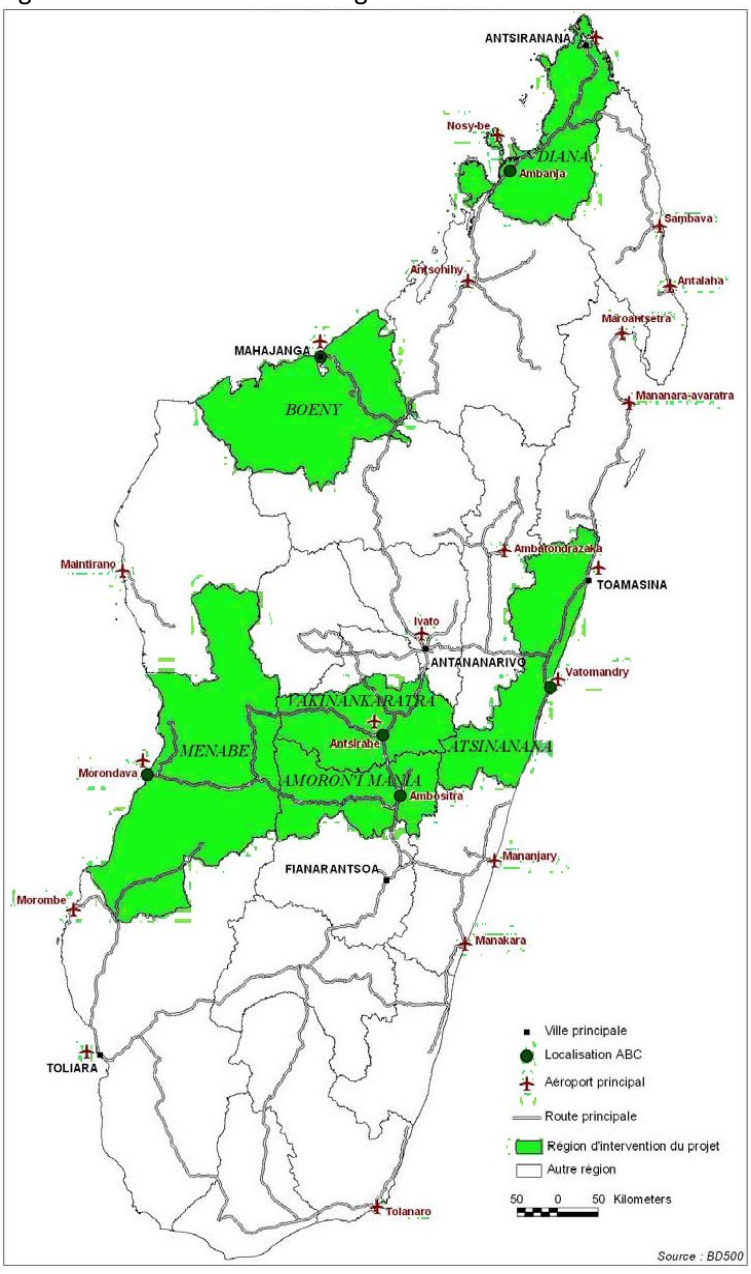
OTHER TERMS

are	one tenth of a hectare, or 100 square meters
stere	one cubic meter; the term is used when measuring wood

CHAPTER 1. INTRODUCTION

The MCA Agribusiness Investment Project (ABIP) is aimed at promoting the development of commercial agriculture through the establishment of local Agribusiness Centers offering services to growers and the private sector of six regions of Madagascar.[1] Chemonics International was given the mandate to offer technical assistance to ABIP through building the capacity of the network to function and deliver its services, and to implement a plan for sustainability to ensure the provision of services beyond the life of the project. This project, ATABC (Assistance Technique aux ABC), is providing technical guidance and promoting the development of the agribusiness sector in three or four subsectors in each region. Services offered to growers include assistance in introducing new agricultural practices both pre- and post-harvest, in obtaining credit for the supply of inputs, and in finding new markets, all with the objective of assisting farmers in moving from a subsistence economy to one that is market driven. This offers them opportunities to increase both their income and their standard of living. In parallel, support is given to the development of the private agricultural business sector in creating linkages between the sector and the farming community. Figure 1.1 shows the location of the six regions where the MCA is working.

Figure 1.1 Location of MCA Regions



[1] Throughout this report the word "project" refers to ABIP, and not to the Chemonics activities within it. This is consistent with the definition of "project" in MCC legal documents, in that ABIP is a constituent part of the overall MCC program in Madagascar.

When ATABC began, the subsectors to be supported in each region and the form that support would take were not known. It was, therefore, not possible to assess in advance exactly what would be done and how project activities could affect the environment. Now, six months into ATABC, the action plan has been finalized, the subsectors and innovations to be introduced in each subsector have been chosen, and the work is underway. Table 1.1 shows the subsectors chosen for each region and the number of beneficiaries targeted for each.

It is now possible to assess how these activities may affect the environment and to prepare a plan to manage those impacts. This process will, moreover, enable us to project the possible impacts of additional subsectors in which the ABCs may work in the future, and indicate the steps that will be required to protect environmental harm from those activities as well. This report is the result of the strategic environmental assessment (SEA) of the ABIP project.

Table 1.1 Number of Beneficiaries per Subsector

Region	Subsector	Beneficiaries
Amoron'i Mania	Geranium	300
	Honey	510
	Onion	400
	Rice	1,330
Atsinanana	Vegetables	300
	Litchis	3,132
	Corn	450
Boeny	Corn	1,200
	Onion	70
	Rice	3,486
Diana	Cocoa	950
	Vegetables	360
	Rice	1,250
Menabe	Peanuts	736
	Lima Beans	1,600
	Rice	2,100
Vakinankaratra	Corn	530
	Onion	200
	Potatoes	530
	Rice	2,057
Other subsectors (all regions)		414
Total		22,005

Source: Chemonics International March 2008, p. 16

1.1 WHAT DO WE MEAN BY "STRATEGIC?"

In referring to this as a "strategic" environmental assessment rather than as a more conventional "environmental impact study," which is defined in Malgache law, we mean several things. First, the assessment is designed to identify the kinds of impacts that will typically occur through the overall project rather than the specific impacts actually occurring at individual project sites. The object of this approach is twofold. First, it is designed to flag the possibility of any serious adverse impacts due to the project activities. Second, it demonstrates the issues that must be considered as additional activities are undertaken by the ABCs. We have of necessity looked at individual sites and identified possible impacts on a few of them. However, the information obtained in that way is presented in order to illustrate the broader concerns that could arise throughout the project. Therefore we have not attempted to gather systematic technical data about such issues as rates of soil erosion or where agrochemicals move in the soil or the water. Rather, we have identified the possibility of such problems arising throughout the project and indicated the steps required to prevent them.

Second, because the activities of the project will continue to evolve for its duration, the SEA must provide guidance that will enable project staff to anticipate and respond to the issues that can come up in the future. To ensure that they do in fact consider future impacts, the management plan calls for steps that require awareness of project activities that can raise environmental concerns. The SEA cannot fully determine or prescribe what those future activities should (or should not) involve, nor can it provide a list of specific situations under which specific approaches must be followed. Rather, its aim is

to provide the information needed to enable ABC staff to anticipate environmental or social concerns based on those discussed for the activities that are underway now, and have an understanding of how to avoid or respond to them.

Third, while considering the impacts of each subsector in each region, the assessment places emphasis on the impacts likely to be of greatest importance, and does not call for detailed response to every possible impact.

Fourth, because the project consists of a number of small components, it is important to consider whether they will have cumulative impacts that will be greater than the sum of the parts, either across subsectors within a region or across regions. Insofar as possible, the assessment will also identify complementarities or cumulative impacts between ABC activities and those of other projects, and opportunities for collaboration among projects.

Fifth, while the assessment focuses primarily on the biological environment and human health, it also considers certain key social issues. One is whether project activities are expected to have an impact on gender relations or roles within the target communities. A second is how increases in income are likely to be spent, and how this affects beneficiary households or communities from a development perspective.

Because environmental impact assessment – strategic or otherwise – developed out of a concern to prevent harm to the environment, there is a tendency in all such assessments to focus on the negative. To a significant extent, this report is no different, especially as we consider the project's approaches to crop protection and soil erosion. However this project should also have significant positive impacts on the environment. Where we find them, this report will highlight them, and make suggestions for how they can be maximized.

1.2 METHODOLOGY

The SEA has relied on several sources of information. The background was provided by the scoping study, completed in early 2008 by Aquaterre in collaboration with Chemonics. That document provides the legal and institutional context, flags the full range of environmental issues that could arise in each place, and helps to identify the organizations to consult within each region.

The identification of environmental issues in the scoping study is based on detailed surveys conducted in the six regions, designed to elicit all possible impacts of ABC activities. The survey questionnaire asked the respondents to identify positive and negative impacts of the project related to a series of themes, summarized in Table 1.

Table 1. Areas of possible ABIP impact, from scoping study survey

Theme	**Possible Impacts**
Water	quantity used for project activities water management irrigation canals floods depletion of sources
Soil and earth	soil fertility erosion availability and access price of land
Pollution and solid waste	cleanliness and water quality dust odors and smoke toxic substances misuse of pesticides accidental dispersal of pesticides in storage expired pesticides and pesticide packaging
Vegetation	economic interests favoring forest protection how alternate agricultural practices prevent or encourage slash-and-burn agriculture and deforestation forest fires biodiversity
Natural Resources	encouraging nurseries and planting forests or other useful plants cutting trees excessive collection of plants availability medicinal plants, construction wood, fuel wood introduction of invasive species
Conflict	over land, sacred sites or tombs labor migration destruction or theft of crops or livestock between beneficiaries and non-beneficiaries of the project
Income and quality of life	increased income improved opportunities for small and medium enterprises money available for education or health income fluctuations and vulnerable to changes in world price of crops prices of food and other staples transport costs vulnerable groups: female-headed households, poorest of the poor
Health and security	household nutrition and food security medicinal plants accidents due to physical conditions of work or to exposure to chemicals or essential oils alcoholism

The scoping report summarized the responses to the questionnaire, presenting an all-inclusive list of everything mentioned by all respondents. The list was comprehensive, but did not filter the suggested impacts based on such factors as their importance, the probability of their occurrence, the credibility of the respondent, or which subsector might cause them. The SEA team sorted through the responses, using the information in the ABIP action plan and discussions with ATABC staff in Antananarivo to identify the most important issues that might arise from each ABC subsector. Based on this process, we organized our questions and concerns for each region and subsector, taking into account the specific activities described in the action plan, the environmental conditions of the region, and so on. This process served to structure our search for information during our visits to the six MCA regions.

The visits to the regions were brief but did provide an opportunity to get some sense of the important environmental issues. In each region we discussed the work of the ABC with its staff, met with key government officials and other projects, and visited at least two villages working with the ABC. The time constraints, travel times, and road conditions meant that we usually could not meet with beneficiaries growing more than two of the project crops, so for the others we had to rely on the information provided by the ABC.

The team did not rely on the ABIP performance indicators in carrying out the SEA. Those measures were designed before MCC had an environmental policy, so they do not shed any light on the impacts of ABIP activities on the environment, negative or positive. Nor do they shed light on social issues such as gender, equity, or how increased incomes affect household welfare. They were not, therefore, useful in assessing environmental or social impacts of the project.

The SEA considered the environmental dimensions of all the activities included in the ABIP Action Plan of April, 2008. That plan includes all areas in which the project was working at that time or expected to work in the future. It does not include subsectors in which the project worked early, but was no longer active. There are, therefore, subsectors that appear in some of the earlier project reports that are not considered in this study. Since the project does not expect to do further work in these areas, this does not pose a problem. Should they change plans, the same strategy will apply as if they introduce new subsectors not in the Action Plan; the approaches used in this report must be followed, and the same issues addressed, to identify environmental impacts and determine the appropriate response.

As we gathered information about the activities and environmental issues in each region, we designated the possible problems we identified as low, moderate, or high priority. While not actually quantifiable, this prioritization is based on a combination of several definable elements:

- Scale – risks arising from activities in which only a few people are participating are of lower priority than those arising from widespread activities
- Risks to human life or health are considered more important than those to the natural environment. This is a subjective assessment on the part of the SEA team but one that we consider in keeping with social priorities.
- Issues likely to affect a wider group of people or a larger spatial area are considered more serious than those that will affect only a few people or a very small area.

The information from each region is synthesized into a summary table that lists each environmental impact likely to result from project activities. The structure of that table is shown in Table 1.2.

The results of the background work and the information-gathering in the six regions are then synthesized into the set of actions that form the core of the environmental management plan. In selecting these actions, we were very much aware of the need to keep them manageable in scope, so that the ABC staff can easily integrate them into their ongoing work. This is important for two reasons, one conceptual and the other practical. On a conceptual level, the objective of an SEA like this one is for environmental concerns to become a routine part of activities in other fields such as agriculture; they should not be an add-on or a separate topic to be addressed through activities unrelated to the primary work of the project. The practical concerns complement this conceptual approach. An appropriate balance must be maintained between the resources devoted to the primary objectives of the project and those devoted to the environment. Our aim is to make the proposed PGE commensurate both with the importance of the concerns to be addressed and with the ABIP's resources to address them.

Table 1.2 Format of environmental impact summary tables

Impact	**Source**	**Intensity**	**Duration**	**Spatial Extent**	**Frequency**	**Importance**	**Response**
Subsector 1							
Impact 1							
Impact 2							
Subsector 2							
Impact 1							
etc.							

1.3 STRUCTURE OF THE SEA

The results of the SEA are presented in this report as follows:

Chapter 1 This introduction

Chapter 2 Legal context

Chapter 3 Institutional context

Chapters 4-9 Assessment of the six MCA regions. These chapters focus on the farming and processing techniques for each crop more than on the formation of farmer associations and cooperatives, marketing strategies, or other institutional changes, because it is the physical techniques that are likely to have a bearing on the environment.

Chapter 10 Synthesis

Chapter 11 Environmental Management Plan

CHAPTER 2. LEGAL CONTEXT

2.1 LEGAL CONTEXT[1]

The Agribusiness Investment Project is an umbrella program providing a range of different kinds of assistance to the commercialization of agriculture in Madagascar. As such, its specific interventions were not determined until some time after its launch, and they will continue to evolve throughout the life of the project. Consequently, it was not possible to determine whether project activities would fall within the scope of Madagascar's environmental assessment system, and no environmental reviews were conducted before the project began.

The review of Madagascar's legal and institutional context for the environment, the subject of this chapter, takes that context as a point of departure. It reviews pertinent environmental laws, decrees, and orders in order to identify concerns that must be raised in the strategic environmental assessment and activities to be included in the environmental management plan.[2] "Strategic environmental assessments" as such do not have any legal status in Madagascar, at least insofar as the authors of this report have been able to determine, so this report does not respond to specific requirements set in law.

ENVIRONMENT

Law number 90-033[3] of 21 October 1990, the **Malagasy Environment Charter**, provides the overall framework for environmental protection in the country, as set through the National Environmental Action Plan process, discussed below.

Decree number 99-954[4], issued under the authority of the Environment Charter (and known as "MECIE," for its French name Mise en Compatibilité des Investissements avec l'Environnement), sets out the requirements for environmental impact studies (étude d'impact environnemental, referred to here by its French acronym EIE) or environmental agreement programs (programme d'engagement environnemental, PREE). Article 4 of this decree specifies the activities for which an EIE is required, while Article 5 specifies those requiring a PREE.

An EIE, including an environmental management plan setting out how the project will respond to the environmental issues it raises, must be reviewed by a technical committee. Upon approval of the EIE and management plan, the ministry responsible for the environment (at present the Ministry of Environment, Water and Forests, and Tourism, known by its French acronym as MEEFT) delivers a permit allowing work to begin on the project. A PREE, on the other hand, is reviewed and approved only by the environment unit within the ministry responsible for the project; in the case of ABIP this

[1] Links to many of these statutes, as well as to others not discussed here, may be found at http://www.pnae.mg/ee/ref/txt_nat/txt_nat_sect.htm. The full text of many of Madagascar's laws may also be found through http://faolex.fao.org. In addition, footnotes in this chapter provide links to the full text of each of the statutes discussed in this chapter except for a few which could not be found on line.

[2] A law is a statute voted on by the National Assembly. A decree is voted on by the Council of Ministers. It may be proposed either by a single ministry (thus a ministerial decree) or by several (thus an interministerial decree). An order (arrêté in French) is issued by one or several ministries without requiring approval by the Council of Ministers.

[3] http://www.pnae.mg/ee/ref/txt_nat/texte_regl/environnement/loi_2004_015_charte_environnement.pdf

[4] http://www.pnae.mg/ee/ref/txt_nat/texte_regl/environnement/decret_2004_167_guichet_unique_ONE.pdf; this is the version as amended in 2004.

is the Ministry of Agriculture, Livestock, and Herding (Ministère de l'Elevage, l'Agriculture, et la Pêche, or MAEP). The environmental permit or approval of the PREE, as the case may be, would ordinarily be a prerequisite for beginning work on the project.

Given that ABIP is an umbrella project and that its activities or the areas where it might work could not be defined in advance, this approach could not be followed for the overall project. It is important nevertheless to review the specific activities for which MECIE requires an EIE or a PREE, in order to assess whether any individual activities within ABIP might require them.

Article 4 of MECIE lists three general kinds of activities requiring an EIE;

1. Any construction or physical modifications in critical areas as defined by Order (Arrêté) number 4355/97 of May 13 1997 defining critical areas.

(1. Toutes implantations ou modifications d'aménagements, ouvrages et travaux situés dans les zones sensibles prévues par l'Arrêté n° 4355/97 du 13 Mai 1997 portant désignation des zones sensibles.)

The critical areas referred to in **Order 4355/97**[5] include coral reefs, mangroves, small islands, tropical forests, areas subject to erosion, arid or semi-arid zones subject to desertification, marshy areas, areas of natural conservation, water supply buffer zones, and paleontological, archaeological or historical sites along with buffers around them. The decree does not give geographical coordinates for the areas falling under its jurisdiction, nor does it call for this to be done by subsequent regulation. Since much of the country is either forested, arid, or subject to erosion, this would include a great deal of land. The National Environment Office (ONE, Office Nationale pour l'Environnement) has apparently undertaken geographical delimitation of these zones, but we could not obtain information about it. The ABIP does not involve construction, but agricultural extension could be considered to be "physical modification." For the purposes of this SEA, we are focusing primarily on protected areas in considering the impacts of ABIP activities on critical areas, although wherever there is agricultural extensification, it will be important to ask what kind of vegetation was on the land prior to that, and whether it warrants protection.

2. Any investments listed in Annex 1 of this decree (99-954).

Annex 1 provides a lengthy list of activities that require an EIE. Among them, only a few may arise in the ABIP project:

Any plan, program, or policy that could modify the natural environment or the use of natural resources, and/or the quality of the human environment in urban and/or rural areas

(Tout plan, programme ou politique pouvant modifier le milieu naturel ou l'utilisation des ressources naturelles, et/ou la qualité de l'environnement humain en milieu urbain et/ou rural.)

Some of the ABIP activities involve the extension of agriculture on a small scale into lands not previously cultivated or, more often, lands that have not been cultivated for a long time. The cultivation of land left idle over a long period need not be considered a modification of the natural environment, but the conversion of previously uncultivated land does fall into this category.

[5] http://www.pnae.mg/ee/ref/txt_nat/texte_regl/environnement/arrete_4355_97_zones_sensibles.pdf

However a subsequent item in Annex 1 specifies that EIEs are required for agricultural activities only when they affect more than 1000 hectares. Since that is more precise, presumably it should apply to the ABIP.

> Any agricultural or hydro-agricultural project involving development or rehabilitation of more than 1000 hectares
>
> (Tout projet d'aménagement ou de réhabilitation hydroagricole ou agricole de plus de 1000 ha)

The law does not specify whether this means 1000 hectares in total or 1000 contiguous hectares. The ABIP project certain does not work on any areas as large as 1000 contiguous hectares, but in total it probably will affect 1000 hectares on many different parcels. However, it does not involve development or rehabilitation of hydro-agricultural perimeters. MECIE would not require EIEs on each of the parcels where ABIP works; however if any individual parcels require EIEs because of the nature of activities occurring there, the SEA will flag them and call for required studies to be carried out.

> Any industrial or intensive herding projects
>
> (Tout projet d'élevage de type industriel ou intensif)

The project is engaged in herding activities, but they are neither industrial nor intensive, so they do not fall under Annex 1 and Article 4.

> Any storage unit for pesticides of capacity greater than 10 tonnes
>
> (Toute unité de stockage de pesticides d'une capacité supérieure à 10 tonnes)

Any storage of pesticides through this project will be on a much smaller scale than this.

> Any spreading of chemicals that could, by its scale, harm the environment and human health.
>
> (Tout projet d'épandage de produits chimiques susceptible, de par son envergure, de porter atteinte à l'environnement et à la santé humaine.)

Any use of pesticides, pretty much irrespective of scale, could pose risks to human health or the environment if done improperly, so qualifying chemical use based on scale is curious. Since the scale that falls under this criterion is not defined in quantitative terms, presumably this calls for a subjective evaluation of whether the use of chemicals is likely to cause harm. The use of pesticides in this project will be only undertaken on a very small or moderate scale, and has been the subject of considerable review through development of the project's crop protection plan . This report will consider the use of pesticides within the implementation of the crop protection plan, but will not attempt to supplant the extensive work that has already been done to ensure that pesticides are used safely through ABIP.

> Any industrial operation subject to authorization, confirming to the dispositions of the regulations in place under law 99-021 of 19 August 1999 relative to the policy of management and control of industrial pollution

(Toute unité industrielle soumise à autorisation, conformément aux dispositions des textes réglementaires en vigueur de la loi n° 99-021 du 19 août 1999 relative à la politique de gestion et de contrôle des pollutions industrielles)

Although ABIP is an agricultural project, it works in the essential oils subsector, and is involved with distillation of leaves in order to produce those oils. As discussed below, those distillation activities may be considered to require authorization under Law 99-021,and therefore to require an EIE as well. This issue will be considered further below.

3. Any other activities considered likely to harm the environment but not covered by this article or Annex 1.

Article 5 of MECIE and Annex 2 of the decree set out the rules for the PREE and activities for which it must be carried out. Several of these fall within the activities of ABIP.

Any livestock semi-industrial or artisanal livestock project

(Tout projet d'élevage de type semi-industriel et artisanal)

ABIP is supporting the raising of goats in the region of Boeny; this will be considered in this study and may require a PREE..

Any forest operations over 150 hectares

(Toute exploitation forestière de plus de 150 ha)

The distillation of essential oils, currently being undertaken in Amoron'i Mania, and formerly part of project activities in Atsinanana, uses wood as a source of fuel. At present, as discussed in this report, total wood consumption would clear the equivalent of less than one hectare of forest, so this falls far below the cutoff for carrying out a PREE.

In addition, MECIE calls for a PREE for any industrial activity subject to a declaration rather than an authorization under Law 99-021; this will be considered below.

The decision to conduct an SEA instead of an EIE or PREE prior to the start of ABIP has apparently been accepted by MEEFT and ONE. However, the basis for this approach in Malagasy law is not completely clear. It is, therefore, recommended that MCA seek appropriate legal expertise to clarify this issue, both for their own future activities and perhaps for the benefit of other projects as well.

Industry

Law 99-021 of August 19, 1999[6] establishes the system for managing industrial pollution in Madagascar. Article 12 explicitly states that this law applies to both industrial and artisanal activities; therefore the distillation activities carried out with ABIP support come under its jurisdiction. The law divides industrial activities into two categories; those requiring authorization of the ministry responsible for industry at present the Ministry of Economy, Commerce and Industry (MECI) prior to beginning operations, and those required only to declare their activities to MECI prior to beginning operations. Articles 59 and 60 of the law define activities required to obtain authorization as those:

[6] Full text available at http://droit.francophonie.org/df-web/publication.do?publicationId=2594 or at http://www.pnae.mg/ee/ref/txt_nat/texte_regl/industrie/loi_99_021_gestion_pollutions_industrielles.pdf

> Susceptible by their location, the nature of their activities and production, by the primary material and inputs they use, by the nature and power of their energy sources, the nature and volume of their discharges, to present inconveniences, troubles of all kinds, risks and dangers, be it in conforming to the neighborhood or for the health, security, hygiene, and health of the public, be it for cultivation or forests and more generally for agricultural and livestock activities, be it for preservation of the natural and human environment or for the preservation national patrimony including sites and monuments
>
> (susceptibles par leur localisation, la nature de leurs activités et de leur production, par les matières et intrants qu'ils utilisent, par la nature et la puissance de leurs sources d'énergie, la nature et le volume de leurs rejets, de présenter des inconvénients, des troubles de toute nature, des risques et dangers soit pour la conformité du voisinage, soit pour la santé, la sécurité, l'hygiène et la salubrité publiques soit pour les cultures ou forêts et plus généralement pour les activités agricoles ou d'élevage, soit pour la préservation de l'environnement naturel et humain, soit pour la préservation des éléments du patrimoine national y compris les sites et les monuments.)

Industrial activities that do not meet any of these criteria are subject only to declaration. Article 59 further specifies that this applies to activities irrespective of their dimensions. Thus the very small scale and artisanal nature of the distilleries supported through ABIP would appear not to exempt them from authorization under this law and carrying out an EIE under MECIE.

However, this report is not recommending at this time that such authorization must be sought, nor that an EIE be conducted. Prior to taking any such step, we recommend instead that MCA, through ATABC if necessary and feasible, seek appropriate advice from Ministry of Environment, Water and Forests, and Tourism and investigate the application of this law in Madagascar. It seems probable that in practice very small artisanal operations are not in fact expected to seek authorization from MECI and carry out a full EIE prior to beginning operations. If that is so, then it is certainly not recommended that ABIP undertake those steps for its distilling activities.

If in fact MECI authorization and an EIE are required, the question arises of who is responsible for carrying it out. If the industry were not receiving support from any donor agency, the private promoter would be expected to seek MECI authorization and carry out the EIE prior to beginning operations. If there were no private enterprise involved, and ABIP were entirely responsible for making the capital available and initiating the activity, then these tasks would be project responsibility. In any case, ABIP should determine whether the appropriate authorizations have been obtained and work with the promoters to comply with all requirements under Law 99-021 and MECIE.

FORESTS

Madagascar began a revision of its legal framework for forest management in 1997. **Law number 97-017**, of August 8, 1997, lists the types of land that fall under the jurisdiction of forest laws and regulations.[7] These include all natural forests, plantation forests owned by public sector entities, among other categories. Lands that come under this jurisdiction may benefit from certain tax benefits, so the law also specifies that any private forest owner may choose to include his or her property within this domain.

[7] http://www.pnae.mg/ee/ref/txt_nat/texte_regl/foret/loi_97_017_legislation_foret.pdf

The next **law, number 97-1200** of October 2, 1997, sets out the broad lines of a national forest policy.[8] This document begins with an overview of the history of forest management policy in Madagascar, and the recognition that traditional practices are no longer viable. The new policy has four major axes:

1. Put an end to current patterns of forest degradation and destruction. This should be done by finding substitutes for traditional agricultural and livestock practices that harm forests, bearing in mind the poverty of the people engaged in such practices. It must involve some control over bush fires, taking into consideration the specific reasons why fires are set. It must also give higher priority to forest conservation, in order to preserve both biodiversity and the environmental services of the forests upon which people depend.

2. Improve forest management. To this end, one key task is the development of forest management plans that set out, based on an assessment of the characteristics of the remaining forests, how and for what purpose each area is to be used, by whom, under what legal status, and so on. In parallel with the development of these plans, it is essential to determine who has which rights to access or use which kinds of forests; the enforcement of those rights will be a key component of the implementation of the management plans. It will also be essential to review the existing system of forest taxes and fees for services, to ensure that they correspond to the benefits users receive from the forest, and to strengthen the National Forest Fund, which provides resources for forest management. Finally, improved forest management depends on having a professional cadre of forest managers, in both public and private sectors.

3. Encourage reforestation. This should be done by providing training, technical support, incentives, and secure land tenure to those who wish to plant forests. At all levels of government, reforestation plans must be designed to meet the demand for forest products in the area concerned. They should also take into account the importance of forests as a key tool for watershed protection, give the important problems of siltation of river basins throughout the country

4. Improve the economic performance of the forest sector. This will involve making better use of sustainably managed forest products, strengthening both artisan and industrial enterprises engaged in transformation of those products, and assisting in their marketing. It also involves strengthening the country's ecotourism sector.

The law goes on to discuss the mechanisms through which these major axes should be implemented; an emphasis on sustainable forest management that must take into account both biological and economic aspects of sustainability, with roles for public and private sector, reform of the government agencies responsible for forest management, and the involvement of local communities. To achieve this, a sustainable financing mechanism is also needed; the law indicates that the National Forest Fund should become this mechanism.

As ABIP is not a forest project and is not seeking to work in forest areas, this forest policy has only limited implications for the project. The primary link that must be made is between agricultural extensification that may occur through ABIP and the forest management plans called for by the policy. It will be important for the ABC staff to be familiar with those plans in the six ABC regions,

[8] http://www.pnae.mg/ee/ref/txt_nat/texte_regl/foret/loi_97_1200_nouvelle_politique_foret.pdf

and to be well aware whenever their activities may in any way overlap with the intended management of forests in the region.

A much earlier statute also has some bearing on ABC activities. **Ordinance number 60-127**, originally passed in 1960 and amended several times thereafter, specifies the conditions under which land clearing is permitted, and the conditions under which fire may be used to do so.[9] This ordinance prohibits any clearing of land in national forest areas, and, although this may be observed more in the breach than in fact, it requires a permit for any other land clearing or setting of fires. While the ABC staff is certainly not going to begin seeking permits to clear land, it is recommended that they be aware of where the national forest areas are in their region, to ensure that they are not encouraging agricultural extensification into them. This will call for the same communication with the regional office responsible for water and forests as will compliance with the forest policy.

PROTECTED AREAS

Although protected areas have existed in Madagascar for decades, the basic legislation concerning them was rewritten in 2001, with the **Law number 2001/05** on the management of protected areas.[10] This law set up the operating procedures for the protected areas managed by ANGAP (Association Nationale pour la Gestion des Aires Protégées), the national parks agency. It defines the three categories of protected areas in the country. Integrated natural reserves are designed to protect a representative area of a key type of ecosystem, including both flora and fauna. National Parks are designed to protect key resources while also providing places for recreation and education. Special reserves are created in order to protect specific ecosystems, plant or animal species, or geological formation.

Each protected area is made up of a core protected area, in which all uses are tightly regulated, and a buffer zone with greater flexibility in use. The buffer zone, in turn, can include a number of different use areas, such as a zone of controlled residence within the park, a zone of managed use within the park, or a service zone which may include tourist or educational infrastructure. Outside the protected area are a series of additional zones. The first is the protected zone, in which agricultural and livestock activities are permitted, and other activities may be authorized by the protected area manager if they do not pose any threat. The next is the peripheral zone, where adjacent communities typically live. Anything proposed in that zone other than traditional livelihood activities should involve collaboration among all of the organizations or individuals concerned to ensure appropriate protection of the protected area.

The law gives ANGAP a number of rights and responsibilities in connection with park management. The agency has the right to collect entry fees and other fees for use of the parks. It is responsible for enforcement of the obligations of park users, meaning that ANGAP staff must include police as well as managers.
This law has several implications for ABIP. The presence of all these buffer zones means that the ABC staff must be aware of where ANGAP protected areas are, and of any possible impacts of ABC activities on those areas. As there are only a few ANGAP areas in the six MCA regions, this is not difficult. Although not specified in the law itself, nor in the implementing decree (number 2005/13), ANGAP allocates half of the entry and user fees from each area to development activities in the

[9] http://www.pnae.mg/ee/ref/txt_nat/texte_regl/foret/ordonnance_60_127_avec_ses_modifications.pdf
[10] http://www.parcs-madagascar.com/cape/coap_ver_franc.doc. Rules for implementation of this law are set out in Decree 2005-013, which is apparently not available on the internet.

buffer zones. When the ABCs are working near protected areas, therefore, they must be sure to coordinate with ANGAP, to ensure conservation of the protected area and complementarity between ABC and ANGAP development activities. Finally, ANGAP's policing role means that if ABC activities do unintentionally lead to agricultural extensification into protected areas, ANGAP will be responsible for evicting the cultivators. Avoiding such a situation is obviously preferable to responding to it.

In addition to the network of protected areas managed by ANGAP, Madagascar is engaged in creating a much broader system of protected areas, referred to as the Système d'Aires Protégées de Madagascar (SAPM) or sometimes by the label "Durban Vision," because the president announced their creation at the Durban World Parks Conference in 2002. The creation of this system has been authorized by Decree 2005-848, which establishes new categories of protected areas and authorizes a wide range of public and private organizations to manage them.[11] Some of these areas have already been given legal existence, but new ones will be created over the next few years. As with the ANGAP system, it will be important for the ABCs to coordinate with the managers of these areas to ensure complementarity of activities. Because no one agency will be managing them, we cannot specify in advance with whom the ABCs must collaborate; however if they are keeping up on activities in their region, it should be easy to be aware of what is being proposed in this area.

Law number 96-025[12] of September 30, 1996, may become increasingly important as the SAPM is implemented. That law gives local communities the right to take responsibility for management of natural resources near them through a contractual arrangement with the public entity (e.g. the local government or a national ministry) that was previously responsible. For purposes of the contract the local community has the status of a non-governmental organization. The contract specifies how the resource must be managed – usually this involves sustainable management of forests or other areas rich in biodiversity – and the financial gains or resource use to which the community is entitled – e.g. tourism revenues or the right to sustainably harvest plants or wildlife in a protected area. Such community-based natural resource management arrangements are typically established under the aegis of a donor-funded project or an international conservation organization. If such management contracts are signed in areas targeted by the ABCs, it will be important to ensure that they are considered in the design of ABC activities.

CROP PROTECTION AND PESTICIDE USE

Ordinance 86-013[13] gives the crop protection service within the Ministry of Agriculture responsibility for managing issues related to plant pests and products with which they are treated. The Ministry is responsible for preventing the importation or spreading of plant pests and is given the authority needed to do so. Article 15 specifies that all importation, manufacture, or transformation for sale of crop protection products must be authorized by the Ministry. **Decree 86-310**[14] of September 17, 1986 details the specific responsibilities and authorities of the Crop Protection Service in carrying out Ordinance 86-310; it makes no reference to pesticide control.

Decree number 92-473[15] spells out the implementation of Article 15 of Ordinance 86-013. It creates a committee responsible for authorizing the importation, manufacture, distribution, or use of specific

[11] http://faolex.fao.org/docs/texts/mad66499.doc
[12] http://www.pnae.mg/ee/ref/txt_nat/texte_regl/environnement/loi_96_025_GELOSE.pdf
[13] http://faolex.fao.org/docs/pdf/mad7459.pdf
[14] http://faolex.fao.org/docs/pdf/mad7460.pdf
[15] http://faolex.fao.org/docs/pdf/mad7461.pdf

crop protection products, and gives the Crop Protection Service the authority and responsibility for implementing the decisions of that committee. It sets out the specific procedures to be followed prior to authorizing any products. The criteria for authorization pertain to effectiveness in dealing with crop pests, toxicity for plants, impacts on the environment, and impacts on human health.

This decree is implemented through three orders (arrêtés) that give the Crop Protection Service specific authorities to control the importation, manufacture, and marketing of crop protection products. **Order number 7450/92**[16] specifies the procedures for sampling the products in order to analyze their active ingredients and verify their contents. **Order number 7451/92**[17] specifies how all agrochemicals must be labeled, including information about the active ingredients, the modes of use, the risks posed, and so on. The labels must be in different colors, following the World Health Organization safety classifications for agrochemicals. For explosive, corrosive, or inflammable products, the label may use the colors and symbols proposed by the UN Food and Agricultural Organization, although this is not mandated. **Order number 7452/92**[18] specifies the physical conditions under which large quantities of agrochemicals must be stored.

A number of other orders have also been promulgated concerning use of chemical pesticides, the texts of which could not be located on the web or from other sources.[19] These include Interministerial **Order number 0467/93**, which regulates importation, marketing and distribution of agropharmaceuticals, **Order number 6225/93**, which suspends use of specific highly toxic chemicals in compliance with the Stockholm Convention, and Order **number 6242/93**, which regulates sales of agrochemicals. According to the SEA Scoping Study, all retail sales of pesticides must be done from places designed for this purpose and meeting specific criteria pertaining to construction and safety; other sales are banned.

For the most part, these statutes regulate the activities of the importers, manufacturers, and distributors of chemical pesticides, not those of the users. The ABCs are supporting the use of chemical pesticides for some subsectors and in some regions, and in a few cases they are actually purchasing and distributing the products, so an awareness of these laws is important. In particular, the ABCs must not purchase anything not authorized in Madagascar, and anything they supply must be properly labeled. When the peasants themselves purchase pesticides that are being marketed in violation with these laws, as they do in some cases, the ABC should discourage such activity. They are, in fact doing this, not on any legal grounds, but simply based on common sense; the purchase or use of unlabeled pesticides is dangerous.

Madagascar has also promulgated regulations concerning biological pest control methods and integrated pest management. In particular, **Decree number 99-798**[20] of 6 October, 1999 pertaining to authorization of agents of biological pest control and biopesticides, requires authorization of all natural crop protection products along the lines of the authorization of chemical products. Most of this decree pertains to the use either of animals (insects, usually) to keep plant pests in check or of biopesticides made from exotic plants. However it also regulates the use of biopesticides made from indigenous plants, which would include those from neem, papaya, hot peppers, and so on. These products are an important part of the ABCs' crop protection strategy. The ABCs themselves are not

[16] http://faolex.fao.org/docs/pdf/mad7463.pdf
[17] http://faolex.fao.org/docs/pdf/mad7464.pdf
[18] http://faolex.fao.org/docs/pdf/mad7466.pdf
[19] Some information is available here http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2006/04/ 10/000160016_20060410113417/Rendered/INDEX/e136410PAPER.txt and in the SEA Scoping Study, Annexe 3, pp. 9-10.
[20] This decree could not be found on the internet; the full text is in an appendix to this chapter (in French).

involved with manufacturing or distributing these products, so they are not liable for implementing the appropriate legal procedures; this is the responsibility of the research organizations with which the project works, in order to register and authorize their use.

WATER

The Water Code, Law number 98-029 of 19 December, 1998[21], is the basic statute pertaining to ownership, management, and supply of water. It stipulates that water is public good, and all use or discharge is subject to civil law, under the authority of the National Water and Sewer Authority (in French the Autorité Nationale de l'Eau et de l'Assainissement or ANDEA). Articles 10 and 11 of the code may be relevant to the ABC activities. They specify that no surface or ground water may be extracted for any purpose, or for any period of time, without authorization. However, this is then qualified to say that water may be extracted for personal use if the quantity is below threshold levels to be specified by decree. Eleven decrees and orders implementing the Water Code were apparently promulgated in 2006, according to a reference on the website of the Ministry of Energy and Mines.[22] However it has not been possible to locate the texts of those decrees, so we do not know what the thresholds are. Since the ABCs are not engaged in building irrigation systems, nor even in renovating them, this probably would not affect them in any case. Moreover, it seems likely that the thresholds have been set high enough that they would not pertain to small-scale agricultural or household use of water.

Several decrees establish the rights and responsibilities of agencies involved with water management, pursuant to the Water Code. **Decree number 2003/192**[23] defines the structure, attributions, and operations of the National Water and Sewer Authority, which comes under the authority of the Ministry of Energy and Mines (not, as one might expect, the Ministry of Environment, Water and Forests, and Tourism). **Decree number 2003/191**[24] defines the structure, attributions, and operations of watershed agencies, created at the level of the province (*faritany*). These agencies are responsible for all activities related to water in their province, presumably including irrigation, although this is not specified in the decree. To the extent that the ABCs get involved with rehabilitation of irrigation systems, therefore, they must collaborate with the watershed agencies as appropriate.

At a more local scale, **Decree number 90-642**[25] pertains to water users' associations that are responsible for the maintenance of irrigation and drainage infrastructure, and at least in part responsible for the costs of that maintenance. Such water users' associations are assisted by the Ministry of Agriculture, and are created under the aegis of the most decentralized level of local government that includes all the users of the infrastructure concerned. The associations are responsible for management and maintenance of the systems, and for their expansion if they consider that necessary. Their members are responsible for paying for these activities, according to a formula set out in the decree.

[21] http://www.pnae.mg/ee/ref/txt_nat/texte_regl/energie_eau/loi_98_029_code_eau.pdf or http://www.droit-afrique.com/images/textes/Madagascar/Madagascar%20-%20Code%20de%20Eau.pdf
[22] http://www.energy.gov.mg/index.php?option=com_content&task=view&id=32&Itemid=33
[23] http://www.pnae.mg/ee/ref/txt_nat/texte_regl/energie_eau/decret_2003_192_ANDEA.pdf
[24] http://www.pnae.mg/ee/ref/txt_nat/texte_regl/energie_eau/decret_2003_191_agence_bassin.pdf
[25] http://www.pnae.mg/ee/ref/txt_nat/texte_regl/foncier_agriculture/decret_90_642_gestion_entretien_reseaux_hydroagricoles.pdf

In point of fact, the maintenance of irrigation and drainage systems is cited as a bottleneck for a number of subsectors in the ABIP action plan. In such cases the ABC staff may want to work with these water users' associations, in order to improve their operations and thus improve the condition of the infrastructure. This would be part of the ongoing work of the ABC, not an activity within the environmental management plan.

Several other statutes pertaining to water have less relevance to the ABC activities. **Decree number 2003/464**[26] of April 15, 2003 specifies standards for surface water quality and for effluents from industry, hotels, and establishments using petroleum products. It does not pertain to agricultural runoff, and therefore should not be of concern to the ABCs. **Decree number 2003- 941**[27] pertains to ensuring the quality and safety of drinking water, both water that comes from the environment and bottled water; this should not have any bearing on the ABCs.

RURAL DEVELOPMENT ACTION PLANS

The Rural Development Action Plans were established by **Decree number 99-022** of October 9, 1999[28], which established the institutional framework and process through which the national ministries collaborate on reviewing all development projects and programs, ensuring coherence among them, and establishing priorities among them. Although the plans themselves are individual documents, they are prepared by a Permanent Steering Committee (Equipe Permanente de Pilotage, or EPP). The EPP may, if needed, create regional groups that work on the regional development plans (Plans Régionaux de Développement, or PRD), called Groupes de Travail de Développement Rural Régionaux (GTDR). Although in practice the GTDRs appear to be of limited effectiveness due to lack of funds, they are responsible for oversight of ABC activities, as of all other development activities. The ABCs therefore should remain in contact with them as part of their ongoing activities.

2.2 INTERNATIONAL CONVENTIONS

Madagascar is a signatory to a number of conventions that bear some relation to ABIP projects, discussed in the order in which they were adopted:

The Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention, 1971)

The Ramsar Convention, named after the Iranian city where it was signed, engages its signatories to identify and protect wetlands of international importance within their territories. Madagascar has identified five wetlands as being of international importance; Tsimanampetsotsa Lake, Manambolomaty Lakes Complex, Lake Alaotra wetlands and basin, Torotorofotsy marshes and watershed, Tsarasaotra Park, and the Bedo Wetlands. Two of these, the Torotorofotsy marshes, and the Bedo Wetlands are in provinces where ABIP is working (Toamasina and Mahajanga, respectively), though neither is close to the communities where the project works. The Ramsar sites are not part of the national park system managed by ANGAP. They are managed in a variety of ways, including by community groups, NGOs, or private organizations. Should the project undertake any activities in

[26] http://www.pnae.mg/ee/ref/txt_nat/decret_2003_464_eau_surface_rejets.PDF
[27] http://www.pnae.mg/ee/ref/txt_nat/texte_regl/energie_eau/decret_2003_941_surveillance_eau.pdf
[28] http://www.pnae.mg/ee/ref/txt_nat/texte_regl/foncier_agriculture/decret_99_022_institutionnalisation_processus_PADR.pdf or http://faolex.fao.org/docs/texts/mad73624.doc

proximity to these areas, it will be essential to ensure that they do not have any impact on them, as with all protected areas.

United Nations World Heritage Convention (1972)[29]

The world Heritage Convention recognizes the existence of natural and human-made sites of global significance that warrant protection by the states in which they may be found. It calls upon signatory countries to identify such sites on their territories, and offers financial support for their protection when needed. Madagascar has three World Heritage Sites, the Tsingy de Bemaraha Strict Nature Reserve, the Royal Hill of Ambohimanga, and Rainforests of the Atsinanana. All three are part of the country's protected area system. As with all protected areas, ABIP must and ensure that its activities do not encroach on or otherwise have any impact on them.

Convention on International trade in Endangered Species (CITES, 1975)[30]

CITES defines three categories of species according to the extent to which they are at risk, and requires signatory countries to permit and track international trade in species within each category. This convention does not have any direct relation to the ABIP project, which pertains to trade in agricultural products, largely domestic, and not to wild species.

Rio Declaration on Environment and Development (1992)[31]

The Rio Declaration, proclaimed at the UN Conference on Environment and Development, sets out twenty-seven broad principles pertaining to environment, development, and the links between them. Several of these are relevant to ABIP, such as principle 4, that environmental protection must be an integral part of all development activities and principle 20 calling for the full participation of women in all development activities. These issues are key elements of this SEA. For the most part, however, the Rio principles are background to virtually all development activities, as well as to much environmental policy and law in Madagscar as throughout the world. As such, they do not have specific implications for ABIP above and beyond the need to comply with laws in place and carry out the project as designed.

Agenda 21 (1992)[32]

Agenda 21 spells out the programs and approaches through which the principles of the Rio Declaration are to be implemented. As with the declaration, Agenda 21 is fundamental to most development activities in Madagascar, and some components have specific relevance to ABIP. The document sets out a broad set of programs for implementation of the Declaration. Madagascar's activities in the Agenda 21 framework are incorporated into its development planning, its legal framework, and participation in international partnerships organized through Agenda 21. For ABIP, therefore, aligning project activities with Agenda 21 will be accomplished by aligning them with other

[29] Full text available at http://whc.unesco.org/en/conventiontext/.
[30] Full text available at http://www.cites.org/eng/disc/text.shtml#texttop.
[31] Full text in English, and link to text in French, available at http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=78&ArticleID=1163
[32] Links to full text in English or French available at http://www.un.org/esa/sustdev/documents/agenda21/index.htm

elements of Madagascar's legal and institutional context; Agenda 21 does not call for specific additional actions or approaches on the part of ABIP.

United Nations Framework Convention on Biodiversity (CBD, 1992)[33]

The CBD requires signatory countries to develop plans for conservation and sustainable use of their biodiversity, integrating this into sectoral and cross-sectoral plans, programs, and policy. To do this, they are required to identify their own biodiversity, monitor its state and use, and implement impact assessment techniques to ensure that impacts on biodiversity are considered before projects or programs are implemented. Madagascar has complied with these requirements through the implementation of MECIE, as documented in their 2005 report to the CBD Conference of Parties (MEEFT 2005); therefore ABIP's compliance with this element of the CBD will be accomplished by ensuring that the project is in compliance with MECIE. The CBD also requires the development of a protected areas system where this is an appropriate strategy for conserving biodiversity. Madagascar has developed an extensive and growing system of protected areas. To ensure ABIP compliance with this element of the CBD, it will be important to ensure that the project has no negative impacts on those areas, and contributes to improving them insofar as possible.

United Nations Convention to Combat Desertification (1994)[34]

The Desertification Convention calls on signatories facing this challenge to establish strategies and priorities for combating desertification and mitigating the impacts of drought within the context of their sustainable development plans. Countries may prepare national action programs on desertification; these will give them priority in receiving financial support provided by developed countries through the convention. The Madagascar action plan calls for several approaches of relevance to ABIP.[35] In particular, it calls for close attention to erosion problems and improving soil productivity in all agricultural activities, as well as to increasing agricultural yields. Although the regions most threatened by desertification are not those where ABIP is active, these approaches are nevertheless inherent in the ABIP activities, and are assessed in carrying out the SEA.

United Nations Framework Convention on Climate Change (FCCC, 1992) and the Kyoto Protocol (1997)[36]

The FCCC calls for reduction of greenhouse gas emissions by signatory countries; the Kyoto Protocol sets mandatory reduction targets for thirty eight industrialized countries plus the European Union as a whole (referred to as "Annex B" countries, because their targets are listed in Annex B to the Protocol). The Protocol also establishes three market-based mechanisms to help the Annex B countries reduce their emissions in the most cost-effective ways possible. Madagascar is a signatory to the Protocol but of course it is not an Annex B country, so it does not have an emissions reduction target. It may, however, be a beneficiary of the Protocol's trading mechanisms; carbon trading may provide a source of funding for forest conservation in the country. If protected areas are established under such schemes, the ABIP project must respect them as it respects all protected area in the

[33] Full text available at http://www.cbd.int/convention/convention.shtml.
[34] Full text in English or French may be accessed through http://www.unccd.int/convention/menu.php
[35] MEEFT, undated
[36] Full text of the Kyoto Protocol available at http://unfccc.int/essential_background/kyoto_protocol/background/items/1351.php.

country. Aside from this, the FCCC and the Protocol will not have any direct implications for the project.

Rotterdam Convention on Trade in Hazardous Chemicals and Pesticides (1998)

The Rotterdam Convention sets out procedures for identifying pesticides and other chemicals that are harmful and ensuring that all international trade in those products is done with full knowledge of the risks and potential for harm. As ABIP activities include introduction of pesticides, it will be essential to ensure either that no products listed in Annexe III of the convention are recommended.

Rome Declaration on World Food Security and World Food Summit Plan of Action (1996)

The Rome Declaration and Plan of Action are the outcome of the World Food Summit, held in Rome in 1996.[37] The declaration essentially calls for global action to ensure adequate access to food and nutrition for all people in the world. The action plan sets out more specific objectives and actions through which signatories to the declaration will work to achieve its goals. The ABIP activities fall within the scope of the action plan in that they work to increase food production and support commercialization of agricultural products. The action plan does not require other specific actions on the part of ABIP.

Stockholm Convention on Persistent Organic Pesticides (2001)[38]

The Stockholm Convention defines three categories of persistent organic chemicals; those whose production or export is banned (Annex A) restricted (Annex B), or may be unintentionally produced through non-agricultural activities (Annex C). Signatories to the convention are required to report on the measures they have introduced to reduce or eliminate intentional production or export of Annex A and B chemicals and to reduce releases of Annex C chemicals. Madagascar ratified the convention in 2005 but has not yet submitted its implementation report. Nevertheless ABIP, in its use of pesticides, should not recommend any Annex A chemicals and should strictly avoid recommendation of Annex B chemicals.

Codex Alimentarius[39]

The Codex Alimentarius is a set of international standards on food quality, applicable to foods for domestic consumption as well as international trade. It was established in 1963 by the UN Food and Agriculture Organization (FAO) and World Health Organization (WHO). Development of the code, which has been an evolutionary process, is coordinated by the Codex Alimentarius Commission. The Codex is comprised of general hygiene standards, codes of practice, and principles and guidelines, as well as, perhaps most importantly, standards applicable to thousands of specific commodities. One of the commodities covered by the code, is honey, which is produced with ABIP support. The honey

[37] Full text may is available in English at http://www.fao.org/DOCREP/003/W3613E/W3613E00.HTM or in French at http://www.fao.org/DOCREP/003/W3613F/W3613F00.HTM.

[38] Full text is available in English at http://chm.pops.int/Portals/0/Repository/conf/UNEP-POPS-CONF-4-AppendixII. 5206ab9e-ca67-42a7-afee-9d90720553c8.pdf and in French at http://www.pops.int/documents/convtext/ convtext_fr.pdf.

[39] Details and texts available through www.codexalimentarius.net. The honey standard is number 12-1981, and is available on the web at http://www.codexalimentarius.net/download/standards/310/cxs_012e.pdf.

standard, most recently updated in 2001, covers the moisture, sugars, and non-dissoluble solid content permitted in honey, labeling, and a number of other content issues. Honey produced with ABIP support will be expected to comply with these standards.

Cartegena Protocol on Biosafety (2003)[40]

The Protocol on Biosafety was adopted as a supplementary protocol under the CBD to deal with the risks to biodiversity from the introduction of genetically modified organisms (or "living modified organisms," in the terminology of the protocol). In agriculture, such organisms could be introduced either as improved seeds to increase crop output or as a form of pest control. Neither of these activities will be part of ABIP, however, so this protocol should not have any bearing on project activities.

African Convention on the Conservation of Nature and Natural Resources (2003) [41]

This convention, originally adopted in 1968 and revised in 2003, calls on signatory nations to implement a range of sound practices for the management of natural resources, some of them relevant to ABIP. The 2003 version of the convention will come into effect once fifteen countries have ratified it; as of July 2008, it has been ratified by 8 countries.[42] Madagascar signed it in 2004, however, so complying with its provisions is appropriate even if it is not officially in effect.

With regard to soil and land management in agricultural projects, the convention calls on countries to:

> i) improve soil conservation and introduce sustainable farming and forestry practices, which ensure long-term productivity of the land,
> ii) control erosion caused by land misuse and mismanagement which may lead to longterm loss of surface soils and vegetation cover,
> iii) control pollution caused by agricultural activities, including aquaculture and animal husbandry; (Article VI, section 3 b i-iii))

These requirements will apply to ABIP activities, and will be considered in carrying out the SEA. Regarding land cover, the convention calls on signatories to:

> b) take concrete steps or measures to control fires, forest exploitation, land clearing for cultivation, grazing by domestic and wild animals, and invasive species; (Article VIII section 1 b))

This will be a concern for both cultivation and herding activities in ABIP; the SEA will track how well the ABCs are addressing these concerns in supporting agricultural production and commercialization. The convention also calls on signatories to establish conservation areas (Article XII), prevent pollution of the environment (Article XIII), and carry out environment impact assessments (Article XIV). All of

[40] Full text available at http://www.cbd.int/biosafety/protocol.shtml
[41] Full text of 2003 revised version available in English at http://www.intfish.net/treaties/africa2003.htm or in French at http://www.tematea.org/french/?q=node/4919
[42] See http://www.africa-union.org/root/au/Documents/Treaties/List/Revised%20Convention%20on%20Nature%20and%20Natural%20Resources.pdf for a list of countries which have signed and ratified this convention.

these have already been enacted through Malagasy law, so ABIP compliance with these elements of the convention will be ensured by ensuring compliance with laws in place.

Madagascar is also a signatory to a wide range of other international conventions and agreements that are of less relevance to ABIP, though they are relevant to sustainable development or poverty reduction. Among these are:

- World Health Declaration, through which the members of the World Health Organization in 1998 recognized health as a human right and committed themselves to making health care available to all citizens in the 21st century.
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1992
- Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa (1991)
- Convention concerning Safety in the Use of Chemicals at Work (1990)
- Convention concerning the Prevention of Major Industrial Accidents (1993)
- Vienna Convention on Protection of the Ozone Level1985)
- Montreal Protocol on Substances that Deplete the Ozone Layer (1987)

2.3 MILLENNIUM CHALLENGE CORPORATION GUIDELINES

Environment

ABIP activities must comply with the environmental guidelines of the MCC. These require reviews of environmental consequences of proposed activities, and are designed to prevent significant impacts on the natural, physical or social environment. The MCC enabling legislation prohibits the agency from funding any activities considered "likely to cause significant impacts," which includes any use of pesticides that are banned for use in the United States. The MCC guidelines divide project activities into three categories:

Category A: Has the potential to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. Requires an EIA, on which the disbursement of MCC funds is dependent.

Category B: Less adverse impacts are possible. Impact assessments are required "as appropriate," as are environmental management plans (EMPs).

Category C: No adverse impacts expected.

Category D: Projects involving an intermediary that disburses funds through subprojects. All subprojects must comply with domestic laws concerning environmental assessment, and MCC may require other assessment if needed.

Public consultation and input is required in carrying out all such assessments. This was done through the survey conducted during the scoping study, whose results have been integrated into the SEA. Public communication of the results of this SEA will be carried out by ATABC upon acceptance of this report.

In terms of environmental assessment, the Madagascar Compact (the first MCC Compact) presents a unique case. The Compact was signed in April 2005 and MCC Environmental Guidelines were not adopted until January 2006. As such, project categorization was not assigned for ABIP. As project design evolved, market opportunities were identified, and the services to be delivered to improve production, marketing and business practices evolved as well. Throughout this process, MCC and MCA environmental specialists screened activities, integrating fatal flaws analyses into the identification of investment opportunities, conducted site-visits, and recommended site-specific mitigation measures for certain small-scale activities. In addition, site-specific environmental analyses were conducted and EMPs developed for the construction of each of the 12 Agricultural Business Centers. This SEA is an attempt to develop a comprehensive analysis of the project activities now that the final determination of the sub-sectors to be supported in each region has been determined.

The application of MCC regulations in the context of ABIP may raise a question about the extent of MCC authority to call for environmental reviews. Where an activity is carried out with MCC funding, MCC can require reviews conducted according to its specifications. Where ABIP is initiating an activity that would not occur otherwise, even if it is carried out and paid for by the private sector, MCC can also call for such reviews. Where, however, ABIP is providing technical or institutional support to activities that were underway before the project began, and that would occur with or without MCC input, it is not clear whether MCC can require the private promoters to conduct environmental reviews, and it is even less clear whether they can require that the private promoter undertake any mitigating action if environmental concerns are raised. This situation arises in some of the ABIP activities, including the distillation of niaouli by private companies and the treatment of litchis with sulfur prior to exportation. MCC could decide not to provide technical assistance to such activities, if they are unable to require private operators to change their practices.

Gender

ABIP must also comply with MCC's gender guidelines.[43] These are based on the principle that a project cannot be successful if it does not build the different roles of men and women in society into project design and ensure that both genders have a full opportunity to participate in and benefit from the project. They call for MCC beneficiary countries to assess policy, legal, and social factors that may constrain the participation of either men or women, and to determine how they will overcome those constraints in project design. They also mandate that project monitoring and evaluation systems must distinguish between genders wherever meaningful. The SEA considers the gender dimensions of ABIP activities at the level of the overall project and in the individual regions.

2.4 SCREENING ABIP ACTIVITIES

The table below provides a checklist of activities regulated by Malagasy or US law that have some relation to ABIP activities, with which to identify activities within ABIP that could have consequences for the environment. Each row in the table provides information about a regulated activity, not about an ABIP activity. The table first indicates the law or other legal basis for regulating the broad activity area, and, in three check-off columns, shows what would be required for standard activities of that type. The next column explains what ABIP is doing in that area; in most cases this falls below

[43] These may be found at http://www.mcc.gov/countrytools/compact/fy07guidance/english/14-genderpolicy.pdf

the level of activity that would require action under Malagasy law. The last column indicates the response called for by the SEA.

This table may be used when new activities are developed within ABIP, as a quick reference to determine whether they will call for a specific response to deal with their possible environmental impacts.

Table 2.1. Screening ABIP Activities

Regulated Activities	**Legal actions required for standard regulated activities (not necessarily for ABIP activities)**				**Specific ABIP Activities**	**SEA recommendations**
	Legal basis	**Prohi-bited**	**EIE**	**PREE**		
Agricultural activities covering more than 1000 ha.	MECIE		X		ABIP will affect more than 1000 hectares (though not contiguous); however , it does not involve development or rehabilitation of agricultural land or hydro-agricultural perimeters.	All elements of this SEA pertain; see specific activities in this table. MCA should seek legal advice to clarify the basis for conducting a SEA instead of an EIE, for the benefit of future projects.
Use of pesticides banned in Madagascar or by conventions to which Madagascar is a signatory.	Various Madagascar laws	X			ABIP is not recommending pesticides banned in Madagascar.	
Use of pesticides banned in USA	MCC environmental guidelines		X		ABIP is not recommending pesticides banned or severely restricted in the USA. They may recommend pesticides on the Restricted Use Pesticide list when all other options have been considered and judged inappropriate or unavailable; however these do not fall under the MCC guidelines.	Follow ABIP Crop Protection Plan and Action Plan, which involve extensive actions to ensure that pesticides are used safely and take into consideration recommendations provided by MCC.
Spreading chemicals that could harm human health or environment.	MECIE		X		ABIP is recommending the use of pesticides; this involves a judgment call as to whether project measures to help protect health and environment are sufficient. Because the areas of use and products used could not be determined before the start of the project, this SEA replaces an EIE.	Follow ABIP Crop Protection Plan and Action Plan, which involve extensive actions to ensure that pesticides are used safely.
Industrial or intensive herding projects	MECIE		X		None	
Livestock projects of semi-	MECIE			X	ABIP is supporting goat herding in	MAEP purchased goats without ABIP

industrial or artisan nature					Boeny.	involvement, so the MAEP environment unit should have conducted a PREE.
Forest operations covering more than 150 hectares				X	ABIP distillation activities in Amoron'i Mania consume wood equivalent to less than 1 hectare per year, so no PREE is required.	Wood shortages are not currently a problem. If they become a concern in the future, work with promoters on replanting or alternate energy sources.
Modifications of critical areas	MECIE		X		ABIP is working in villages adjacent to protected areas, where it is possible that agricultural extensification encroach on the parks themselves.	To protect parks and avoid EIE requirements, ABC staff must coordinate with protected area managers to ensure that agricultural activities are not within parks and pose no threat.
Industrial activity that could harm environment	MECIE, Law 99-021		X		Distillation of essential oils generates pollution, albeit at a very small scale. It therefore falls into this category.	MCA should seek advice from Ministry of Environment, Water and Forests, and Tourism to determine how these provisions of Law 99-021 and MECIE are being applied.

APPENDIX: DECREE NUMBER 99-798 OF OCTOBER 6, 1999

Décret n° 99-798 du 6 octobre 1999
portant homologation des agents de lutte biologique et des biopesticides
(J.O. n° 2668 du 30.10.2000, p. 3744)

CHAPITRE PREMIER
Dispositions générales

Article premier - L'importation, la production, l'exportation et l'utilisation d'agents de lutte biologique et de pesticides biologiques (ou bio pesticides) sont soumises à un agrément préalable du ministère chargé de l'Agriculture.

Cet agrément se traduit par la délivrance d'une autorisation spécifique ou d'une homologation en vue d'un lâcher inondatif, selon le cas.

Art. 2 - Au sens du présent décret, et tels qu'ils sont définis dans le "*Code de Conduite pour l'Importation et le Lâcher des Agents Exotiques de Lutte Biologique*" de la FAO, on entend par :

Agent de lutte biologique : Auxiliaire, antagoniste, compétiteur ou autre entité biologique capable de s'autoreproduire, utilisé dans la lutte contre les organismes nuisibles.

Antagoniste : Organisme qui n'occasionne pas de dégâts importants mais dont la présence protège ses hôtes des dégâts d'autres organismes nuisibles.

Auxiliaire : Organisme qui vit aux dépens d'un autre organisme et qui peut contribuer à limiter la population de son hôte, incluant les parasitoïdes, les parasites, les prédateurs et les pathogènes.

Compétiteur : Organisme qui concurrence les organismes nuisibles pour les éléments essentiels du milieu.

Eco-Zone : Zone présentant une faune, une flore et un climat suffisamment uniforme pour susciter les mêmes préoccupations en matière d'introduction d'agents de lutte biologique.

Exotique : Non originaire du pays, d'un écosystème ou d'un éco-zone particuliers.

Lâcher : libération intentionnelle d'un organisme dans l'environnement.

Lâcher inondatif : Lâcher d'un très grand nombre d'un agent biologique invertébré, produit en masse, dans le but de réduire rapidement une population d'un organisme nuisible sans obtenir forcément un effet durable.

Lutte biologique : Stratégie de lutte contre les organismes nuisibles faisant appel aux auxiliaires, antagonistes ou compétiteurs et autres entités biologiques autoreproductibles.

Pesticide biologique (ou biopesticide) : Terme générique appliqué à un agent de lutte biologique, le plus souvent un pathogène, formulé et appliqué d'une manière analogue à un pesticide chimique et normalement utilisé pour réduire rapidement une population d'organismes nuisibles pour une lutte à court terme.

Art. 3 - L'organisme chargé de la protection des végétaux est habilité à délivrer les autorisations et/ ou permis d'importation, sur décision émanant du Comité Interministériel, et à assurer les contrôles sur toute importation, exportation, utilisation et lâcher d'agent de lutte biologique et de biopesticides.

Art. 4 - Il est crée un Comité Technique Interministériel, composé de membres, nommément désignés, issus :

- du ministère chargé de l'agriculture (organisme de protection des végétaux),
- du ministère chargé de l'élevage,

- du ministère chargé des eaux et forêts,
- du ministère chargé de la recherche scientifique,
- du ministère chargé de l'enseignement supérieur,
- du ministère chargé de l'environnement,
- du ministère chargé de la santé,

ainsi que des représentants des opérateurs, selon les besoins.

Le Comité est chargé, après étude et évaluation des dossiers techniques fournis à l'appui des demandes,

- de décider de l'octroi d'une autorisation ou d'une homologation pour un agent de lutte biologique ou un biopesticide, selon le cas ;
- de statuer sur toute demande d'importation, d'exportation ou de lâcher inondatif d'agents de lutte biologique et de biopesticides ;
- de faire assurer le contrôle des expérimentations ;
- de contribuer à l'élaboration de toutes réglementations relatives aux agents de lutte biologique et aux biopesticides ;
- de statuer sur tous les problèmes relatifs aux agents de lutte biologique et aux biopesticides.

Les résolutions et décisions prises au niveau du comité sont applicables immédiatement.

Le comité se réunit sur convocation émanant de l'organisme de protection des végétaux qui en assure la présidence, et en autant de fois que nécessaire. Le Comité peut inviter à assister à la réunion, à titre consultatif, toute personne dont la compétence fait autorité en la matière.

L'organisme chargé de la protection des végétaux est responsable:

- de l'application des décisions émanant du comité technique et de la centralisation de tous les dossiers se référant au sujet ;
- de la délivrance des autorisations et homologations après avis du Comité ;
- de la centralisation des données et informations sur les agents de lutte biologique et des biopesticides et de leur diffusion.

CHAPITRE II
Procédures d'homologation et d'importation

Art. 5 - Toute importation d'agents de lutte biologique et de biopesticides, pour quelque utilisation que ce soit, est soumise à la présentation à l'autorité compétente, en l'occurrence l'organisme chargé de la protection des végétaux qui en saisit le Comité Technique Interministériel, d'une demande accompagnée des dossiers ci-après :

A - Dans le cas de l'importation et de l'utilisation d'un agent de lutte biologique et de biopesticide exotiques

a.1- Dossiers exigés pour les agents de lutte biologique

- un dossier concernant l'organisme nuisible à combattre, et comprenant des informations sur l'identification précise de l'organisme nuisible visé et sa répartition géographique, sur l'évaluation de son importance ainsi que sur les auxiliaires, antagonistes ou compétiteurs connus dans la zone de lâcher proposée ou dans d'autres régions du monde;

- un dossier relatif à l'agent de lutte biologique proposé, avec
- des informations sur son identification précise,
- un résumé de toutes les informations disponibles sur son origine, sa biologie, sa distribution, ses auxiliaires et son impact dans sa zone de distribution,
- une analyse de la spécificité de l'hôte de l'agent de lutte biologique et de tous les risques potentiels pour les organismes non visés,

- des informations sur les auxiliaires et contaminant de l'agent proposé et les procédures d'élimination des colonies en laboratoire.
- un dossier sur l'identification des dangers potentiels, les analyses des risques et les propositions d'atténuation des risques, notamment
- les risques pour les personnes manipulant les agents de lutte biologique dans les conditions de laboratoire, de production et au champ,
- les risques pour la santé de l'homme et des animaux à la suite d'une introduction massive.

a.2 - Dossiers exigés pour les biopesticides
- un dossier concernant l'organisme nuisible à combattre - un dossier relatif à la matière active,
- un dossier sur le produit formulé,
- un dossier relatif au contrôle de la qualité du produit formulé,
- un dossier sur l'identification des dangers potentiels, tel que décrit ci-dessus.

B - Dans le cas de la production et de l'utilisation d'un agent de lutte biologique et de biopesticide indigènes

Les mêmes dossiers communs que ci-dessus doivent être fournis en ce qui concerne les agents de lutte biologique indigènes.

Dans le cas spécifique des biopesticides indigènes, la demande doit être accompagnée de :
- un dossier concernant l'organisme nuisible à combattre,
- un dossier relatif à la matière active,
- un dossier sur le produit formulé,
- un dossier sur l'identification des dangers potentiels, tel que décrit ci-dessus.

Pour les agents de lutte biologique exotiques exclusivement destinés à la recherche, des informations sur la nature du matériel proposé à l'importation ainsi que l'efficacité des mesures d'isolement ou de quarantaine (types d'installation et qualification du personnel) doivent, en outre, être fournies.

Pour l'importation d'un biopesticide destiné à des lâchers inondatifs, il est demandé, en sus des dossiers précités, de fournir un dossier sur l'analyse des risques pour les organismes non cibles et sur l'environnement en général avec description en détail des procédures d'urgence en cas d'apparition de propriétés nuisibles imprévues après lâcher ainsi qu'un rapport détaillé sur les analyses en laboratoire et les observations aux champs et la gamme connue ou potentielle d'hôtes de l'agent proposé.

Une liste des données et informations exigées pour l'homologation est reproduite en annexe au présent décret.

Art. 6 - Avant toute importation pour un lâcher inondatif ou à grande échelle, tout agent de lutte biologique proposé doit obligatoirement faire l'objet d'expérimentations aussi bien en laboratoire que sur le terrain, sous la supervision des services officiels concernés et dont la réalisation, aussi bien technique que financière, est prise en charge par le demandeur. Les modalités et procédures d'expérimentation sont fixées par voie réglementaire,

Les protocoles et conditions d'expérimentation doivent être approuvés par le Comité Technique Interministériel avant que la mise en exécution puisse être ordonnée. Le Comité peut également imposer des mesures restrictives et contraignantes s'il juge, après étude des dossiers, que des risques potentiels sont à craindre ou que des informations complémentaires sont nécessaires quant à l'innocuité réelle de l'agent de lutte biologique proposé.

Art. 7 - Aucune autorisation d'importation ou dérogation pour un lâcher inondatif, même à échelle réduite, ne peut être délivrée tant que les résultats d'expérimentation ne sont disponibles ou que les conditions réglementaires requises ne sont remplies.

Une autorisation spéciale peut être délivrée pour les importations en petite quantité destinées aux Centres de Recherche ou pour les besoins des expérimentations; ces importations doivent faire l'objet de mesures de mise en quarantaine obligatoire selon la réglementation nationale en vigueur. Les frais et coûts résultant de la mise en quarantaine incombent au demandeur.

Art. 8 - Pour les agents de lutte biologique indigènes réintroduits après purification ou purifié localement, la présentation du dossier concernant l'agent de lutte (identification) et d'un dossier sur les dangers potentiels et les risques pour la santé humaine et l'environnement, dans le cadre d'une multiplication intensive en vue de lâcher inondatif, reste exigible ainsi que la mise en place d'essais pour l'évaluation de l'efficacité réelle de la souche sur la cible visée.

Les dispositions évoquées au dernier paragraphe de l'Art. 5 ci-dessus doivent également être satisfaites, notamment en ce qui concerne les procédures d'urgence.

CHAPITRE III
Dispositions diverses

Art. 9 - L'exportation d'une souche d'un agent de lutte biologique, sous quelque forme que ce soit, est soumise à une autorisation préalable du Comité Technique Interministériel, sur présentation d'une demande accompagnée de tous les détails se rapportant à son identité, tels que spécifiés dans l'annexe.

Art. 10 - Les pesticides biologiques et agents de lutte biologique destinés à des lâchers inondatifs doivent satisfaire aux dispositions de l'arrêté n° 7451/92 du 30 novembre 1992 en ce qui concerne l'étiquetage.

Par ailleurs, les organismes doivent être conditionnés dans des emballages suffisamment robustes avec un matériau inerte et fabriqués de manière à ce qu'aucune fuite ne puisse être possible en cours de manipulation et/ ou de transport.

L'importateur ou le producteur local doit également s'assurer à ce que les envois soient accompagnés des documents appropriés comprenant des informations sur l'identité et le mode d'identification, la sécurité, les conditions d'élevage ou de culture, les méthodes de manipulation et les éventuels contaminants avec leur identification et leur élimination.

Art. 11 - L'importation de tout agent de lutte biologique et de biopesticide est soumise aux dispositions réglementaires en vigueur en ce qui concerne le contrôle phytosanitaire (permis d'importation) et les procédures de quarantaine obligatoire dont les modalités seront définies par l'autorité compétente concernée.

Le contrôle de la qualité du produit, à l'importation ou à la sortie de fabrication, est exigible selon les modalités en vigueur appliquées aux produits agropharmaceutiques.

Art. 12 - L'importateur est tenu d'assurer, à ses frais, et en collaboration avec les services officiels concernés, le suivi du lâcher d'agents de lutte biologique et/ou de biopesticides afin d'en évaluer l'impact sur les organismes visés ou non cibles.

Art. 13 - L'importateur est tenu de dispenser la formation nécessaire à ses distributeurs afin qu'ils puissent donner les conseils adéquats sur l'utilisation des agents de lutte biologique et de biopesticides.

Il est également tenu de faire une large diffusion des renseignements concernant la sécurité et l'incidence des agents de lutte biologique et des biopesticides sur l'environnement, de signaler aux autorités concernées les problèmes qui peuvent apparaître et d'entreprendre les mesures correctives qui s'imposent.

En cas de dégâts à caractère environnemental causés par les agents de lutte biologique, le promoteur ou l'importateur doit prendre en charge tous les frais occasionnés aussi bien pour les études que pour les réparations nécessaires.

Art. 14 - Les infractions aux dispositions du présent décret seront punies des mêmes peines que celle prévues à l'article 31 de l'ordonnance n° 86-013 du 17 septembre 1986 ainsi que celles du décret n° 95-092 du 31 janvier 1995.

Art. 15 - Les dispositions du décret n° 92-473 du 22 avril 1992 portant réglementation des produits agropharrnaceutiques et de ses textes subséquents, pour autant qu'elles ne soient pas contraires aux dispositions du présent décret, sont applicables au domaine des agents de lutte biologique et des biopesticides, notamment en ce qui concerne les modalités de contrôle de la distribution.

Art. 16 - Des arrêtés ministériels seront pris, en tant que de besoin, en application du présent décret.

Art. 17 - Le Ministre de l'Agriculture et le Ministre de l'Environnement sont chargés chacun en ce qui le concerne de l'exécution du présent décret qui sera publié au *Journal officiel* de la République.

ANNEXE

DONNEES ET INFORMATIONS EXIGEES
POUR L'HOMOLOGATION DES BIOPESTICIDES

Données requises sur :

I: Identité du produit
a.- la matière active :
- Propriétés physiques et chimiques,
- Nom systématique et souche pour les micro-organismes,
- Nom vulgaire,
- Populations naturelles de l'organisme,
- Procédé de fabrication,
- Procédures d'examen et critères utilisés pour l'identification (morphologie, biochimie et/ ou sérologie),
- Composition des matières indésirables, description de leur nature et de leur identité et teneurs,
- Méthodes d'analyse.

b.- le produit fini :
- Propriétés physiques et chimiques,
- Quantité de matière active,

- Nom et type de la formulation,
- Nature et quantité des diluants,
- Objet et identité des matières non actives,
- Stabilité du produit et effet de la température et des conditions de stockage sur l'activité biologique,
- Méthodes d'analyse.

II.- Propriétés biologiques de la matière active

- Populations naturelles et mode de distribution du principe actif dans différentes conditions climatiques,
- Cible du ravageur et pouvoir pathogène de l'agent considéré sur ce ravageur (ou antagonisme),
- Dose infectieuse, transmissibilité et mode d'action ,
- Parenté de l'agent à un agent pathogène d'un végétal ou d'une espèce vertébrée,
- Types de cultures ou de locaux à protéger,
- Mode, dose et fréquence des applications.

III.- Données toxicologiques

a.- Données toxicologiques primaires :

- Principe actif :
  - Pouvoir pathogène/toxicité aiguë par voie orale,
  - Toxicité percutanée aiguë,
  - Pouvoir pathogène/toxicité aiguë par voie pulmonaire,
  - Etude sur l'infection/irritation des yeux,
  - Cas signalés d'allergies ou d'hypersensibilité.
- Produit fini :
  - Pouvoir pathogène/ toxicité aiguë par voie orale,
  - Toxicité percutanée aiguë,
  - Pouvoir pathogène/ toxicité aiguë par voie pulmonaire.

b.- Données toxicologiques supplémentaires (en cas d'indications sur la production de toxines ou de signes d'infection ou de longue persistance du biopesticide) :

- Pouvoir pathogène/ toxicité subchronique (en cas de persistance inhabituelle),
- Effet sur la reproduction,
- Immunodéficience (pour les virus),
- Infectivité/pouvoir pathogène sur les primates.

IV.- Données sur les résidus

- Toxicité pour les poissons,
- Etudes concernant les végétaux non cibles,
- Etude concernant les insectes non cibles,
- Pouvoir pathogène et toxicité par voie orale d'une dose unique pour les oiseaux,
- Pouvoir pathogène par voie respiratoire sur les oiseaux,
- Identité et moyens de mesure des toxines (pour les agents microbiens qui en sécrètent).

CHAPTER 3. INSTITUTIONAL CONTEXT

The institutional context for the ABC activities and more specifically for consideration of the environmental impacts of ABIP has several components. One is the set of broad plans and policies that have been developed over the past decade in order to steer development in Madagascar. A second is the set of government agencies that work in fields related to the ABCs or may be involved in the work of the ABCs. A third is made up of the other projects working in related fields, some of which will be important for ABC collaboration in the context of minimizing possible impacts on the environment. The Scoping Study presented a broad overview of all of these actors; here we will limit ourselves to discussing those that relate directly to the SEA, and explaining how the ABCs should work with them in that context.

3.1 PLANS AND POLICIES

The National Environmental Action Plan (PNAE, Plan National d'Action pour l'Environnement) was developed in the late 1980s, and put into place in 1990 with the passage of the Environmental Charter, Law 90-033. This led to the creation of the Office Nationale pour l'Environnement (ONE, the National Environmental Office) and the elaboration of the three phases of the Environment Program (referred to as PE1, PE2, and PE3). The third phase has focused on biodiversity conservation, sustainable management of forests, water, and coastal resources, and environmental education. The World Bank has taken the lead in bringing a wide range of foreign donors in to support the PNAE, the institutions it created, and the three phases of the Environment Program. This phase is coming to an end; it is not yet clear whether there will be a PE4. Though the PNAE does not have specific implications for carrying out the SEA, it forms the context for all environmental protection in Madagascar.

The Rural Development Action Plan (PADR, Plan d'Action pour le Développement Rural) was established by Decree 99-022, as discussed in the previous chapter. The Plan itself was issued in 2001, and had five major axes: improve rural management through institutional and regulatory reform, encourage economic agents as partners in rural development, increase sustainable agricultural output, ensure food security, and development of infrastructure to provide social services. The PADR process involved work by the regional technical support groups, the GTDRs cited in the previous chapter, through which regional rural development plans (PDR) were mapped out. These plans set out specific targets for regional development in a number of areas, including agriculture and the environment. The ABC objectives and activities are aligned with the PDRs, and in some cases the subsectors and villages in which the ABCs are working have been chosen within this framework. The PDRs set out environmental priorities for the regions which have been taken into account in identifying the possible environmental impacts of the ABIP activities for the SEA.

The Poverty Reduction Strategy Paper (PRSP) was prepared in 2002 and launched in 2003 with support from the World Bank. It is a required prerequisite to obtaining funds through the Bank's Heavily Indebted Poor Countries (HIPC) financing initiative, which provides debt relief and other support to developing countries. The PRSP set out development strategies for the period from 2002 to 2007. The 2003 PSRP has now been replaced by the Madagascar Action Plan, which the World Bank refers to as a "Second Generation Poverty Reduction Strategy,"[1] as the primary orientation for the country's development. It therefore does not have any specific implications for the ABIP SEA.

[1] http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/MADAGASCAREXTN/0,,menuPK:356366~pagePK:141132~piPK:141123~theSitePK:356352,00.html, accessed 15 June, 2008.

The Madagascar Action Plan (MAP) is the overall plan now used to orient development activities in Madagascar.[2] Launched by the president in 2007 and managed by a staff working out of his office, the MAP includes several commitments related to the activities of the ABCs. The objectives for rural development – referred to as "challenge 4" - seem to have been the basis for defining the MCA activities, as they include improving access to rural financing, improving security of land tenure, promoting market-based activities and improving access to market. The environmental objectives, "challenge 7," focus on halting the degradation of natural resources, strengthening the protected area system, strengthening forest management, and integrating environmental concerns into all decision-making. The ABIP project fits well into the objectives of the MAP.

3.2 GOVERNMENT AGENCIES

Ministry for Agriculture, Livestock, and Fisheries

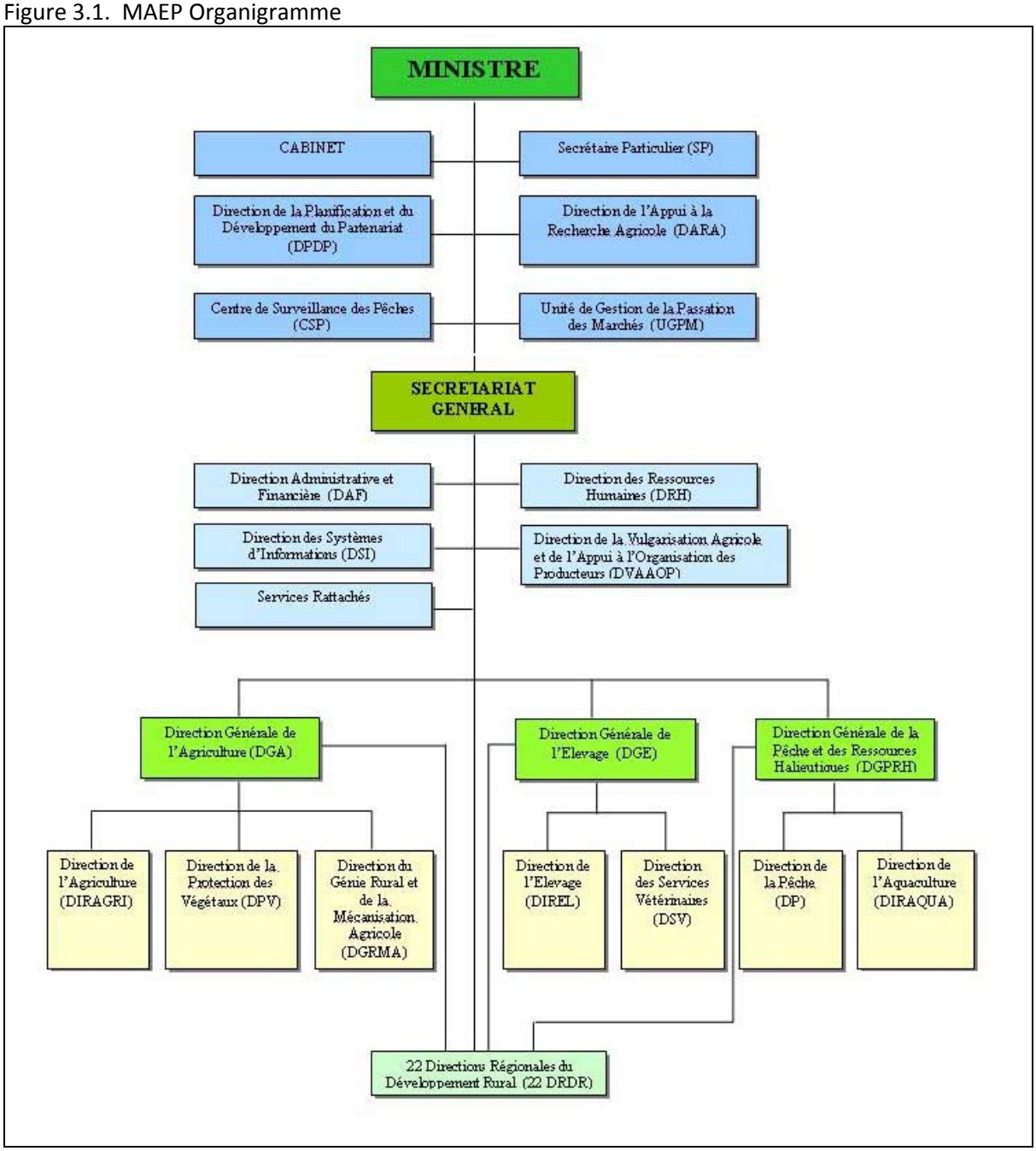
The ABCs and the ABIP operate under the jurisdiction of the Ministry for Agriculture, Livestock, and Fisheries (MAEP, Ministère de l'Agriculture, l'Elevage, et la Pêche). Figure 2.1 shows the organizational chart of the MAEP. As it shows, at the regional level the representative of the Minister is the Regional Director of Rural Development (DRDR, Directeur Régional du Développement Rural). The DRDR is responsible for coordinating all agriculture-related activities within the region, which includes work of the ABC, other projects aiming to increase agricultural output or do agricultural research, projects dealing with soil erosion, those working on intersectoral rural development, and so on. The DRDR also coordinates the activities of the GTDRs, the working groups created by Decree 99-022 in connection with implementation of the PDRs. The DRDR thus plays a key role at the regional level as the liaison among the different activities going on in the field, with a mandate to ensure that the different projects are consistent with each other, do not overlap or work at cross purposes, and support each other as much as possible.

In terms of the SEA, this means that the DRDR has a broad perspective on the problems of the region, the environmental problems that may arise, and the other projects with which the ABCs may want to collaborate in order to ensure that it has no negative impacts on the environment and makes best use of all opportunities to improve environmental quality.

The DRDR is the government agency concerned with crop protection and ensuring safe use of pesticides, and in some regions the ABCs have worked with them on training in this area. However, the Crop Protection Services, the regional arm of the national-level Directorate of Crop Protection (Direction de la Protection des Végétaux) within the DRDR, are generally very poorly staffed; one or two staff members

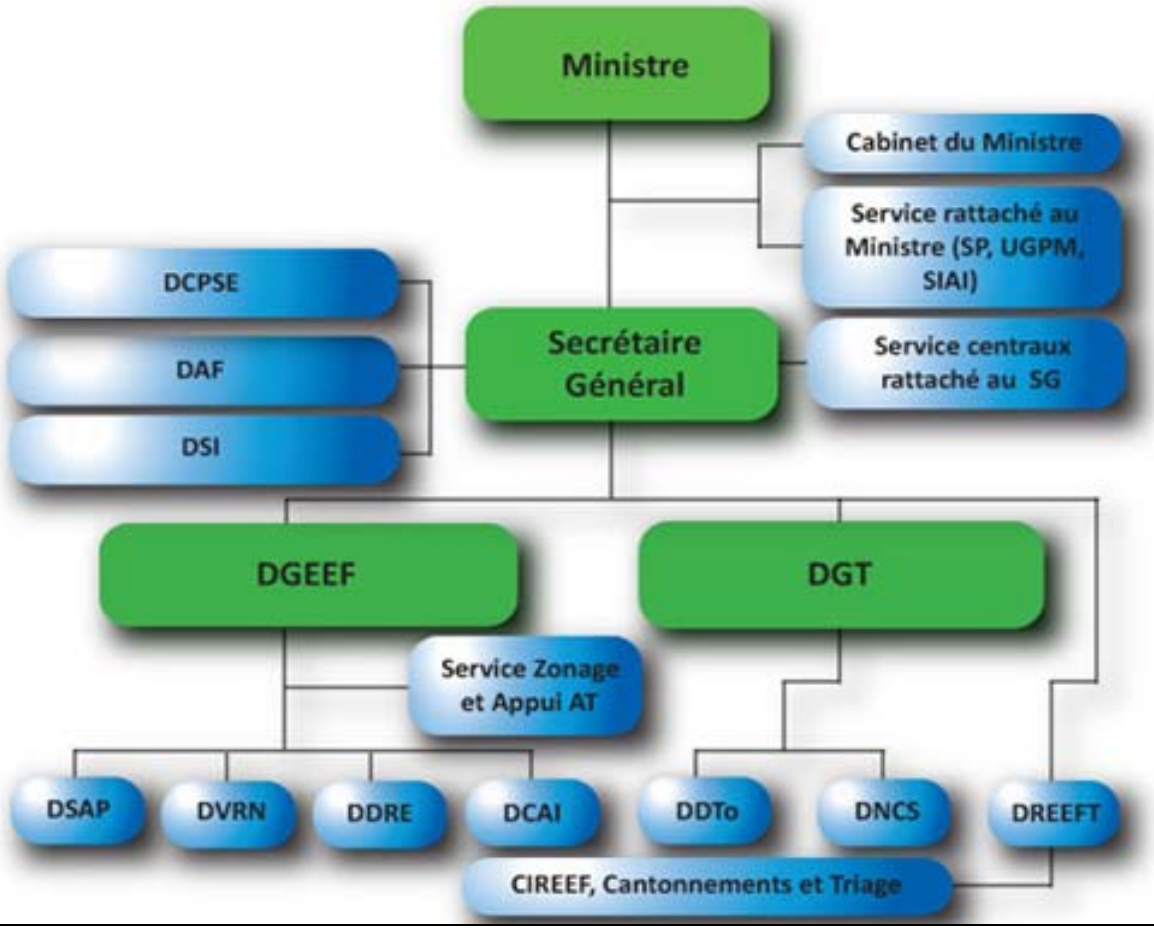
[2] http://www.map.gov.mg/?version=en or full text in pdf at http://siteresources.worldbank.org/MADAGASCAREXTN/Resources/MAP_MADAGASCAR.pdf.

Figure 3.1. MAEP Organigramme



Source: http://www.maep.gov.mg/organigramme.html

Figure 3.2. MEEFT Organigramme



Acronyms (English translations):

DGEEF General Directorate for Water and Forests
DGT General Directorate for Tourism
DCPSE Directorate for Coordination, Planning, and Monitoring
DAF Directorate for Administration and Finance
DSI Information Systems Directorate
DSAP Directorate for Protected Areas
DVRN Directorate for Economic Use of Natural Resources
DDRE Directorate for Development of Environmental Reflexes (integration of environment into other activities

DCAI Directorate for Oversight
DDTo Directorate for Tourism Development
DNCS Directorate for Standards, Audits, and Monitoring
Service du Zonage et AT : Service for Forest Zoning and Technical Assistance

Source : http://www.meeft.gov.mg/index.php?option=com_content&task=view&id=27&Itemid=44

to cover a whole region is typical. Therefore, while they may be interested in ABC activities in this area, they may not be in a position to provide much practical assistance.

In 2006 the MAEP adopted a new policy on the irrigation sector which they refer to as Watersheds and Irrigated Perimeters (Bassins Versants et Périmètres Irriguées, BVPI). This is described in some detail in a policy letter approved by the Council of Government in July, 2006.[3] The associated program involves a combination of agricultural development and commercialization, expansion and rehabilitation of irrigation networks, watershed management in order to prevent erosion and siltation, and management of specific projects. The World Bank and the French Development Agency (Agence Française de Développement, AFD) have both made major contributions to the implementation of this program, and are working in several of the MCA regions. Where they are working with the same beneficiaries as the ABCs in areas where erosion is a risk, ABC staff should collaborate with them on introduction of erosion control techniques. If the ABC staff encounter erosion risks in non-BVPI districts or communes, they may want to seek technical assistance or training from BVPI staff in order to learn which techniques will work best in local conditions.

Ministry of Environment, Water and Forests, and Tourism

The Ministry of Environment, Water and Forests, and Tourism, has primary responsibility for environmental protection in Madagascar, including implementation of the environmental statutes discussed above. The overall structure of the ministry is shown in Figure 2.2. The ministry is represented at each regional level by a regional directorate, within which there is a unit for water and forests referred to as a "circonscription." The key concern for the SEA will be to consult with that regional unit regarding the existence of a forest zoning plan or the identification of critical areas targeted for conservation. It will be essential for the ABCs to be aware of such areas, so as to ensure that agricultural extensification in villages targeted by the ABCs does not threaten those resources.

ANGAP

ANGAP is responsible for managing the country's national park system as set up prior to introduction of the Durban Vision and the SAPM (discussed above). ANGAP works on development activities in the buffer zones surrounding the parks. Those efforts are funded through an allocation of 50% of the fees collected from each park. This financing strategy is designed to reinforce the link between development activities in villages adjoining the park, and the park's attracting a large number of visitors because it is pristine and has not been encroached upon by its neighbors. Because the funds from each protected area only support development activities adjoining that area, the availability of these funds varies widely from area to area depending on the number of visitors. Only one national park in the MCA regions i.e. Ankarafansika in Boeny, attracts many visitors and thus much funding,.

Where such funding is available, the ABCs should collaborate with ANGAP both on development activities in the adjoining villages and on ensuring that agricultural activities do not encroach on the parks. Even where ANGAP does not have funds for development activities, the ABC staff must be aware of where the protected areas are so that they can ensure that development activities will not lead to encroachment. The same goes for areas to be part of the new SAPM, pursuant to the Durban Vision. Figure 2.3 shows the locations of existing ANGAP protected areas, areas targeted for protection through the SAPM, and other sensitive areas throughout the country. Because the Durban Vision areas may be managed by any of a number of public or private institutions, we cannot

[3] http://www.maep.gov.mg/lbvpi.htm

point to a single organization with which the ABCs must coordinate. However, by maintaining effective communication with the DRDR and the regional unit responsible for forests, the ABC staff should have no trouble being aware of new protected areas that are under consideration in their regions.

National Environment Office

The National Environment Office plays several roles in managing the environment. It is responsible for the environmental impact studies required under MECIE and for pollution prevention. It is also responsible for maintaining data on the environment and publishing the Environmental Monitoring Reports (TBE, Tableaux de Bord Environnementaux) at the national and regional levels. The TBEs provide useful summaries of environmental conditions, insofar as data are available, and they could prove useful if additional environmental data are sought by the ABCs.[4] ONE is also one of several organizations engaged in managing spatial data on the environment and related issues; should ABIP decide that it wishes to build a GIS system to track the relationship between its activities and the SAPM or other sensitive areas, ONE may be a source of spatial data.

PROJECTS AND DEVELOPMENT ORGANIZATIONS

There are dozens, if not hundreds of projects and organizations working on rural development in the six ABC regions. The ABCs are not working directly with most of these groups, and for the most part there will not be a need for active collaboration with them in carrying out the SEA or implementing the environmental management plan. It is nevertheless useful to be broadly aware of what other projects are doing, especially when they are working in the same locations at the ABCs, however. Ensuring this kind of communication is the responsibility of the DRDR, and if need be the ABCs can encourage the Director in that function by providing full information about ABC activities and seeking information about who else is engaged in similar activities.

Soil Erosion

That being said, a few organizations and projects are working in areas that suggest collaboration will be useful in implementing the environmental management plan. First, several different projects are working to control soil erosion in the ABC regions. Soil erosion is a risk that will be posed by some ABC activities. While the ABC staff are familiar with some techniques for controlling it, the projects specialized in this field may have more detailed knowledge of the local effectiveness of different approaches, and more experience implementing them. In Boeny, Amoron'i Mania, and Diana, the German-funded Erosion Control Project (Projet de Lutte Anti-Erosive, PLAE) is training villagers to grow crops on steep slopes and stabilizing lavakas to prevent further erosion. The BVPI projects mentioned above are active in Amoron'i Mania and Vakinankaratra. In Boeny the National Nutrition Office is also working on rehabilitating irrigation systems as part of their programs to insure adequate nutrition to the villages concerned. In all of these regions, it will be valuable for the ABC staff to coordinate with the other projects if erosion control measures are needed to protect the environment.

[4] The TBE data are available through this web page: http://www.pnae.mg/ie/tbe.htm. When searching for a region, all of the information may be obtained in a single pdf file by clicking the links for "version intégrée."

Crop Protection

In the area of crop protection, working with other organizations will also be important, and is already being done through ongoing ABC activities. In most regions the ABCs are contracting out for training in crop protection, or for broader training that includes crop protection. Where other organizations are actively engaged in use of biological controls, engaging them to train ABC staff and beneficiaries will be an effective way to encourage such techniques. In this vein the ABCs are already working with Tatie Cris Farm in Diana and CEFFEL in Vakinankaratra. In contrast, the Crop Protection Services of the MAEP and the trainers at FIFAMANOR in Vakinankaratra are more heavily oriented towards preventive use of pesticides; it is important when working with them to emphasize ABIP approach on the promotion of integrated pest management methods. In some regions it may be useful to identify trainers on crop protection whose approaches more closely match those of the ABCs in order adequately to protect the environment.

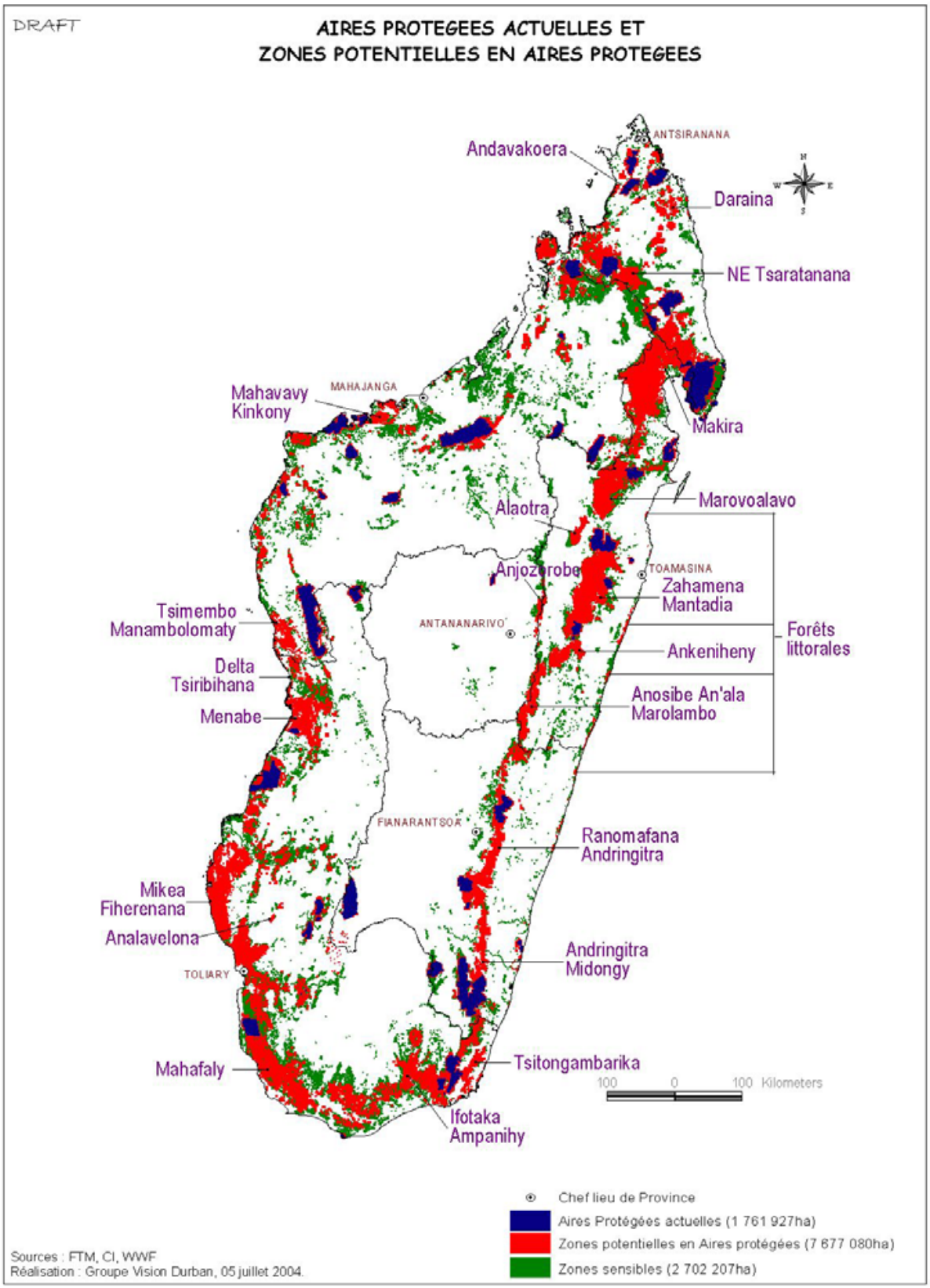
Protected Areas

In addressing the possible extensification of agriculture into areas targeted for protection, a number of organizations may be involved. As mentioned above, the traditional protected areas system is managed by ANGAP, so in that case there is a single institution with which collaboration is needed. As the SAPM is implemented, however, more organizations will become involved with the management of protected areas, as will some local communities through the community-based natural resources management contracts authorized by Law 96-025 discussed above. A few SAPM protected areas have already been established in MCA regions. In Menabe, Fanamby has established a protected area in the Allée des Baobabs; they are already working with the ABC to encourage cultivation of lima beans instead of rice in that area, in order to protect the baobabs. The Wildlife Conservation Society has established a protected area in Diana, the Makira Forest Project; Conservation International is working to protect portions of the Zahamena-Mantadia conservation corridor which includes large portions of Atsinanana; Birdlife International and Conservation International are working together on the new Mahavavy-Kinkona protected area in Boeny. If the ABCs are working near any of these protected areas, they will have to coordinate with the groups responsible for managing them to ensure that the ABC activities will not have any negative impacts on the resources being protected. If community-based management contracts are part of the park design, they must be taken into account if the ABCs are targeting the communities involved.

Rural Development Organizations

In some regions the ABCs are planning to work through other rural development organizations in implementing their activities. In Atsinanana they plan to work with ODDIT (Organe de Développement du Diocèse de Toamasina), the development arm of the Catholic diocese of Toamasina, while in Boeny they are expect to work through SAF/FJKM (Sampan'Asa Fampandrosoana / Fiangonan'i Jesosy Kristy eto Madagasikara), the development department of the Protestant church. Both of these organizations are engaged in a wide range of rural development activities, including increasing agricultural output,

Figure 3.3. Actual and Potential Protected Areas in Madagascar, as of 2004



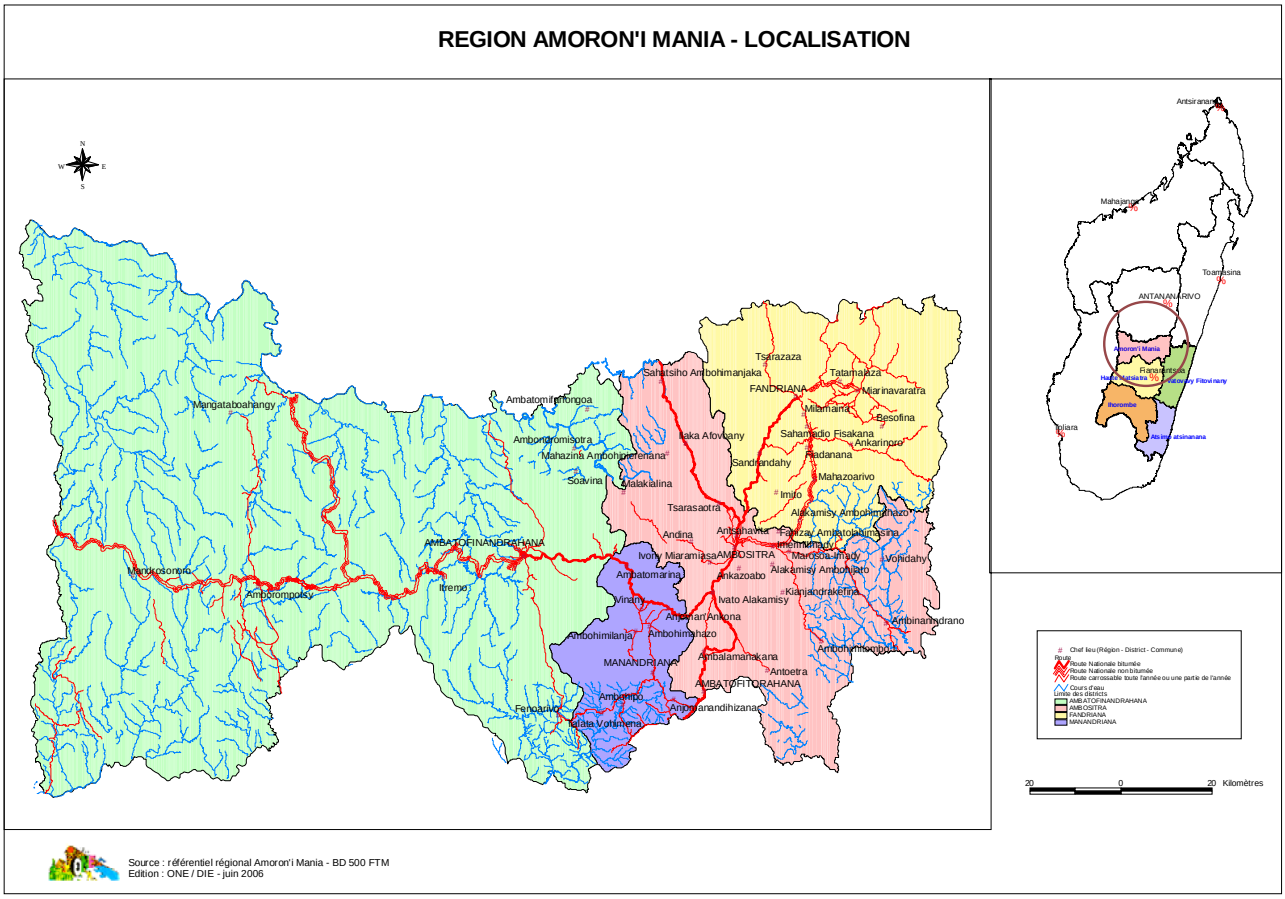
Source: Durbin 2006, p. 2

commercializing agriculture, health, nutrition, and so on. If ABC activities are carried out through these groups, then the same approach will be necessary as for all activities called for by the environmental management plan. In particular, when the ABC staff must pay particular attention to the risks of soil erosion or encroachment into areas targeted for protection, they must ensure that ODDIT or SAF/FJKM field agents with whom they work internalize the same concerns.

CHAPTER 4. AMORON'I MANIA

4.1 OVERALL DESCRIPTION OF THE REGION

Figure 4.1 Location of Amoron'i Mania



Source : ONE June 2006, p. 13

Amoron'i Mania is located in the central highlands of Madagascar. It has an area of 17,516 square kilometers, and is made up of four districts; Ambatofindrahana (light green in the map) to the west, Manandriana (lavender) and Ambositra (pink, also the capital) in the center, and Fandriana (yellow) in the north east.

The region's climate is typical of high altitude tropics, with average temperatures ranging from 12 to 21 C. The rainy season runs from October to April, with temperatures between 18 and 21 C, and the dry season from May to September, with average temperatures between 13 and 16 C. Annual rainfall averages between 1,100 and 1,550 millimeters.

The region's population was estimated at 669,608 in 2003, with a population growth rate of 3.4%, slightly higher than the national growth rates of 2.8%. (ONE December 2005, p. 13) This gives the region an average population density of about 39 people per square kilometer, slightly denser than the national average of 28, and higher than many of the other MCA regions. The region has

traditionally been a sender of labor to other parts of the country, as people sought to work in the irrigated areas of the west, southwest, and northern parts of the country.

Agriculture in Amoron'i Mania is overwhelmingly for production of basic foodstuffs. Of the 99,340 hectares cultivated in 2001, 98,735 were used to grow seven products; rice, corn, manioc, sweet potatoes, beans, peanuts, and potatoes. Rice accounted for almost 40,000 hectares, and manioc 22,000. Corn and beans came in third and fourth at 12,260 and 10,705, respectively, and the other crops accounts for smaller areas. (TBE Tables F2.5.2a and F2.5.2b, p. 82)

Surprisingly, given the mountainous terrain of the region, less cultivated land in Amoron'i Mania is on hillsides than is the case nationwide. Table 4.1 shows the area and share of cultivated area on each type of land, for the region and for the country as a whole. On the other hand, Amoron'i Mania has a higher percentage of terraced plots than the country as a whole. The shares represented by hillside and terrace together are about the same for the region and the country as a whole, suggesting that Amoron'i Mania mastered the art of terracing to deal with a greater preponderance of steep slopes than are found elsewhere. The Ministry of Agriculture considers just over 40% of the region's land to be cultivable, but only 6.13% of the total land area actually was cultivated in 1999. (TBE Tables F2.7a and F2.7b, p. 84)

Table 4.1 Cultivated area by type of land, in hectares

	Hill	Baiboho	Terrace	Plain or River Basin	Valley	Plateau	Total
Amoron'i Mania	4,703	5,290	5,945	14,658	16,914	28,488	75,998
% of cultivated area in region	6.2%	7.0%	7.8%	19.3%	22.3%	37.5%	100%
Whole country	252,033	241,224	31,841	574,045	377,093	607,352	2,083,588
% of cultivated area nationwide	12.1%	11.6%	1.5%	27.6%	18.1%	29.1%	100%

Source: TBE Table F2.5.2e, p. 83

The vegetation in the region is formed of dense high-altitude humid forest on the eastern cliffs, by open tapia forest[1] in the center, and savannah grasslands to the west. The dense forest is part of the forest corridor that runs along much of the eastern slopes of Madagascar, extending south from Amoron'i Mania along the Ranomafana-Andringtra corridor and north of the region along the Fandriana-Marolambo corridor. All of this forest areas are targeted for conservation in the context of the new SAPM protected areas system.

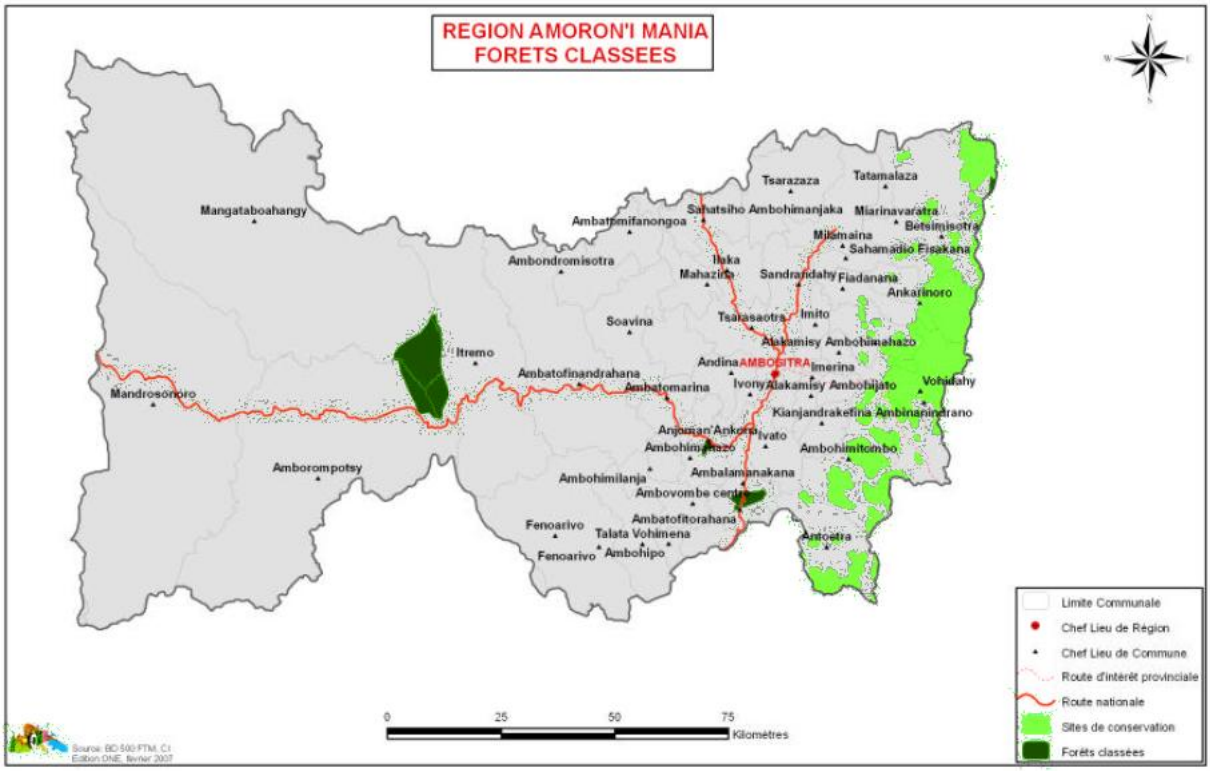
The eastern part of Amoron'i Mania has been the target of a broad program of planting with eucalyptus and pine, exotic species with varieties that have become fully acclimated to Madagascar. This reforestation is done by the state, by villages, or by private entities. In the district of Fandriana, pine is rapidly becoming an invasive species, which is not appreciated by local residents. About the same area has been planted with each of the two species. However, in addition to pressure from local consumption, the eucalyptus plantations are harvested for fuel wood and charcoal destined for markets in Antsirabe and Antananarivo, while pine is expanding beyond the original limits of

[1] Tapia is a native tree essential for the production of local silk.

plantation. Annual consumption of fuelwood within the region is 46,453 steres; annual consumption of charcoal is 12,583 metric tons. (ONE December 2005, Table 28, p. 52)

Amoron'i Mania does not have any protected areas managed by ANGAP, and only two areas of public forest (*forêt classée*), as shown in Figure 4.2. The dark green in that image is the public forest; the light green includes zones targeted for conservation. Not surprisingly, given where the forests are, deforestation problems are the greatest immediately to the west of the areas targeted for conservation. The ABC does work in the eastern part of the region, so it will be important to be aware of specifically which land is targeted for conservation. Tables 4.2 and 4.3 show forests trends for the region, insofar as data are available.

Figure 4.2 Classified Forests and Conservation Zones in Amoron'i Mania



Source: TBE Amoron'i Mania, Map F3.1a, page 91

Table 4.2 Deforestation by region in Amoron'i Mania, 1993-2001, in hectares

District	Forêt 1993 (T0)	Forêt 2001 (T1)	Déforestation (T0 – T1)	% déforestation (1993 – 2001)	Taux annuel de déforestation
Ambositra	135 083	116 635	18 448	13,66%	1,71%
Fandriana	70 179	60 070	10 109	14,40%	1,80%
Ambatofinandrahana	5 626	5 470	156	2,77%	0,35%
Manandriana	2 179	1 963	217	9,94%	1,24%
Total	**213 067**	**184 138**	**28 929**	**10,19%**	**1,27%**

Source: TBE Table F2.2a, p. 75

Table 4.3 Evolution of forest cover in Amonon'I Mania, 1995-2003, in hectares

En hectare	Forêts naturelles	Forêts de tapia	reboisement
Surface totale initiale	149 477	6 211	9 544
Surface total en 1995	86 880	3 485	10 956
Surface totale en 2003	78 898	10 213	6 056

Source: TBE Table F2.2b, p. 75

Soil erosion and bush fires are problems throughout the region. The eastern parts of the region are relatively wooded, which helps prevent erosion; however TBE data on siltation of rice paddies show it to be by far the worst in the central district of Ambositra, as Table 4.4 shows. This probably reflects the higher population density and high incidence of cultivation on steep slopes in that district. On the other hand, there are slightly more bush fires relative to area in Ambatofinandrahana than elsewhere in the region. The TBE tells us that the largest share of bush fires are set in order to regenerate grasses for livestock (TBE Amoron'i Mania, p. 77, notes on Table 2.3.1a); given the distribution of livestock in the region, this pattern of fires is consistent with that explanation. Soil erosion in the western portion of the region is the cause of not only of local siltation, but also of significant problems further downstream in the region of Menabe. While this problem is well known, most efforts to deal with erosion operate at a more local scale; government officials in both Amoron'i Mania and Menabe said that national action would be required to address the issue across regions.

Table 4.4 Distribution of rice paddy siltation and bush fires by district within Amoron'i Mania

District	Degraded paddy, in ha (a)	Area in km^2	Degraded paddy/km2	Number of fires (b)	Fires/km2
Ambatofinandrahana	120.5	10,132	1.19%	1196	11.80%
Ambositra	450	3,161	14.24%	310	9.81%
Fandriana	10	2,947	0.34%	241	8.18%
Manandriana	34	1,276	2.66%	29	2.27%
Sources: (a) TBE Amoron'i Mania Table F1.6, p. 67 (b) TBE Amoron'i Mania Table 2.3.1b, p. 77					

Security in the face of criminal activity is a significant problem in the western areas of Amoron'i Mania. The problems are caused by organized bands of armed brigands who live from the theft of cattle herds. The herds are taken down to the western coast, where they are sold for export. In some cases the bandits set fire to the fields behind them, to hide their traces so the herds cannot be tracked. This problem is being addressed through a system of village patrols, termed *kaloina,* designed by the chief of the local fokontany. The kaloina enforces a traditional principle which says that anyone who sees a fire is obliged to drop whatever she or he is doing in order to put it out, at the risk of severe community sanctions if they do not comply. Apparently these traditional patrols are putting a dent in the rate of forest fires in the region, as well as reducing the rate of petty crime.

4.2 Subsector Assessments

Geranium

Geranium is a new crop for the region of Amoron'i Mania. The activities of this subsector are based in six communes in the districts of Ambositra and Fandriana, and were launched by MCA in December, 2006. Since March 2007, over three hundred beneficiaries, representing sixteen farmer organizations, have been trained; this number is expected to rise before the end of the project. Their training has focused on a number of cultivation techniques, including planting from cuttings, caring for the plants through the use of mulch and compost, weeding, watering, and so on. The farmers received credits for geranium cultivation from OTIV, which has been the source of some concern. The analysis on which the credits were based assumed much higher yields than have turned out to be possible. As a result, the farmers in this subsector have assumed debts that they will be unable to repay from the revenue it has provided. Moreover, instead of planting the

"Bourbon" variety of geranium as planned, they have planted varieties from China and Africa and a Bourbon-China mix, which are all less prized on the market than the pure Bourbon. This has hurt their earnings and the possible success of the project.

About half of the geranium parcels were previously cultivated with sweet potatoes and manioc. The others, however, are new parcels on slopes upstream from the rice paddies. Canals next to the parcels are used for watering them, which must be done twice a week in the dry season. The growers are cultivating an average of fifteen ares each, for a total of about 45 hectares of geranium. The farmers are practicing erosion control measures such as terracing and the construction of canals to prevent water from running off, so this cultivation on slopes does not appear to pose an environmental threat.

The farmers have been trained on artisanal crop protection methods. Once a week they apply preventive treatments that they mix from cow manure and fermented hot peppers. Because these products do not pose risks to the environment, the use of scheduled preventive treatments does not pose a risk, as it would if they used synthetic pesticides. The farmers do not have sprayers, but do not feel they need them for this purpose. They did observe some bacterial infestations during the rainy period which were apparently treated with the natural pesticides they are preparing.

While the leaves are being harvested, the distillation is done on site. As discussed in chapter 2, this small-scale artisanal activity appears to be subject to the requirements of Law 99-021 and is required to have an industrial operating permit and to carry out an EIE under MECIE. It would seem, therefore, that the companies carrying out the distillation have not complied with these requirements.

AgTech, one of the companies purchasing the leaves and carrying out the distillation, has two distilleries stationed in villages that are central to the growing regions. To produce a quality product, distillation should begin within four hours of harvest, but in practice this has been increased to as much as twelve hours because of the logistics of bringing in the leaves. The distilleries hold 300 kilos of leaves; with a yield ratio of 2:1000 this should produce 0.6 kilos, or perhaps one liter of oil. The process takes four hours and consumes about one third of a stere of fuelwood. Unless it rains, two batches are distilled per day.

The distillation process produces a liquid effluent which is discharged into a nearby stream. Although the SEA team did not observe this because the distilleries were not operating when we were there, this effluent raised considerable concern on the part of the MCA environment staff. However they believed that this liquid would not harm the crops and could therefore safely be used for watering. Assuming this is the case, the effluent from all geranium distilleries should be routed onto nearby fields rather than into the irrigation and drainage system.

The distillation process also, not surprisingly, generates a large quantity of leaf residue. These are reclaimed by nearby farmers as compost, which is very much valued as an alternative to synthetic fertilizers. The MCA environment staff raised concerned about the storage of these residues until they are taken for compost; however given the demand for the leaves, this problem seems to be a very short-term one at most.

The pine and eucalyptus used to fire the distillery are gathered locally, purchased by the processors from local forest operators. Based on the first harvest in 2008, total leaf production in the first year of geranium cultivation is likely to be about 90 metric tons. At a rate of one third of a stere of wood and 300 kilos of leaves per batch, this implies a total consumption of 100 cubic meters of wood per

year. This represents only 0.22% of the total annual fuelwood consumption in the region, some 46,453 cubic meters, although it may increase with development of the subsector.

The distilleries' consumption of wood is very low, especially in relation to total wood consumption in the region. Since there were no reports of fuelwood shortage in the areas and since regrowth of standing forests offsets the fuelwood consumed, the SEA judged that no particular mitigation is needed. Moreover, pine is locally perceived as an invasive species; if this is the source of distillery fuel, farmers may be glad to see it go. On the other hand, the loss of eucalyptus is a problem for beekeepers, whose bees depend on eucalyptus flowers to produce honey. However, as discussed below in the section on the honey subsector, regrowth of eucalyptus for fuelwood would not solve the honey-growers' problems, because the trees are harvested before they begin producing flowers. That being said, tracking the use of wood and determining its species and source may determine whether wood shortages are likely to become a significant problem in the future. If there is an interest in reforestation, encouraging the distillers to collaborate with beekeepers in planting eucalyptus may be an efficient approach.

This last issue, the consumption of wood fuel, could have negative impacts on the environment, though the pressure is quite small at present. The effluent discharge should be managed so as to avoid any impacts on surface water. When cultivation on steep slopes cannot be avoided, appropriate techniques must be implemented to avoid erosion and to manage runoff. On the other hand, the composting of leaf residues will have a positive environmental impact, by improving soil quality in the area.

ONIONS

Onions are a new crop in Amoron'i Mania, launched by the ABC in November, 2006. Onion cultivation is actually being carried in three communes within the district of Ambatofinandrahana, through the efforts of 105 farmers on 1.8 ha. In 2007, some 19.15 hectares were planted with onion. The crop is grown in rice paddies during the off season, so there is no risk of soil erosion, and plenty of land is available for cultivation without risk of extensification onto areas targeted for conservation. The growers are using organic fertilizers in their parcels, so this crop will not contribute to excess BOD either, although during the rainy season they use chemical fertilizers on the rice.

Onion growers in 2007 were using synthetic pesticides to protect against plant pests, polytrine (a.i. cypermethrine) for caterpillars and dithane (a.i. mancozebe) for fungal disease. The farmers have been trained in the use of these products. According to the individual interviewed about onion cultivation, the model farmer obtained the products in Ambositra and brings them back to their villages to distribute to the members of their cooperative or association. The chemicals are supplied in granular form. The growers then mix the solutions according to the training they received, and apply them by hand using pine branches and leaves to sprinkle the product onto the plants. They do not wear any protective clothes. The equipment used to mix the solutions is well washed with soap, away from any surface water. Three treatments are required prior to harvesting the vegetables. The pesticides are stored without any special security measures; the interviewee said her household kept its supply under the bed.

No pesticide has yet been used in the 2008 crop and it is unlikely that synthetic pesticides will be used because farmers have not been able to obtain credits to purchase these products. At the same time, ABC staff is promoting the use of natural methods of control.

On the whole, onion cultivation poses only slight risks to the environment. Since cultivation is occurring on rice paddies during the off season, erosion is not a risk. The quantity of pesticides used is potential low to not at all so they do not present a risk to the environment. If they are used, they may present a health risk, given the mode of application and storage. It is essential for the ABC staff to follow up in this area, and reinforce the training the farmers received.

RICE

The ABC is working in partnership with the DRDR on the rice subsector in Amoron'i Mania. The cultivation techniques being taught include those of the improved rice cultivation system (système de riziculture améliorée, SRA), which is being introduced throughout Madagascar as part of the country's "green revolution" objective of tripling rice production by 2012. These techniques include planting the seedlings in lines, planting them at fifteen days instead of considerably older as in traditional rice cultivation, managing water levels more carefully, hoeing the fields to control weeds, and applying fertilizer. The ABC interventions also include institutional strengthening for the farmer organizations, helping them to obtain credit with which to purchase fertilizer, hoes, and other inputs, and helping them establish direct sale contracts between farmer organizations and rice buyers. The project hopes to reach more than eight hundred farmers with this training by October 2008.

The team met with one model farmer in Amoron'i Mania, in the village of Ambondromisotra. She was very enthusiastic about the ABC assistance, and paid careful attention to the proposed cultivation techniques. Some of these, such as the use of organic fertilizers, were familiar from earlier training she had received, and she reported that they led to a doubling of her rice output. Like many farmers interviewed in the course of the field visits (and, indeed, like some the ABC staff), she mentioned the lack of financial assistance as a limitation on the willingness of many farmers to work with the ABC, especially when other donor projects provide not only advice and credit, but subsidies as well. She also mentioned the problem of maintenance of irrigation canals as a bottleneck in implementing the water management recommendations of the ABC. This is due in part to difficulties in the internal organization of the water users' organization; this problem arises in many regions.

The need to reinforce the training in use of crop protection products became apparent in the course of this visit. The model farmer interviewed raised the problem of rats which attack her rice while it is still in the field. To deal with this, she has placed rat poison on the ground around the fields. The poison she is using is not intended for outdoor use, and it raises a number of possible problems. The poison may enter the water in the irrigation channels. It may be eaten by chickens which wander freely everywhere in Madagascar. If it does not kill the chickens outright, it may be consumed by villagers when they eat the chickens or their eggs. Alternative approaches, such as clearing brush away from the fields, may be effective against the rats without posing as many dangers. The ABC staff should raise this issue wherever they are working, to ensure that if farmers have rat problems they address them in a safe way.

Soil erosion is a significant problem in the district of Ambatafonandrahana where the ABC is working, and the resulting siltation can affect rice yields. Since June 2005, the German-funded Projet de Lutte Anti-Erosive (PLAE) has been working in the area to help farmer groups prevent the degradation of small-scale watersheds. If such siltation is harming the ABC villages, ABC staff may want to collaborate with the PLAE, to see whether that project can provide assistance to address this problem.

The activities of the rice subsector should not pose any major environmental problems. The only major concern pertains to the use of raticides; this must receive attention by the ABC staff.

HONEY

The ABC support to the honey subsector consists of capacity-building, both in production techniques and in organization, management, and marketing. The project has trained people from twenty farmer organizations, representing 277 beekeepers. They have learned how to raise the bees, how to harvest and process the honey, and how to respect quality standards appreciated by the market. Among them, these beekeepers are maintaining 2813 hives, of which 215 are traditional, 1889 "improved," and 708 use frames to hold the wax and honey. These hives are spread out over an area of some 1,700 hectares. The frame hives are by far the most productive if used properly, but using them properly requires the purchase of wax foundations to start the honeycomb formation for each harvest and these in turn require a centrifugal extractor. At present the project is not able to assist the beekeepers with credit, because of the problems with reimbursement of the geranium credits. Consequently most beekeepers cannot buy the wax foundations, and are not achieving maximum yields.

One of the principal reasons for decreased honey production is the decrease in plants on which the bees feed. On the one hand, stands of eucalyptus, the main honey-producing plant in the region, are subject to strong pressure from fuelwood consumption and charcoal production. New plantations are not permitted to grow until they flower, at about five years, and can be used by the bees, but are instead cut on a four-year cycle for other uses. The primary forest which could also support bees is considerably further east, near where the land drops off towards Atsinanana. Some farmers move their hives to that forest in seasons when flowers are not available locally; however this entails a ten-to-twelve hour walk each way, and increases the risk that the honey or the hives themselves will be stolen.

The beekeepers in Amoron'i Mania are very much interested in reforestation, and are already undertaking some plantations. The ABC is encouraging them to plant eucalyptus and other honey-producing plants on their own; the project cannot take this on itself because of the short time frame left for its interventions. To the extent that beekeepers working with the ABC do invest in reforestation, this will be a positive environmental impact of the work in this subsector.

4.3 CULTURAL ISSUES

In the region of Amoron'i Mania, particularly in the district of Fandriana, women are often engaged in agricultural activities typically considered to be men's work, such as digging and plowing. This situation arises because the soils are so poor in that area that the men often must seek paid work elsewhere to ensure the survival of the family. The women are left in the villages to handle all of the farm work, as well as family responsibilities towards the community. When both adults are present, however, the allocation of tasks typically accords to women those requiring less strength but more precision or finesse. In Ambondromisotra, the very dynamic female model farmer hopes to find markets for her organization's products as far away as Antsirabe, and to buy a small truck to collect their own output and bring it to market. She is pushing everyone around her to make a strong commitment to these ambitions – but she is, admittedly, not typical. If she is successful, however, she might have a strong impact on the women around here, as they learn from her example!

The individuals interviewed in Amoron'i Mania indicated that women typically manage the household budget, while both parents are involved in making major purchasing decisions. Increases in income are typically spent first on improved nutrition. Thereafter, they are invested in the purchase of cattle, a common form of savings in Madagascar despite the risk of theft. Some families invest in small livestock such as pigs or fowl, or in the purchase of food at the time of harvest that they will sell in the lean period when prices rise. Other use increased income to improve their homes or build new, more solid ones. Investments in agricultural tools, however, are not generally a priority.

Education of children through primary school is important for all families. Interest in further education varies from family to family, however. Additional education is expensive, because children must typically board away from home, so this is not a routine investment. In all cases, however, children help their parents in the fields when not in school as soon as they are old enough to do so. The project activities are not likely to have any effect on these patterns.

4.4 CONCLUSIONS

The environmental impacts of ABC activities in the region of Amoron'i Mania should be positive on the whole. The honey subsector should contribute to reforestation and protection of the forests, through the commitment of beekeepers to plant flowering trees and manage the natural forests so as to ensure their availability for honey production. Collaboration with projects working on reforestation and conservation may help in ensuring that this potential is realized. Otherwise, this subsector increases local incomes without presenting any environmental hazards.

The geranium subsector will have positive impacts as well, through the use of plant residues for compost. The possible negative effects of this subsector are linked to possible soil erosion from cultivation on steep slopes, to effluent discharge from the distilleries, and to the use of fuel wood. However simple measures are available to reduce or eliminate these impacts, and the ABC staff are encouraged to implement them. Collaboration with the PLAE on erosion issues may be a useful strategy in dealing with this issue.

If agrochemicals are used, as in the case of onions, it will be important to follow up on the training already given, and to reinforce the use of safe practices. This will be important in rice cultivation as well, given the use of raticides observed in Ambondromisotra.

Table 4.5 Environmental Impacts in Amoron'i Mania

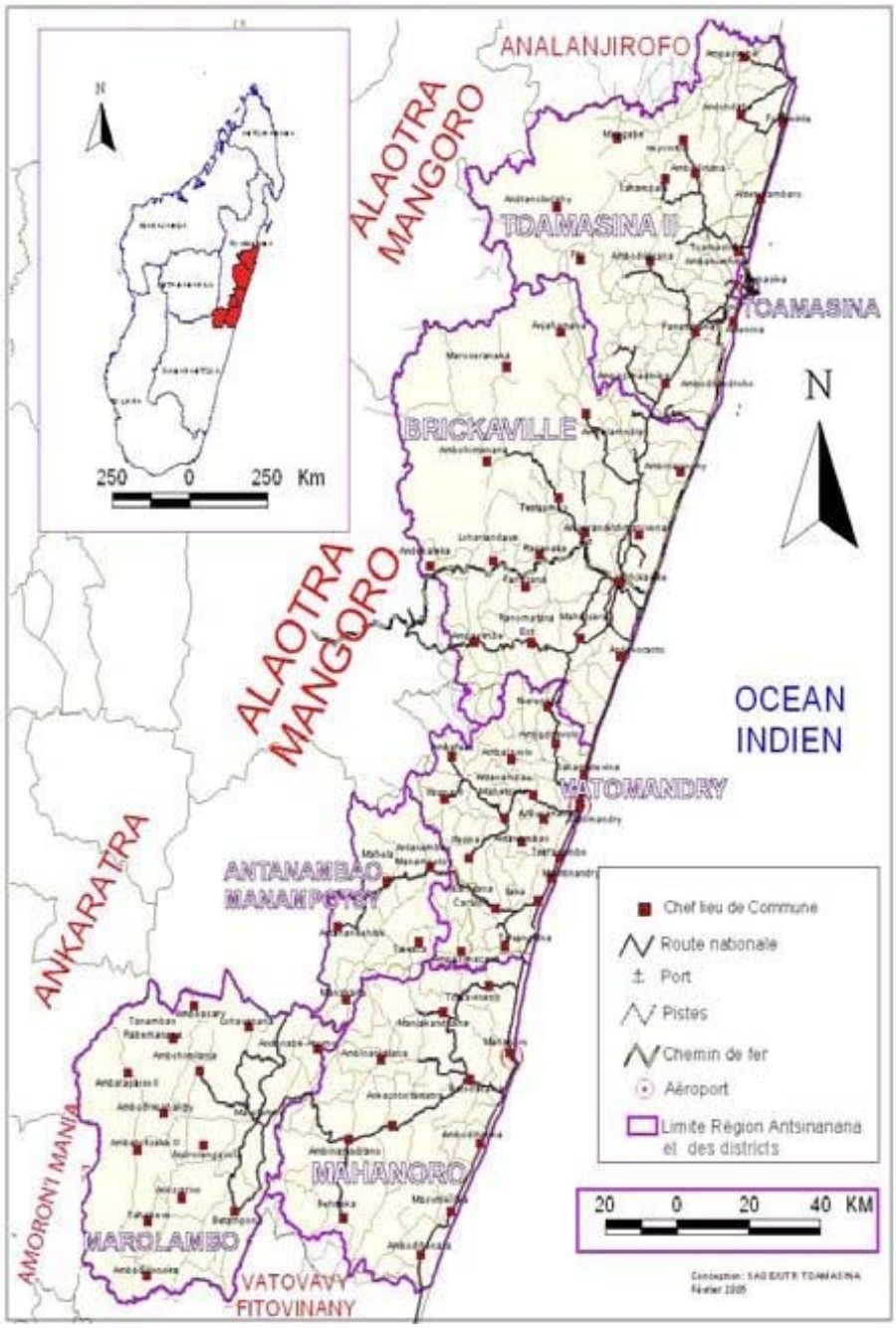
Impact	Source	Intensity	Duration	Spatial Extent	Frequency	Importance	Response
GERANIUM							
Pollution of surface water	Discharges from the distilleries	Depends on the concentration of the effluent	While distillation is ongoing	Downstream from the distillery; the extent depends on topography and flow levels	Three times a year during the periods of leaf harvest and distillation	Moderate negative impact	ABC staff should verify that the effluent cannot hurt crops ; if it is safe, it should be directed onto the fields rather than into streams
Deforestation of eucalyptus or pine	Use of fuelwood to fire the distilleries	Depends on quantity of leaves distilled	Permanent, for the trees that are cut	Wood probably comes from areas near the villages where distilleries are operating	Three times a year during the periods of leaf collection and distillation	Low at present, because consumption is a tiny portion of regional wood consumption	Field agents should encourage reforestation, especially in collaboration with eucalyptus planting to support honey activities
Enrichment of soil	Use of leaf residue as compost	Locally intense where residues are available for compose	As long as geranium distillation is a local activity	On the fields of growers using the residue for compost	Leaves are available three times a year, during geranium harvest	Moderate positive impact	ABC staff should encourage composting and provide training if needed
ONIONS							
Health risks from pesticides if used	Unsafe handling and storage practices	Depends on practices followed and quantity of pesticides used	As long as pesticides are used or stored unsafely	Local; this can affect farmers handling pesticides or their families	During the season, as long as pesticides are used or stored	High negative impact ; although the probability of harm is low, the consequences are serious	Field agents should reinforce training in safe pesticide use and storage
Rice							
Improved management of the water users association leading	Application of management training received through ABIP to	Depends on behavior of farmers in water users association	As long as management remains better	Area managed by the water users association	Ongoing	Low positive impact; benefits could be considerable but	Field agents should reinforce management training when

Impact	Source	Intensity	Duration	Spatial Extent	Frequency	Importance	Response
to better management of irrigation and drainage systems	water user association					probably is low	possible to encourage application of new skills
Risks to health and environment	Use of raticides to keep rats from eating rice	Depends on quantity used	As long as products are being used	Farmers handling raticides, their families, or others in the area	During the season, as long as raticides are used or stored	High negative impact ; although the probability of harm is modest, the consequences are serious	Field agents should train farmers in alternate methods for handling rats
Honey							
Reforestation	Planting honey-producing species by beekeepers	Depends on how much reforestation is done.	As long as beekeeping continues or the trees survive	Wherever trees are planted	As long as the trees survive	Highly positive with respect to watershed protection and eventually wood supply	ABC staff should encourage reforestation and collaboration with other projects working in this area.

CHAPTER 5. ATSINANANA

5.1 OVERALL DESCRIPTION OF THE REGION

Figure 5.1 Location of Atsinanana



Source: Atsinanana 2005, p. 10

Atsinanana is on the eastern side of Madagascar, in the center of the island's northeast-southwest axis. The district rises in altitude from sea level up to a height of 1,300 meters along the ridge that runs down its western portion. The coastline itself is flat, rising only to a height of 25 meters. The coastal plain runs the length of the province, and is rich in agricultural potential. Transport on he plain is served both by the Canal des Pangalanes and by the highway that parallels to the coast.

Atsinanana's climate is generally characterized by high rainfall and relatively moderate temperatures. The coastal area, influenced throughout the year by trade winds, has the highest rainfall; indeed, it is said of this region that "there are two seasons, the rainy season and the season when it rains." Both rainfall and temperature drop somewhat as one moves to the western part of the region, as shown in Table 5.1.

Table 5.1 Atsinanana Climate

Zone	Climate	Rainfall, in mm	Average Temperature	Altitude, in m
Coast	Hot, moderate to high humidity	>1800	>22	0-300
Cliffs and rain forest	Hot, moderate to high humidity	>1600	>20	300-800
West	Temperate tropical climate	>1200	16-21	800-1300
Source: ONE, Politique Régionale Environnementale, Atsinanana. Pages 11 and 12.				

The high rainfall and steep topography of the region lead it to have a large number of fast-moving rivers, subject to rapid increases in flow and frequent flooding during the rainy season. Moreover, the region is subject to violent cyclones during the rainy, with frequent and devastating effects on its infrastructure, agriculture, and living patterns. These patterns combine to make soil erosion a significant concern wherever – as is, necessarily, often the case – cultivation takes place on steep slopes. They also mean that any use of agrochemicals or other activities that could create runoff must pay particular attention to managing water flows to ensure that no harm will be down to downstream watercourses.

While Atsinanana's vegetation has been heavily impacted by human activities, especially in the eastern parts of the region, as Figure 5.2 shows much of its rainforest still remains towards the west. The coastal zone is characterized by dune vegetation where the sea affects soil conditions. On the plains near the coast, natural vegetation is characterized by prairie, in some cases mixed with woody plants and areas of plantation forest, notably eucalyptus. Some patches of primary forest still remain along the coast, particularly in the southern part of the region. These are targeted for protection in the forest zoning plan being prepared by MEEFT with assistance from the USAID-funded Jariala project. Further inland, tropical rain forests are mixed with secondary forests known in Madagascar as *savoka*, which takes over when rain forest is cleared by burning. These include a mix of shrubs, ferns, bamboo, and large herbaceous plants, dominated by the fan-shaped *ravinala* or traveler palm.

Atsinanana is home to three protected areas, the Special Reserves of Mangerivola and Sandrangato to the west of Brickaville and the Integrated Nature Reserve of de Betampona to the northwest of Tamatave (also called Toamasina). Just west of Atsinanana, and due east of Antananarivo, is the Mantadia-Andasibe National Park, a major destination for viewing lemurs and other rain forest species; to the north of the region is the Zahamena National Park. The major areas of remaining rain forest form a natural corridor connecting these protected areas. It is the hope of ONE and others working on biodiversity conservation to protect (or improve) as much of this area as possible in order to maintain a large parcel of contiguous habitat for fauna and flora alike. Establishment of such biodiversity corridors is a common practice in biodiversity conservation; moreover with the threat of climate change, it is preferable that they have a north-south rather than east-west orientation. Maintaining the integrity of this band of forest is therefore an important concern in assessing the impacts of ABC activities.

This should, in fact, not pose a problem for the ABC. Because MCA is focused on commercializing and professionalizing existing agricultural activities, ABC is focusing on the areas near the coast, where transport is easier and lower in cost. The forest corridor exists precisely because that area is inaccessible; for the same reason, the ABC is not interested in working there. Threats to the forest corridor may come from other development activities in the region, as improving transportation to

inaccessible areas is a goal of many development plans. If the road network is densified and extended into the western portion of the region, this will pose significant threats to the rain forests. However this will not be caused by ABC activities.

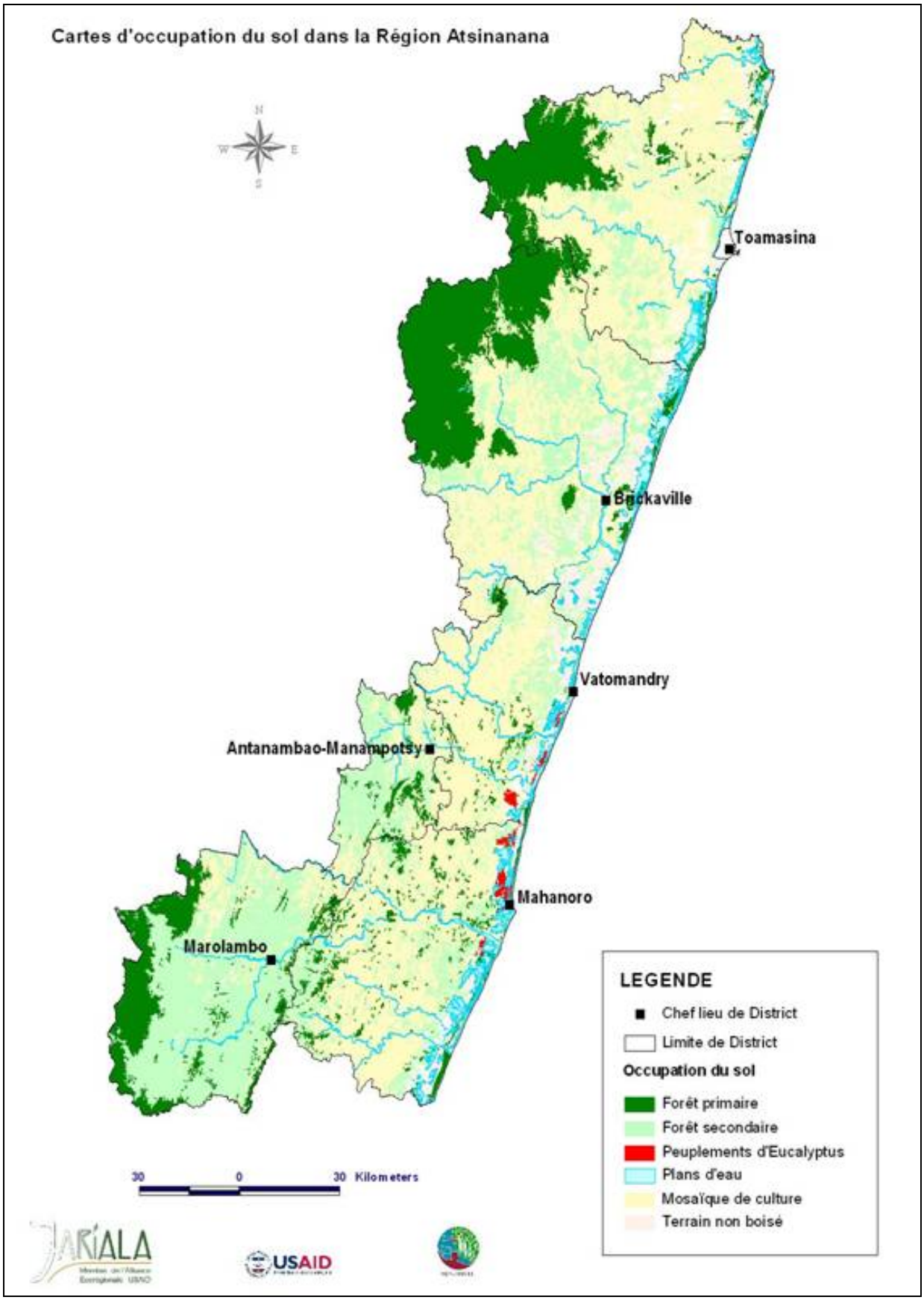
On the other hand, there are also much smaller areas of forest closer to the coast that MEEFT would like to protect from further exploitation. To the extent that the ABC is already working in villages near any of these regions, it is important that they coordinate with MEEFT and the various environmental projects in the region to identify the exact locations of the forest areas to be protected. They should then make sure the villagers are aware of these areas, and should make it clear that no ABC support will be available for agricultural activities that involve clearing any of that land. In choosing new villages to work, ABC may wish to avoid villages adjacent to those forest areas altogether. Figure 5.3 shows the proposed forest zoning, including the areas targeted for conservation in the future. That figure extends beyond the borders of the region in indicating the scope of the proposed conservation corridor; this may be seen by comparing the two figures in this chapter.

Atsinanana is a region of relatively high population density and immigration, when compared with Madagascar as a whole. The limited population data available in the regional environmental policy paper (ONE June 2006, p. 19, Table 7) suggest an annual growth rate of about 5.5%, as compared with a national average of 2.8%. Population density in the region is almost 39 people per square kilometer as compared with 28 for the country as a whole. Some of this immigration has been attracted by economic opportunities, including a range of mining activities. Most recently, the Canadian Sherritt company is developing the nickel and cobalt resources at Ambatovy near Moramanga, a project which includes construction of a pipeline from there to Tamatave and of a processing plant in Tamatave. The construction has led to an influx of thousands of workers; once operational, the ongoing operations will continue to provide jobs for hundreds. As will be discussed below, the ABC vegetable cultivation activities are targeted at meeting the demand created by the Sherritt operations.

This growing population places pressure on the environment, exacerbating all of the demands places on the region's natural resources. The largest threat to the environment of Atsinanana comes from the practice of *tavy*, or slash and burn agriculture. This is a major source of deforestation, soil erosion, and siltation of downstream water courses and irrigation systems. When primary forest is cut, clearly the result is a loss in plant biodiversity and habitat for animal species. But all burning, whether of primary or of secondary forest, can have significant negative externalities. Burning can remove all plant cover, leaving the soil exposed to the air and vulnerable to erosion from wind and water. If, as is often the case in Atsinanana, the land burned is steep in slope, this adds to the erosion risks mentioned above. Erosion not only harms the fields that have been burned, but the soil born off the slopes is borne downstream where it can clog up rivers and rice paddy irrigation systems. In some cases, given the frequency of flooding in the region, such soil can also be deposited on downstream fields. This may increase their fertility; there are some silver linings to the loss of soil upstream.

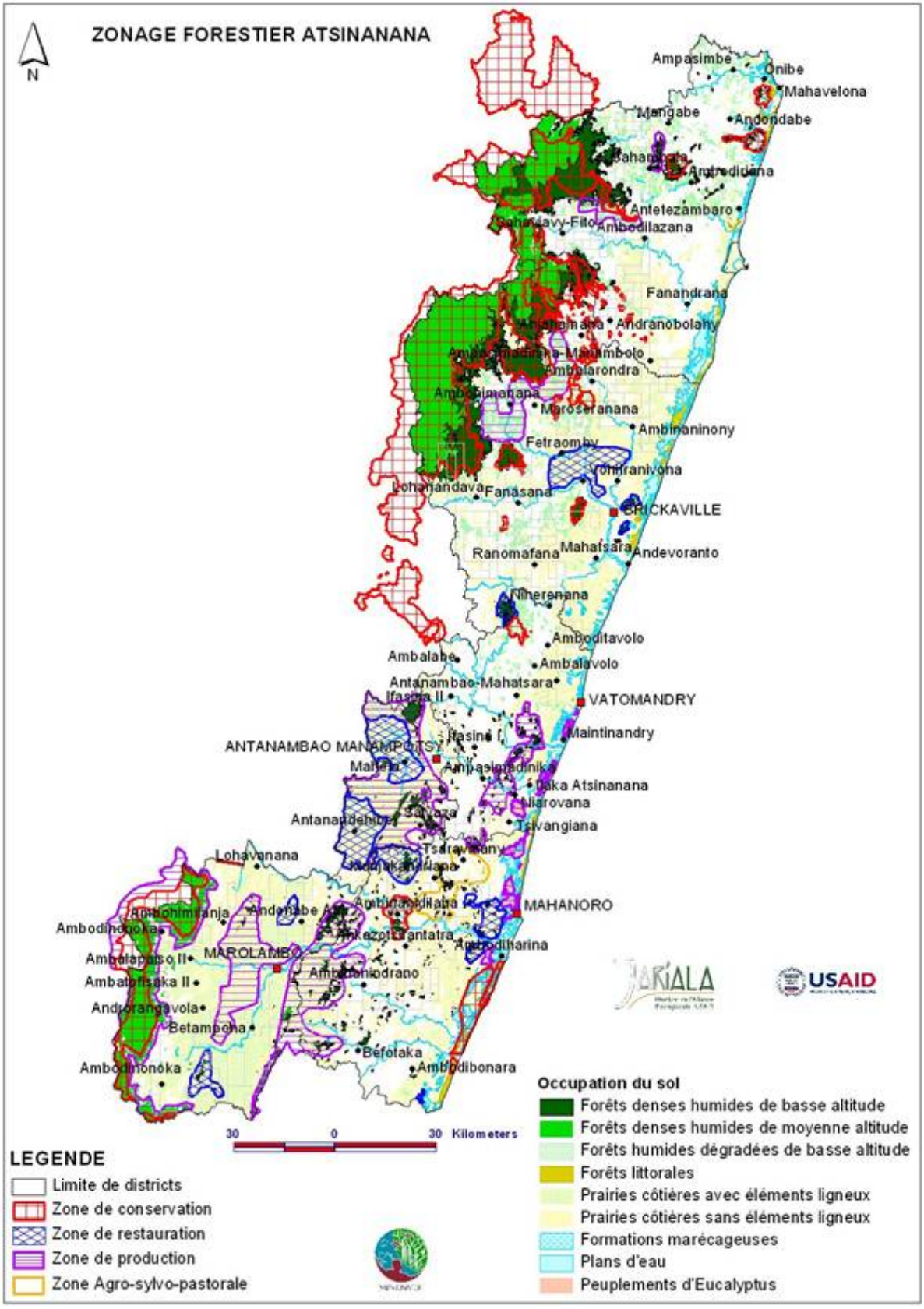
The major reason for burning fields in Atsinanana is to clear land for cultivation; this differs from other areas, where encouraging growth of tender young grasses as fodder for livestock is a major motive for setting bush fires. The need for wood for cooking and household use and for the manufacture of charcoal also drive some forest destruction. Ravinala and bamboo from savoka forests are used for building materials, while raffia is used to manufacture baskets and other items both for local use and for sale to tourists. Plantation forest products meet some of the need for wood products, and there is a regional effort to encourage further plantations, but this does not begin to keep up with the growing demand. (ONE June 2006, p. 32)

Figure 5.2 Land Cover in Atsinanana



Source: MEEFT/Atsinanana

Figure 5.3 Forest Zoning, Atsinanana



Source: MEEFT/Atsinanana

Eliminating *tavy* is more complex than simply banning the practice. The practice is used not only on primary forest but also on savoka or other land once cultivated that has been left idle. Where the land only has brush on it, alternative methods of clearing for cultivation, such as cutting the plants, leaving them on the ground to begin decaying, and then cultivating within them, are feasible. Where trees are growing on the land, however, methods of clearing that do not use fire are extremely labor-intensive, and therefore not economically viable. When the land in question is flat, the use of fire in such areas may not pose a great risk of erosion, but where it is steep in slope, the risks are severe.

One other environment-related issue must be noted in Atsinanana. The region is a major producer of litchis. These are trucked to Tamatave, where they are treated with sulfur to preserve them for shipping to European markets. This becomes a source of some air pollution, and more importantly of large quantities of organic wastes including the leaves and baskets used to package the fruit and discarded fruit not considered suitable for export. This waste piles up in a few areas outside the city, but is not composted or managed in any other suitable way. The ABC is working with the litchi subsector; therefore some attention must go to its impacts on this waste management problem.

The major natural resource management and environment concerns to which ABC must pay attention in Atsinanana, therefore, are:

- managing the risk of erosion created by cultivating on steep slopes
- protecting the remaining forested areas from agricultural extensification
- preventing the use of tavy, with the risks it poses both for forested areas and erosion
- managing any use of agrochemicals to ensure that it will not threaten downstream water supplies
- management of the wastes from litchi processing in Tamatave.

5.2 SUBSECTOR ASSESSMENTS

The March 2008 ABIP Action Plan envisages support to three subsectors in Atsinanana; corn, vegetables, and litchis. In addition, in the past the ABC provided support to the essential oil subsector, which raised questions about environmental pollution. All four of these subsectors are considered by the SEA.

Corn

Through ABIP, the ABC staff is helping farmers to improve and expand corn cultivation. The technical improvements include the use of improved seeds that have been pre-treated with synthetic pesticides, planting in rows in order to make weeding easier, intercropping corn and cow peas in order to enrich the soil and reduce the risk of erosion, using organic fertilizer (guanomad, a locally manufactured fertilizer made from guano). They also include techniques that can enrich the soil while preventing erosion, which are discussed below.

The ABC staff reported that the villages where they worked, farmers were already cultivating 0.2 hectares per person of corn, largely planted to serve as fences around other crops. Under the project an additional 118 hectares were cultivated by some 150 farmers, a rise from 0.2 to 0.79 hectares per farmer. This expansion of corn cultivation raises concerns pertaining to what vegetation is now on the land, how that vegetation is cleared, and how steep the land is. In most cases it appears that some natural vegetation is now on the land to be used for corn; this crop is not

displacing other economically valuable cultures, nor are fully cleared fields available for new cultivation. However the vegetation to be displaced is typically brush and grasses or savoka forest. Except to the extent that ABC might already be working in villages near the small forest areas MEEFT wishes to protect (see above), clearing this vegetation does not in and of itself raise environmental concerns.

However the method of clearing can raise concerns. Villagers prefer to clear land by burning off the existing vegetation and planting in the charred remains (*culture sur brulis*). Where that vegetation consists of significant trees, they first cut them down and then burn to clear out both the cut trees and the stumps and roots. Such fires can contribute to rapid soil erosion, and if not well managed they can get out of control (though one person interviewed said proper firebreaks were now used regularly, so uncontrolled fire is not a major problem). Because of the possibility of soil erosion, ABC has established a policy of not supporting any agricultural activities for which land has been cleared by burning. This only pertains to the actual fields in which they are working; though they may discourage burning, they cannot prevent farmers from using these practices elsewhere. However this will at least make the point that burning is not an acceptable practice on steep slopes. More importantly, if the alternate practices that they recommend are effective, they may lead farmers to avoid burning other fields.

It is not clear that all burning is uniformly harmful. When the land is flat, burning removes existing vegetation efficiently and leaves ash which contributes to soil fertility. When it is steep, the same happens; however if there is significant rainfall shortly after burning, the newly cleared soil can run off the slopes altogether, with consequences both for the denuded hillsides and for downstream areas where the soil is carried. Since it rains often in this region, this is a significant risk which may justify a ban on burning on all but flat parcels. On the other hand, much arable land in the area has been left uncultivated for long enough that it has significant tree cover. Clearing that land for cultivation without burning is too labor-intensive to be economically viable; only fire is efficient enough to make it possible to convert those areas back into fields. A ban on all burning may therefore limit available land for cultivation and require shorter idle periods than otherwise in practice.

Where the existing vegetation is limited to grasses and brush, ABC is proposing alternate methods of clearing and cultivating. They recommend cutting the brush, leaving it on the ground to dry and form mulch, and then planting directly within it. They also recommend planting hedges to limit wind-borne erosion, and intercropping (*culture associée*) the corn with leguminous plants such as cowpea (*niébé*), both to limit erosion and to enrich the soil. Members of the farmer group in the village visited were open to trying these techniques, and tests were in process to assess corn yields when they were used. The ABC technical assistants reported that these techniques are labor-intensive; they suggest that it takes thirty person-days per hectare to prepare land for cultivation using these techniques. The farmers in the village visited indicated that they borrowed money to hire laborers to prepare the ground for soil cultivation; it is not yet clear whether the revenues will be high enough to cover this cost. The farmers also indicated that while they had been trained in the new techniques, they were not always able to train the hired laborers in the same practices, and they were even less able to ensure that laborers implemented the new practices.

The scoping study and one of the people interviewed suggested that the erosion resulting from corn cultivation on steep slopes could silt up lowland or river basin areas used for other cultivation, including for the vegetable subsector which is also receiving ABIP support in Atsinanana. If the erosion control practices introduced by the ABC are effective, this should not, in fact, be a risk. If they are not, whether this occurs will depend on the exact placement of crops in relation to each other. The ABC has not yet actually begun any vegetable planting work, and is not mapping out

formal land use plans in any of the villages where they work. An informal approach to ensuring that siltation is not a risk may be the most effective. In guiding farmers in the choice of cultivation areas, the field agents should make sure they are aware of what is both upstream and downstream from the fields where they work, so that their crops will neither cause nor be affected by potentially harmful soil erosion.

The cultivation of corn is being done with inputs of the organic fertilizer guanomad, purchased by the farmers on credit. If used to excess, or if heavy rains fall immediately after application, this could lead to runoff of organic material and increases in biological demand in waterways downstream. At face value, this would seem unlikely, as the fertilizer is expensive and farmers seem unlikely to waste it; indeed, none of the people interviewed felt excess use was a risk. However, the ABC staff did indicate that farmers are very enthusiastic about the impacts of guanomad, and were interested in increasing from 400 to 600 kg /ha in cultivating corn. However at present, ABC staff is recommending the use of 200 kg/ha because of the financial constraints of the farmers and their ability to obtain and repay credits for all cropping operations due to the low income generated by this crop.

Corn cultivation is also supposed to be done with improved seeds that have been treated with pesticides to head off specific infestation problems. The potential risk here comes from the process of treating the seeds, if this is done by the farmers themselves. So far it has not been. If the use of improved seed does come to involve direct treatment with pesticides by farmers, then training and monitoring will be required, as with all pesticide activities.

It has been suggested that the introduction of larger scale corn cultivation could lead to monoculture on a scale large enough to create new pest problems. This seems unlikely. No plots are expected to be larger than 2-3 hectares, and so far they are much smaller. Malagasy farmers generally cultivate different crops next to each other, which will reduce the risk of new pest problems. In addition, ABC is encouraging intercropping as an erosion strategy; this further makes monocropping-related pest problems unlikely.

Vegetables

The ABC is planning to provide support for vegetable growing, but actual planting has not yet begun. Consequently, we cannot base our assessment of this subsector on environmental issues that have already arisen. The farmers interested in entering this subsector have not yet identified the specific plots they will use for that purpose, so we also cannot assess whether the new crops will displace important natural vegetation or how they may be affected by soil deposition due to upstream erosion. However, vegetables are likely to be grown in lowland areas of considerable agricultural value. Since these are valuable areas, it is likely that they are already in cultivation or fallow. We do not, therefore, anticipate that the land to be used for vegetables would be obtained by deforestation of any areas intended for conservation. In addition, since vegetables are likely to be grown in lower flat areas, we also do not expect significant erosion to result.

On the other hand, agricultural pests do constitute a risk in vegetable cultivation, and either natural or chemical means may be needed in order to reduce the harm they cause. The procedures discussed above for crop protection throughout the country will therefore have to be implemented in this subsector, with particular attention to the prevention of runoff that could contaminate water supplies with hazardous chemicals.

Litchis

The ABIP support for the litchi subsector is focused on quality control and marketing. In the existing system, litchi collectors (or occasionally the exporters themselves) travel to the villages and buy all of the litchis available. They look over the fruit they are buying and estimate the share of it that might be usable by the exporters and the share that will be discarded. They then set a price for the whole harvest based on the share they anticipate will actually be exported – while taking the whole harvest rather than taking only those fruit that can be exported.

The ABC quality strategy involves encouraging the farmers to sort their own litchis and only offer for sale the ones that are actually of high enough quality to be exported. The remainder the farmers may then keep and sell themselves on local markets. The hope is that the collectors will then pay for 100% of what they take instead of taking 100% and paying for, say, only 80%. If this works, then the farmers will end up making more money, because they will earn something by selling the rejects on the local markets. Farmers who sort their own litchis bring the high quality ones to a community hangar, and the collectors come to the hangars to purchase them. When they purchase from the hangar they know that they are purchasing only high-quality litchis, and therefore – at least in theory – should be willing to pay for 100% of what they take. In addition, the hangar system makes it possibly to comply with the tracking requirements of EurepGAP, so exporters working within that system will be able to purchase from the hangars, creating an additional market for this product.

In practice, the ABC staff said that this is not quite working. One exporter who buys directly is indeed paying for 100% of the litchis bought from the hangars, but no one else is. The farmers have to contribute a sum to cover the cost of managing the hangar, and have to find buyers for the lower quality litchis that they sell locally. Consequently while some 3,500 growers apparently are working within this system, ABC staff said that most growers are not interested in continuing their participation. For the system to become more effective and interesting for the grower, the buyers – whether collectors or exporters – will have to appreciate that litchis from the hangars are all of high quality and be willing to pay for 100% of what they take. If compliance with EurepGAP becomes more important, this system will also be more advantageous than it is now, which may give the farmer groups organized through the hangars the leverage to insist on being paid for 100% of what is sold, not a lower share.

If this system works, it should help address one of the significant environmental concerns raised by the litchi industry. Litchis are treated with sulfur at processing plants in Tamatave before being packed for shipping to Europe. During the four to six week period of the harvest, huge quantities of organic waste pile up in the city, including the leaves and baskets in which villagers pack the litchis for collection and the rejected litchis, which are generally discarded by the exporters. While this material could be composted, most exporters simply dump the trash in one of a few designated areas around the city. The municipal government has not taken on the challenge of composting, so the material goes to waste. The ABC system, by reducing the quantity of litchis brought to the city and eliminating the shipping of litchis that will be discarded, will also reduce the amount of waste that accumulates during the period of harvest and treatment. It will also reduce the quantity of sulfur used in treatment and the resulting environmental impacts, both local and global. Therefore this activity of the project will have a positive effect on urban environments in the region of Atsinanana.

The ABC is planning a further modification to the litchi collection system, which will have additional environmental benefits. They plan to replace the banana leaves and loosely woven baskets in which litchis are now packed with stackable, traceable plastic cases that will be brought back to the villages for regular reuse. This will further reduce the amount of trash generated from the litchi industry.

This packaging is a component of the EurepGAP tracking system; the desire to be able to sell into that market may give the farmers an incentive to participate in the new system.

Essential Oils

Although there is little activity in the Atsinanana essential oils sector at this time, they did receive support from the ABC prior to the beginning of the Chemonics project. At that time the subsector was the subject of some concern on the part of MCA staff. They made a number of visits to Atsinanana, and visited four specific distillery sites (one of which was no longer operational). They raised several environmental concerns.[1] The distilleries consumed a fair bit of water – 600 liters per hour for one, 1200 per hour for a second, and 5000 per day for the third. Much of this water was presumably discharged back into the environment after processing, with the addition of organic matter from the plants; this discharge was considered a source of potential pollution with possible negative effects on downstream water users. Two of the distilleries were powered with wood, one using one stere of wood (one cubic meter) every six hours, the other using two to three stere per day. This led to questions about where the wood came from, and the impacts of this much wood use on forests in the area. In addition, one of the distilleries, in Ampasimazava, was capable of consuming 900 kilos of eucalyptus leaves, much of which remained as waste after the oils were extracted. This waste was accumulating near the distillery, and leachate was running out of the mound of leaves and into a nearby stream used, some 100 meters downstream, for water supply. In a subsequent trip to the region, the MCA staff discussed an additional distillery, which had recently begun operations, where accumulating leaf pulp also was beginning to threaten adjacent water quality, as excess organic matter in the surface water was leading to the formation of algae due to high levels of biological oxygen demand (BOD). In both of these cases MCA directed that the waste piles be moved away from the water supplies and be spread out so that they could dry, after which the waste was to be burned in small piles over time. A recent visit by ATABC in June 2008 noted that this has in fact been done.[2]

In 2007 the MCA staff had water quality tests carried out downstream from the distillery discharge point in one village, to assess whether these wastes were having negative impacts on water quality. These found that water quality was acceptable on all measures but pH, which, at 5.6, was below the World Health Organization minimum of 6.5. No measures were taken upstream from the discharges, however, so there is no way to know whether the low pH was related to the distillery.

These concerns could have been raised in an EIE conducted by the niaouli promoters for their distillery operations, if it turns out to have been required by MECIE as discussed in Chapter 2. The MCA staff memos on this activity make no reference to such an EIE, nor of the niaouli promoters obtaining an operating permit from the MECI as required by Law 99-021. This suggests that in fact it was not done. The ABC is considering the continuation of their support of niaouli beneficiaries though there has been a breakdown in communication and collaboration between promoters and niaouli collectors.

Should the ABC continue its support to this subsector , the questions of the operating permit and the EIE must be resolved. As mentioned in Chapter 2, MCA should seek advice from Ministry of Environment, Water and Forests, and Tourism on the implementation of Law 99-021 to determine whether it has in fact been interpreted to apply even to very small-scale artisanal activities. If so, then the promoter will be required to carry out the study as a prerequisite to any new operations.

[1] Rasoanandrianina and Andrianarisoa October 2006
[2] Ag Tech International, June 2008

If not, then the information available from the MCA staff reports enables us to identify the concerns that will arise in this case and in the cases of other distilleries or treatment. This enables us to direct the ABCs as to the strategies required to prevent such problems in the future. Several steps will be required, on each of which the ABC staff should both train the villagers and follow up to ensure that the lessons are being followed:

- If waste leaves are significant in quantity, ensure that interim storage for them is at a safe distance from surface water. The distance considered "safe" will depend on topography and the direction in which any liquid leaching out of the waste may flow.
- Assess the feasibility of composting the waste, spreading it out to dry and then burning it in an appropriate controlled fashion, or applying it directly on the soil as mulch. Which of these is most feasible will depend on the season (given high levels of rainfall drying and burning may not be realistic most of the year), the need for mulch, and so on.
- Identify the quantity, composition, and concentration of any effluent leaching out of accumulated waste to determine the impacts it could have on surface or ground water. This will provide a basis for assessing whether the effluent does in fact pose any risks; in many cases the quantities are likely to be small enough and the contents innocuous enough that no harm may be done by simply allowing it to flow into surface water or onto the ground.
- Evaluate the quantity of wood used to fire the distilleries (if wood is used), the source of that wood, and whether this use constitutes a threat to adjacent forests. It is quite possible that distillation may not be economically viable if an alternate fuel is used; this issue must be taken into account if the ABC is considering resuming work in this subsector.

5.3 CULTURAL ISSUES

As in most parts of Madagascar, gender roles are clearly defined for agricultural work in Atsinanana. Men handle work that requires strength, such as cutting trees or brush, digging, and construction of raised planting beds. They also handle burning the fields. Women undertake more meticulous activities, including planting, weeding, and removing corn kernels from the cobs. When men cut brush from fields, women drag it off the field so it can be piled up for burning. There was agreement among everyone interviewed that men do not have the patience for work that requires continuous attention to detail; in many places this point elicited laughs among those interviewed, and rueful acknowledgements that only the women could undertake these tasks.

Most people interviewed felt that the balance of labor in agriculture is fairly even. For the most part the activities introduced by the ABC would not change this. The new techniques for growing corn will call for less weeding, so this will lighten the burden on women. On the other hand, since they are also responsible for ongoing activities related to home and childrearing, some people indicated that on the whole they did have more work than the men. Everyone interviewed indicated that while children do undertake agricultural work at some time, they are not kept out of school for this purpose, so the ABC activities do not pose a risk of increasing child labor.

On the issue of how households will use increased income resulting from ABC activities, most people interviewed did not know. The director of ODDIT, which works on integrated rural development projects through the Catholic Church, mentioned expenditures on agricultural equipment, clothes, and food. If the ODDIT observations are typical, then increases in income would appear to have a valuable positive impact on the affected communities.

5.4 CONCLUSIONS

The ABC activities in Atsinanana call for several responses:

- Assess the location of corn and vegetable activities to determine whether they are taking place in proximity to forests targeted by ANGAP or MEEFT for conservation. If ABC is working near or within such forests, they should coordinate with ANGAP, MEEFT, or other organizations that will be managing protected areas to ensure that agricultural activities do not have negative impacts on forests.
- Where cultivation is occurring on steep slopes, primarily for corn, continue working with farmers to introduce techniques that will prevent soil erosion.
- If agrochemicals are introduced in vegetable growing, ensure that farmers are thoroughly trained; monitor their crop protection practices to ensure that they are applying the techniques in which they are trained.
- Determine whether MEEFT considers an EIE to be required for the essential oils sector; if so, ensure that it is carried out.

Table 5.2 Environmental Impacts in Atsinanana

Impact	Source	Intensity	Duration	Spatial Extent	Frequency	Importance	Response
Corn							
Incursion into small forest areas that MEEFT hopes to protect	Extension of fields for cultivation of corn.	Total destruction of forest to be protected	Permanent	Size of the fields involved; from quite small to possible 2-3 ha.	Once it occurs it is permanent.	Moderate	Do not work in villages near those small forest areas. If ABC is already working there, do not provide support for any cultivation that involves clearing those forest areas.
Significant soil erosion on steep slopes if rain follows burning. Soil that runs off could either silt up or enrich downstream fields.	Burning vegetation to clear previously cultivated but idle land or make new land available for cultivation. (see also next item)	Depends on weather conditions	Time required to restore soil nutrients; duration depends on techniques used (if any)	Size of the fields involved; from quite small to possible 2-3 ha. The spatial scale of downstream siltation due to erosion will depend on topographic and hydrological patterns in the immediate region.	Depending on soil and weather conditions and whether vegetation grows back, erosion could continue to be a problem indefinitely.	Low; ABC will not work with farmers who burn fields.	ABC has already established a policy of not supporting agriculture on fields that are burned, so this may not be a problem. However the costs of clearing trees from fields left idle for long enough for them to grow back may mean that corn cultivation is not economically viable.
Reduced soil erosion and enriched soil, if corn grows well	Introduction of hedges, intercropping, cultivation on	Will vary depending on how effective they prove to be.	As long as the practices continue to be used.	Size of the fields involved; from quite small to possible 2-3 ha.	Ongoing if the practices continue to be used.	Moderate positive impact.	If corn (or other crops) grow well using these practices, they

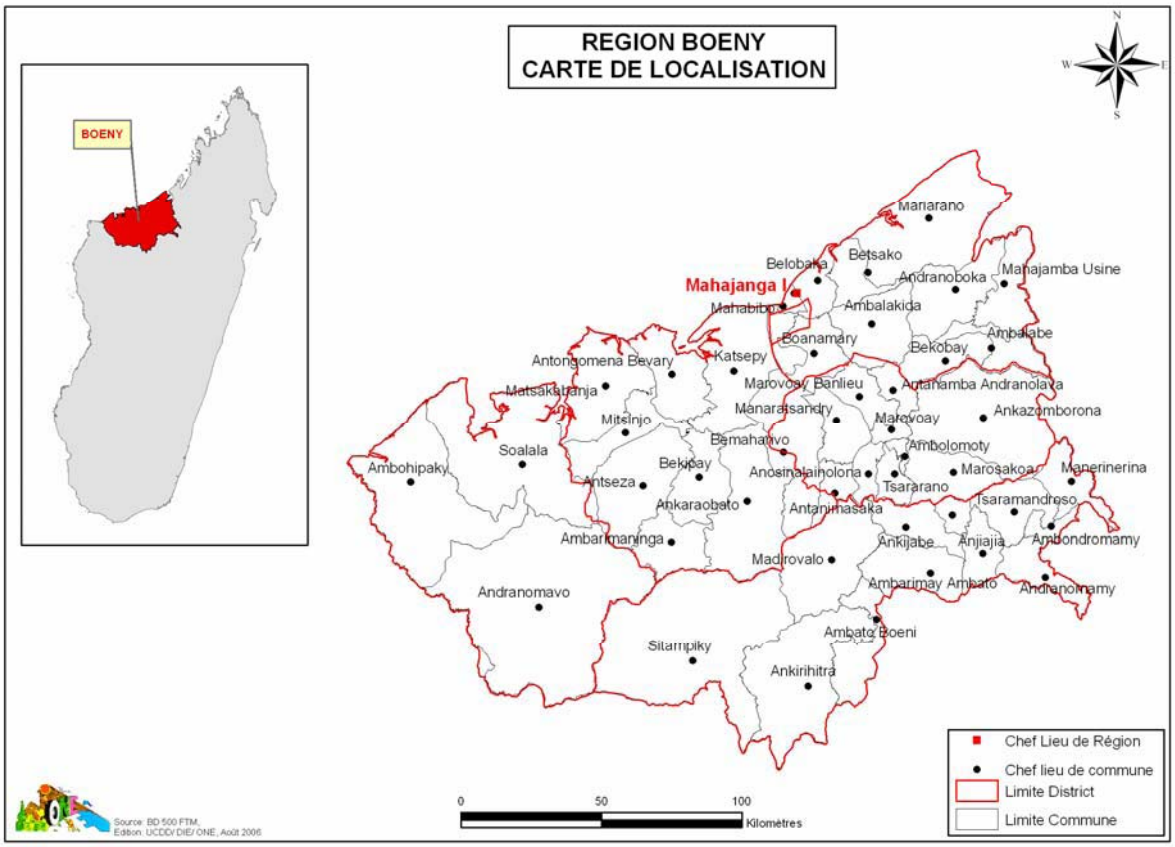
Impact	Source	Intensity	Duration	Spatial Extent	Frequency	Importance	Response
	organic matter, and other practices to prevent erosion. These practices may be seen as the flip side of burning, as they are the alternatives ABC is recommending.			The spatial scale of downstream siltation due to erosion will depend on topographic and hydrological patterns in the immediate region.			should be encouraged wherever feasible.
Siltation of fields downstream – OR – enrichment of downstream fields that receive the rich soil running off the hillside. Downstream impacts depend on whether the downstream fields are actually cultivated when the erosion occurs. Young plants might be smothered by erosion, whereas siltation of a field to be planted shortly thereafter might be a benefit.	Soil erosion due either to burning or to the failure of practices intended to prevent erosion.	Depends on amount of erosion.	Depends on amount of erosion.	Depends on amount of erosion.	Depends on land cover on the hillsides upstream.	Moderate	To avoid negative impacts, the farmers on upstream and downstream fields should coordinate with each other, so as to ensure that hillsides are not bare when the lowlands have just been planted. In addition, of course, erosion prevention techniques should be used to minimize the risk.
Litchis							
Reduced accumulation of	The ABC quality screening system	At present about 3,500 growers are	As long as the ABC system is	The trash problems – and	Annual during the litchi harvest.	Moderate positive impact	Encourage more farmers to join the

Impact	Source	Intensity	Duration	Spatial Extent	Frequency	Importance	Response
organic waste in Tamatave as a byproduct of litchi treatment for shipping	for litchis will eliminate the shipping of below-quality litchis, thus reducing waste accumulation.	participating in the ABC system, so the impact is not that great. As the system takes hold, the impact will increase.	used.	thus their reduction – are confined to urban areas where litchis are treated for shipping.			ABC system. While there will still be litchi waste management issues in Tamatave, addressing this broader issue goes beyond the scope of the ABC's activities.
Niaoli oil							
High BOD levels in surface water leading to algae formation. Possible contamination of drinking water.	Distilling essential oils generates organic waste that is contaminating surface water	Could be locally intense if individual distilleries process enough leaves to create large quantities of waste.	If not managed properly, the problem will be ongoing, as large piles of leaf pulp will take a long time to decay.	Quite local, with possible downstream impacts depending on volume of water flow.	Ongoing problem; if distilling is a seasonal activity, the waste problem will become worse seasonally as well.	Low. At this point activities are low due to lack of a market and disagreement with promoters.	Keep wastes away from surface water. Compost or burn them, as appropriate to the context.
Degradation or depletion of adjacent forests	Distilling essential oils can consume significant quantities of fuelwood	Depends on volume of wood burned in distilleries	This will be a permanent problem, since wood is likely to be used faster than it grows back.	Depends on location of forest resources and amount of wood consumed.	Ongoing problem.	Low. At this point activities are low due to lack of a market and disagreement with promoters.	Switch to alternate fuels if they are economically viable. If they are not, then distilling essential oils in areas without adequate fuelwood resources should not be undertaken by ABC.

CHAPTER 6. BOENY

6.1 OVERALL DESCRIPTION OF THE REGION

Figure 6.1. Location of Boeny



Source: TBE Boeny, p. 3

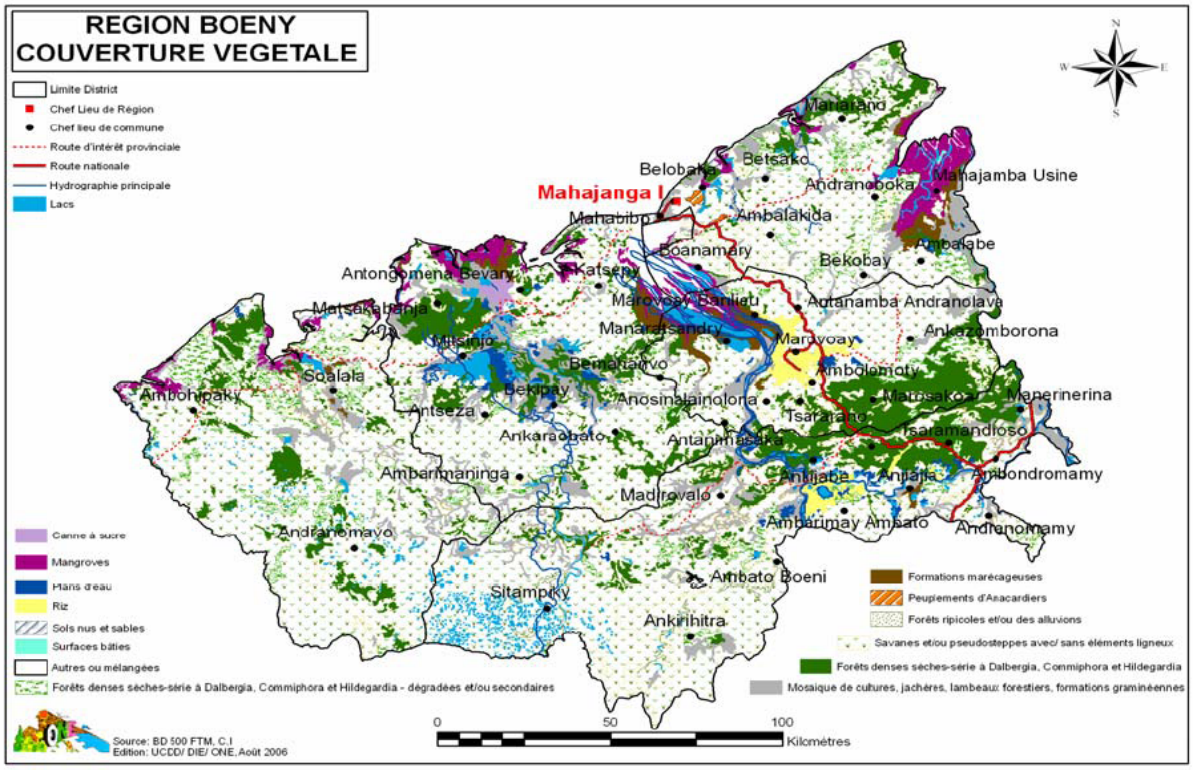
Boeny is located on the north-west coast of Madagascar, facing the Mozambique Channel. The region is of moderate size, at 29,830 square kilometers, and has a population just under 570,000 according to the 2005 Regional Development Plan (Plan Régional de Développement, or PRD). Of this number, some 41% live in urban areas. The region's population growth rate is, according to the PRD, 3.1%, just above the national average of 2.9%. Of these, just over 35% are children of school age or younger (the PRD does not indicate what age this would be) and 23% of women of reproductive age.[1] With 29,830 square kilometers in the region, the overall population density is 17.5 per square kilometer, but the distribution is quite uneven. Aside from the urban area around the district capital of Mahajanga, rural populations are concentrated in the agricultural areas within the districts of Marovoay, Ambato-Boeny, and Soalala. Elsewhere in the region roads are sparse or non-existent; the same may be said of the population. Eight communes out of forty three have no

[1] PRD p. 18

roads whatsoever, and only fourteen have any roads that are practicable throughout the year. Some 32% of the population lives in areas that are entirely cut off from roads for at least six months of the year.[2]

The soils of Boeny are of three major types. The largest in area is composed of red lateritic soils, which make up much of the region. Just upstream from the mouths of the three major rivers are areas of hydromorphic soils. Along the river banks, in areas that are flooded during the rainy season, are the so-called *baiboho*, which are of great value for cultivation. These areas are already cultivated, by and large. Much of the lateritic soil, on the other hand, is savanna grasslands that could be cultivated if the complementary resources (labor, seeds, in some cases irrigation or access to markets) were available to introduce agricultural activities. The PRD indicates the availability of large amounts of cultivable land, relative to what is now being planted. In Marovoay, according to the plan, 18,950 hectares were being cultivated in 2002, and another 18,560 are available. In Ambato-Boeny, where 18,960 hectares are under cultivation, another 32,535 are available.[3] Figure 6.2, which shows vegetative cover for the region, supports the idea that a lot of land is available for cultivation. Much of the extension of agriculture is onto savanna grasslands; as the map shows, this covers much of the region.

Figure 6.2. Vegetative Cover in Boeny



Source: TBE Boeny, p. 63.

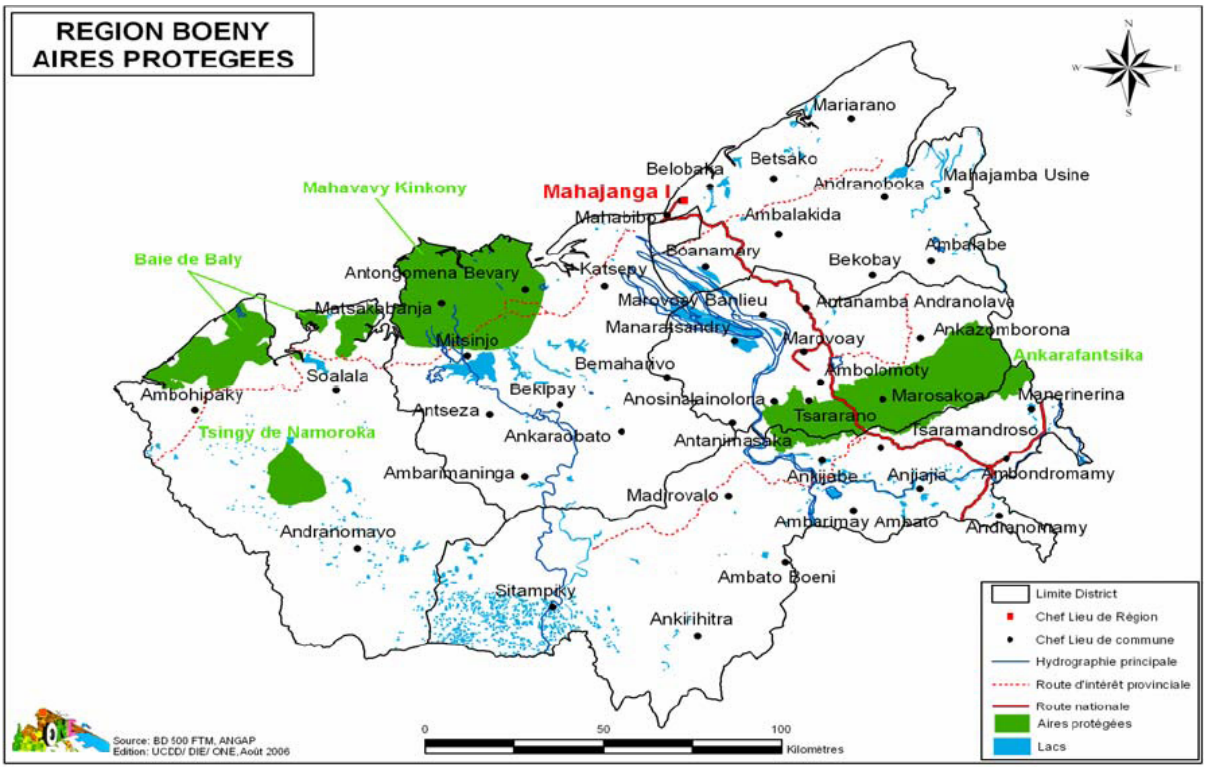
[2] PRD pp. 37-39
[3] PRD p. 52

The climate of the region is generally hot and dry. The rainy season extends for five months, from October to April, with average annual rainfall between one thousand and fifteen hundred millimeters. The average annual temperature is just under 28 C, and like most of Madagascar, the region is subject to cyclones during the rainy season.

Soil erosion is a major concern in Boeny, particularly in the Marovoay plain and the port of Mahajanga. The plain, an area of 12,000 hectares in the lower part of the Betsiboka river basin (and sometimes referred to as the "plaine de la Basse Betsiboka" for this reason), is downstream from a large sandy area with sparse vegetation and significant herding activities. The agro pastoral practices of the region contribute to soil erosion, since the herders regularly burn what vegetation there is in order to encourage the growth of young grasses preferred by their cattle. This leads to movement of sand downstream, and siltation of the rivers and irrigation canals of the plain. This siltation is a major threat to agricultural activities in the Marovoay plain. It also threatens the port of Mahajanga, where large accumulations of sand are making it difficult for boats to access the quays.

ANGAP is managing three protected areas in the region of Boeny, Ankarafansika, Baie de Baly, and the Tsingy de Namoroka. In addition, the recently-created Mahavavy-Kinkona protected area, part of the new Système d'Aires Protégées de Madagascar (SAPM), is being managed by Conservation International (CI) and the Birdlife International Madagascar Programme (BIPM). (Figure 6.3.) As elsewhere in the country, fifty percent of the entry fees to ANGAP protected areas are used for development activities in the areas immediately adjacent to the parks. The logic for this allocation of funds is that it will help local residents to perceive a connection between well-managed, high-quality parks and their own economic wellbeing – and thus, it is hoped, reduce their depredations in the protected areas. The revenues from each protected areas are used only in the buffer zone of that area; there is no redistribution of such revenues in order to permit development activities around areas with few visitors. Around most

Figure 6.3. Protected Areas in Boeny

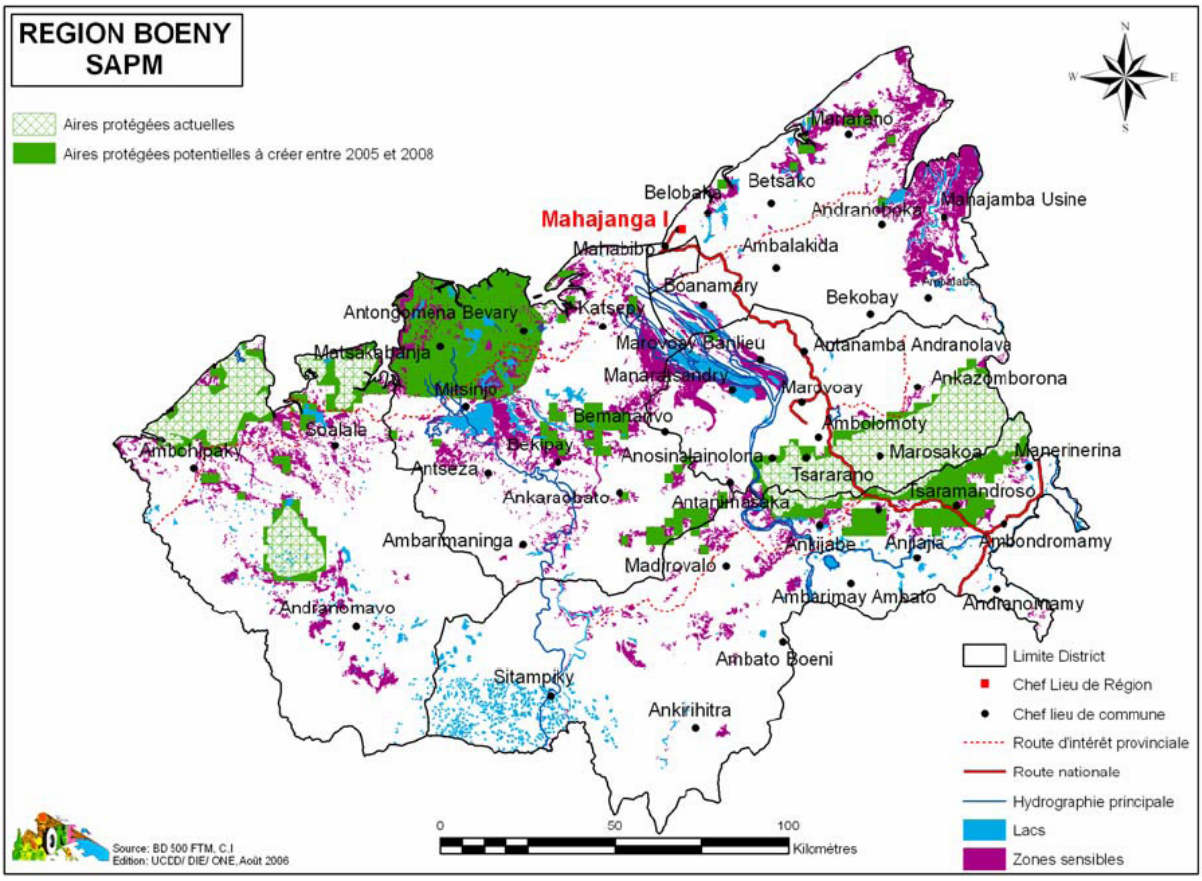


Source: Tableau de Bord Environnemental, Boeny, p. 57

ANGAP sites, therefore, little money is available for development, as most sites do not have many visitors. Ankarafansika, however, is one of the most visited national parks in the country, so a significant amount of resources is available for adjacent villages. The ABC is working in at least one buffer zone village. Coordination between the ABC and ANGAP will therefore be important in these areas. Coordination with CI and BIPM will be important when the ABC is working in areas near or within the wetlands of Mahavavy-Kinkona.

In addition to the existing protected areas, some other regions are targeted for protection, primarily in buffer areas around the existing ANGAP parks. These are shown in Figure 6.4 (but note that that map was made before Mahavavy-Kinkona was declared a protected area, hence its inclusion here as a potential new park). If the ABC is working in these areas, it will be important to collaborate with ANGAP, MEEFT, or other organizations involved with creating new protected areas.

Figure 6.4. Areas Targeted for Protection in Boeny



Source: Tableau de Bord Environnemental, Boeny, p. 57

6.2 SUBSECTOR ASSESSMENTS

ABC is supporting four subsectors in Boeny; rice, corn, goats, and onions.[4] We had time to visit sites working on goats and onions; our information on rice and corn is based on discussions with the ABC staff.

GOATS

Boeny is a major region for livestock production, although goats and sheep account for only a small share of the animal populations. The data on the two species are combined; the PRD indicates that there are close to 14,000 head in the region. The Ministry of Agriculture (Ministère de l'Agriculture, l'Elevage, et la Pêche, MAEP) recently purchased 390 goats of the Boer race from New Zealand, with the goal of diversifying the existing herds in a few regions of the country such as Boeny, through a controlled interbreeding program. After being housed briefly in MAEP facilities, 180 of the goats allotted to Boeny were passed on to three local traditional herders and 45 were placed in the Boeny

[4] Earlier in the project, the ABC worked with farmers in Boeny on hot peppers and tomatoes as well as these products. Because the project is no longer working on those subsectors, they are not covered by this report, as discussed in Chapter 1.

Demonstration Farm (Vitrine Régionale de Boeny). The role of the ABC in this subsector is to help the herders prepare business plans for purchasing and managing these goats, repay MAEP and in time increase their incomes.

MECIE requires that any artisanal herding activities be preceded by the preparation of a PREE. PREEs must be approved by the ministry responsible for the activity generating it – in this case MAEP. Since MAEP decided to purchase the goats and followed through on this decision – not ABIP or the individual herders who are buying them – the ministry should also be responsible for having prepared the PREE prior to bringing the goats to Madagascar. We do not know whether such a PREE was carried out by MAEP. Since it is not an ABIP responsibility, the SEA team focused on how the goats are being introduced and their impacts on the environment so far; however the ABC should determine whether the PREE was carried out and draw MAEP attention to the obligation to do so if it has not been done. If MAEP has not carried out a PREE and does not intend to do so, ABIP should cease working in this subsector, since MCC cannot support activities that are in violation of Malagasy law.

The team met with one of the three herders, Soaly Maor, who lives with his family and his goats in the town of Marovoay some sixty kilometers east of Mahajanga. Mr. Maor is, to all appearances (particularly that of his house, where we spoke with him), an entrepreneurial middle-class man who is willing to take financial risks and is relatively sophisticated about business ventures. He has taken one hundred of the goats, although he is still working through the procedures to obtain the credits with which to pay for them. He is very enthusiastic about these goats, and about the possibility of more extensive goat herding activities developing in the region.

Two environmental issues can arise with respect to goat herding in this region, one negative and one positive. The bad news first; goats will happily eat most anything, including crops and vegetation planted to halt soil erosion. The good news is that their excrement can be a good fertilizer for fields in the area.

The MAEP has prepared instructions on the care of goats in the area, which Mr. Maor had received the day before we met with him. Of particular relevance to the environmental concerns is that the MAEP says the goats must spend all of their time in an enclosure, for which they give fairly detailed plans; it must have brick walls, a straw or corrugated iron roof, and a cement or packed earth floor. It must be large enough to provide at least three square meters for each animal. The house must be cleaned daily; the instructions list the specific tools required for this purpose. The herder must cut (or purchase) grass for his or her goats to eat, since they cannot graze if they live in a house.

Keeping the goats permanently in an enclosure eliminates the risk that they will eat crops or other valuable plants, but it greatly increases the cost of the operation, since the herder must pay for the shelter and a year-round food supply. Mr. Maor was quite disturbed about the instructions from the MAEP, because of the cost involved. Although he has a parcel of land on which he plans to build such a house, he does not want to have to purchase food for his goats all year long.

At present the goats are housed in rooms adjacent to his house in town; after many requests, he showed us this area. During the rainy season (or the end of the January to March rainy season, since he has not had them since January) he kept them in this shelter and purchased food for them. He said this was necessary because the animals were not habituated to the large pools of water that

accumulate during the rains, and he was afraid they would walk into them and drown. Now they are grazing in fields of farmers in the area after the crops have been harvested. According to Mr. Maor, they are taken out of their shelter each morning with two people who lead them to the area where they are to graze that day. Two people are enough to lead the goats to the grazing area and prevent them from grazing in other areas. The cultivators of the fields are happy to have the goats there because they fertilize the soil.

If all of this is accurate, then the goats are only a benefit to the environment, not a source of harm. Moreover, the area could support far more goats than Mr. Maor's one hundred (though he will soon have more than one hundred, as they are already beginning to breed). He reports that the herd can walk as far as a kilometer to their grazing area. They are now rotating on a five-day cycle among five different grazing areas, each about two hectares. Though these figures would have to be verified, they suggest that ten hectares of rice or corn fields in the off season could support one hundred goats. Within a kilometer of Mr. Maor's home (or of the land where he will be building them a more satisfactory shelter) there is far more available land than that. Thus this symbiotic relationship between goats and cultivation could be considerably extended if others living in the area develop an interest in raising goats.

The key issue in terms of environmental impacts and preventing conflicts between farmers and herders is for all herders to actually send their herds out to graze with goatherds who can and will control them to make sure they only eat where they are supposed to. Mamonjisoa Razafitrimo, the regional director of the German-funded Programme de Lutte Anti-Erosif (PLAE), whom we met in Marovoay, was well aware of Mr. Maor's herding activities and was in fact quite afraid that his goats would eat the vetiver and other species that PLAE has planted in order to control soil erosion. He did not suggest that this was already happening, but seemed to be tensed for a fight with Mr. Maor if the goats did not comply with the grazing rules. Since Mr. Razafitrimo and Mr. Maor know each other and are both cognizant of the risks, it is reasonable to hope that they will discuss this concern and ensure that it is managed before the goats commit any offenses.

If goat herding does spread as Mr. Maor hopes, however, it will be important to train other herders in grazing practices, lest they simply allow their herds to wander uncontrolled. This may be even more important in other parts of Boeny, notably Ambondromamy, where the grazing land may be less available. The SEA team did not visit that part of the region, but the MCA environmental experts visited SAF-FJKM grazing activities there and heard a quite different story from Mr. Maor's. People there were interested in goats, but felt there would not be enough grazing land because available fields were already being grazed by cattle. If goats to expand into that part of the region, the risk of destruction of crops or vegetation planted to control erosion may be much greater than it is around Marovoay.

Over the next year, the ABC should work with other herders, including ones who may purchase goats from Mr. Maor, to address this concern. Since ABC may not be around for as long as the goats will, however, they should also work with MAEP to include a discussion of grazing in the instructions they provide to the herders, and to encourage them to carry out a PREE for these activities if it has not been done. Although the MAEP is now telling herders to house their animals year round, this seems to be unlikely because of the costs involved. However, if MAEP is providing instructions on herding, then they may be willing to include a discussion of the importance of managing the animals' foraging activities in the instructions they provide in the future.

ONIONS

Onions have been cultivated in Boeny for many years. ABC's role in this sector has been to connect local villagers with a promoter from La Réunion, entitled VIVEA, who is interested in importing Malgasy red onions to replace other imported onions, presumably brought from greater distances. Boeny onions are harvested at a time of year when there is a window for marketing them in La Réunion. In addition, the proximity of the port of Mahajanga to the onion producing areas gives the region a major advantage over other onion producing areas of the country, such as the highlands. VIVEA is establishing a permanent presence in Boeny through Mpamboly, its local association, and is working with farmer organizations on onion production for the Réunionais market. Working with farmer leaders, they are providing training in a number of new cultivation techniques, including;

- Improving the drainage canals for irrigation system
- Planting on raised beds
- Hoeing
- Using healthy seeds, in order to avoid early stage pests
- Controlling other insects and disease through the life cycle of the crop as well as pests that do not limit growth but destroy the product once it is in storage
- Strategies for storage in dry, shady, well aerated places to prevent spoilage.

To assist in this program, ABC is helping in forming and strengthening farmer organizations that will produce and sell onions. These organizations coordinate the distribution of inputs and equipment advanced by Mpamboly, with expected reimbursement at harvest..

The team visited the village of Andranomandevy, which is growing onions through this plan. Some of the villagers had been cultivating onions for a long time, but others introduced the crop for the first time through the ABC activities. The season runs from April to October. Two types of onions are grown in the region, Noflaye and Rouge de Tana. The Réunionnais promoter gives seeds to all growers who have joined the farmer organization; however membership in the organization costs 10,000 ariary. The promoter furnishes synthetic pesticides and fertilizers to the farmers to treat the plants with an agreement of payback at harvest; these are not a benefit of membership in the organization.

The ABC field agent who joined us at this village said he had been trained in integrated pest management and in pesticide use. In the past, farmers applied the pesticides themselves to the onion crop prior to harvest, and they expect now with APIB to be assisted by ABC field agents with the use of pesticides. The pesticides are used on a scheduled basis. They are provided by Mpamboly and distributed by the field agents and during distribution, the agents give instructions on the correct use and safe handling of the products. It would appear that there is an opportunity to eventually introduce pest management techniques that do not involve synthetic pesticide use, and to promote the use of monitoring techniques and artisanal pest control products such as neem, hot peppers, or other plants. The promoter is well aware of these techniques and intends to introduce them once the participating farmers as well as the field agents are proficient and practiced in these techniques.

The villagers reported that they have regularly used synthetic pesticides in growing onions prior to this project. They have purchased agrochemicals from Hasyma, a local company that works with cotton growers and provides pesticides for that crop. The extra, according to the villagers, ends up being used on other crops. The same happens with agrochemicals sold by SOPAGRI, which is providing them to grow lentils but apparently is not effective in preventing others from making purchases even if they are not growing lentils. In some cases the farmers buy agrochemicals from resellers in local markets, in Mahajanga, or through friends who have made purchases. They have made these purchases without credit, and some do not know what products they are buying. On the onion plants they use them to treat two pests, an insect that they call ariasy, and a fungus that they call oïdium. The ABC field agent indicated that the villagers do not have any protective gear for applying pesticides, but they put plastic bags on their hands in lieu of gloves. Their use of pesticides is, according to him, preventive rather than based on assessment of the actual level of pests present.

This evidence suggests that synthetic pesticide use is rather uncontrolled in this part of Boeny, but it is not the result of the activities of the ABC. The ABC may have an opportunity to improve the situation, however, by providing training in the use of pesticides and other pest management methods on the onion crop grown by ABC beneficiaries. It is still early in the season to introduce other treatment methods that constitute less of a risk to health or to the environment. In addition, it will be equally important to focus on training growers in the safe use of agrochemicals.

The growers indicated that the land was available to cultivate the onions, but that for the first two years the output is quite low on a given piece of land, and fertilization is required in order to enrich the soil. They are considering cultivating onions on the rice paddy land in the off season, which should give higher yields than the fields they are using now. Thus it would appear that finding land to extend onion cultivation is not a problem. However, the village we visited to look at onion cultivation is on the western edge of Ankarafansika National Park. Although incursions into the park caused by the ABC activities do not seem likely, it would nevertheless be a good idea to coordinate with ANGAP, to ensure that everyone is aware of the importance of not extending cultivation onto park land.

CORN

The ABC is working in the corn subsector in the districts of Ambato-Boeny and Mitsinja. Their intervention involves several new techniques:

- Assisting growers in the selection of the strongest and healthiest seeds for planting; these are typically kernels from the middle of the ear rather than the small ones from the end.
- Treating the seeds prior to planting in order to prevent growth of parasites.
- Plant spacing techniques
- Working the soil prior to planting, rather than simply digging a small hole for the seed.
- Cutting corn stalks immediately after harvest and leaving them in the fields to decay, rather than leaving them in the fields to dry and then burning them prior to the next planting season. This enriches the soil and reduces the erosion that results from burning.

We were not able to visit a corn-growing site, so our information is based on discussions with the ABC staff. They have already worked with the growers on selecting and treating seeds, but have not yet introduced the new planting techniques. ABC is buying the chemical with which the seeds are

treated, and reselling it to the farmers. They had tried find a vendor to sell directly to the farmer organization, but none was willing to take the financial risk of purchasing the product for resale, so as an emergency measure the ABC had to undertake this themselves in order to continue work in the corn subsector this season. To treat the seeds for one hectare of corn, the pesticide required costs 4,000 ariary, so this is not a major cost for the farmers.

The first treatment of seeds was done in November 2007. To treat the seeds, the chemical is mixed with water in a container, and the seeds are then poured into the mix. This is stirred, and the seeds left in the container until they have soaked up all of the pesticide mix. They are then planted wet. Initially the field agents demonstrated how to do this; then they supervised the growers as they mixed their own product and treated their seeds. This was done with bare hands, so the agents also showed the growers how to make sure they cleaned their own hands and the containers, and did not contaminate any water supplies in the process. However, in the 2008 July season, ATABC introduced protective equipment for this treatment and the field agent closely monitors the seed treatment activities with individual farmers. Since we were unable to speak with the growers, we could not confirm the actual process. Growers were apparently happy with the results of the treatment in the past. The DRDR did a survey of sixteen producers following these practices in 2007, who reported an increase in yield of some 60% because of this treatment. The data are still being processed, however; it is possible that this high increase is only anecdotal.

The ABC is encouraging extensification of corn cultivation as a way to increase revenues. Corn prices are quite low at the time of harvest, and increasing output is viewed as a way to increase revenues from the subsector. They are also considering the possibility of building storage areas so that growers can store their product until later in the season when prices will rise; however this is not likely to be financially feasible during the life of the project. The emphasis therefore is on increasing yields and increasing the areas cultivated. Some of the villages where corn is receiving ABC support are immediately adjacent to the protected areas in the two districts concerned. This will therefore require collaboration with ANGAP, to ensure that everyone understands where the park boundaries are, and extensification does not go into the protected areas. The villagers are also considering growing corn on baiboho land. However at present the complementary resources needed to extend cultivation are not available, so none of these possibilities poses an immediate threat.

In addition to the possible incursions into protected areas, corn creates risks of soil erosion because it is generally cultivated on slopes, referred to as *tanety*. The recommended practice of cutting the green stalks immediately after the harvest and leaving them on the fields to decay will help address this problem if it is adopted. Even if it is, however, it may not be sufficient to prevent soil erosion. This is a matter of some concern to the ABC staff. They have contacted the PLAE to request help in dealing with this problem, but corn is not being grown in the districts where PLAE is active. The ABC staff hopes, however, that they will be able to learn erosion management techniques from the PLAE technical staff, so that they can introduce them to the villages where corn is being cultivated. This seems a reasonable approach to the problem, and one which we recommend wherever ABC crops are being grown on steep slopes.

RICE

The ABC is working on rice cultivation in the district of Marovoay. Farmers were trained by the internationally acknowledged SRI/SRA organization, Tefy Saina in several techniques for improving rice yields and reducing the labor required, including planting young seedlings, planting the seedlings in rows and using mechanized hoeing. The ABC has also connected farmers with a local self-managed credit and savings association (AECA, Association d'Epargne et de Crédit Autogérée), which is supposed to provide credit to cover the costs of the new techniques. The farmers already hire laborers for their rice crops, but only skilled labor can apply the new techniques, and they are paid more than traditional laborers, 3,000 ariary per day instead of 2,000. Moreover, there are not enough trained teams to do this work; the ones that are available are overbooked. This skilled labor is only made up of women, as men apparently do not have the concentration to do the meticulous work. The ABC is planning to train more women to do this work.

The cultivation of rice in the ABC activities does involve the use of chemical fertilizers, raising the question of whether an excess of fertilizer could end up flowing into the rivers and increasing levels of biological oxygen demand (BOD). Given that farmers are paying for the fertilizer themselves, however, it is not likely that they will use it to excess, so this may not be a significant risk.

6.3 CULTURAL ISSUES

Agricultural tasks are divided between men and women in fairly consistent ways in Boeny. Men do work that uses cattle or machinery, including tilling the fields and other heavy work. Women grow and transplant seedlings, weed the crops, and collect brush that has been cut by men to clear it off the fields. Children typically complete primary school, until their early teen years, but often have full-time responsibilities after that. The ABC activities in Boeny do not seem likely to have any impact on these patterns within the household. The marked gender imbalance in practicing new rice cultivation techniques will create more employment for women if they can be trained to do this work. This should somewhat improve their positions as wage earners, as their skills are in considerable demand.

Our questions about how increased income will be used elicited mixed responses. The farmers growing onions said that the increased income enabled them to eat better, as the crops are harvested during the lean season and provide revenues with which to buy food. They also mentioned using the money to buy school things for the children, and visiting family elsewhere in the country. Mr. Maor, who is Muslim and does not follow traditional Malgache practices regarding his ancestors, indicated that he would put his earnings into paying off his loans and building a structure to house his goats. The Regional Director of Rural Development (DRDR, Directeur Régional du Développement Rural) said that in the Marovoay Plain increased earnings are spent on building better houses, purchasing bicycles, and in some cases purchasing of gold, which is a way to both display and store wealth. He also indicated that small groceries were springing up throughout the region, even in very small and remote villages, which he took to mean that people's diets were becoming more diversified with access to money. In terms of western ideas of development, therefore, it seems that increased incomes obtained through ABC activities in Boeny are positive for some households and communities.

On the other hand, many other people of whom we asked this question indicated that the money will be used for parties and for traditional cultural activities such as exhumations and marriages. The

director of SAF-FJKM in Boeny said that few farmers had much interest in really professionalizing their agricultural activities, viewing changes in agricultural practices as way to obtain modest increases in output and therefore income. The director of ANGAP, speaking about that agency's activities in the areas around the parks, said much the same. Rather than using increased income to expand cultivation or make investments, they spend it on music, parties, sacrifices, and festivals. This may not be the project's goals in terms of its social impacts; on the other hand, it does reflect the preferences of the beneficiaries.

6.4 CONCLUSIONS

The ABC activities in Boeny raise only moderate concerns in terms of the environment, calling for the following responses:

- Where ABC activities are occurring in or near any of the region's protected areas, collaborate with the organizations managing those areas to ensure that fields are not expanded into lands targeted for protection.
- Where crops may be cultivated on steep slopes, collaborate with the PLAE to ensure that the ABC field agents are well versed in the most effective erosion-prevention techniques for the region.
- If goat herding expands, field agents should make sure that herders are communicating with cultivators and those working on erosion to ensure that goats do not graze on vegetation that must be protected.
- In any ABC villages and crops where synthetic pesticides are being promoted by the ABC, the field agents should monitor agrochemical use and reinforce the messages about the importance of following practices that are safe both for farmers, the community, and the natural environment.

Table 6.1 Environmental Impacts in Boeny

Impact	Source	Intensity	Duration	Spatial Extent	Frequency	Importance	Response
Goats							
Consumption of crops or other planted vegetation	Grazing goats	Depends on herd size	Depends on grazing schedule	Depends on herd size	Depends on grazing schedule	Low because there is at present only 3 herders working with the project.	Requirement that goats always be in an enclosure may not be financially feasible. Collaboration between herders, farmers, those planting to control erosion; joint development of land use and grazing plans.
Soil erosion and downstream siltation	Burning to encourage growth of fodder.	How much soil runs off depends on slope, whether it rains after burning, how fast grasses grow back.	Until vegetation grows back.	Spatial extent of eroded area depends on are burned. Spatial extent of siltation downstream depends on rainfall, soil conditions, and hydro geography.	How often a specific area is burned and grazed depends on local conditions	None at present; herding supported through project is not taking place in areas where fields are burned for grazing land.	Work with herders to develop other strategies to feed goats.
Corn							
Soil erosion and downstream siltation	Cultivating corn on steep slopes	Depends on angle of hillside, planting practices, and soil erosion practices	As long as the hillside is cultivated	Area degraded will be the same as area cultivated. Spatial extent of siltation downstream depends on rainfall, soil	As long as the slope is cultivated	Low at present because corn is now being planted in baiboho. If it is extended onto slopes this will be a significant concern.	Implement practices to manage soil erosion; contour plowing, plantation of hedges, protective ditches, infiltration

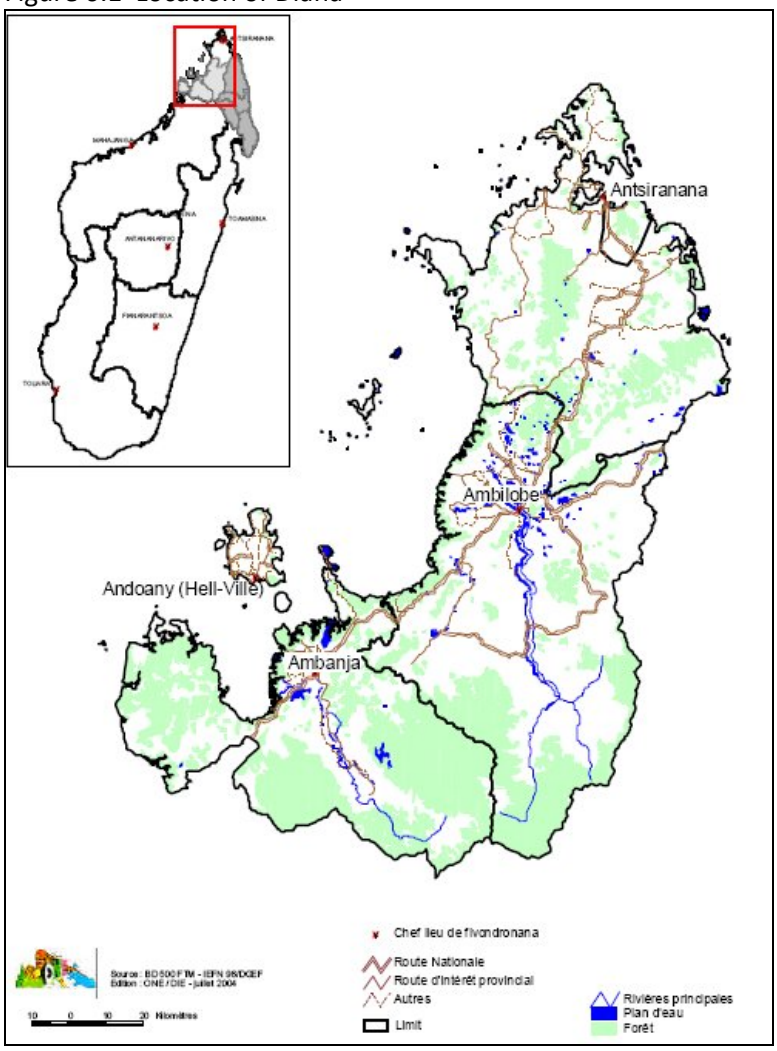
Impact	Source	Intensity	Duration	Spatial Extent	Frequency	Importance	Response
				conditions, and hydro geography.			ditches, growing in mulch or in other plants that stabilize soil, etc.
Onions							
Health impacts of pesticide use	In onion cultivation, mixing or applying pesticides without proper protective equipment.	Depends on how pesticides are handled.	More severe when applying pesticides to soil than when only treating seeds	Not applicable	Depends on how pesticides are used	High; consequences of unsafe use can be serious.	Ongoing training and monitoring of pesticide use practices to ensure that safe practices continue to be followed during and after project
Water quality impact of pesticide use	In onion cultivation, cleaning pesticide-contaminated equipment in water supply.	Depends on particular practices followed	Depends on how long specific pesticides stay in environment	Depends on how much gets into water source, local hydrology, how long pesticides stay in environment	Depends on particular practices followed	Moderate; amount of pesticides used is low and farmers say they follow safe practices in cleaning themselves and their equipment	Ongoing training and monitoring of pesticide use practices to ensure that safe practices continue to be followed during and after project
Onions, corn							
Incursions into Ankarafansika National Park or other protected areas	Extension of corn or onion cultivation in response to ABC activities, in villages on the border of the park	Depends on how much incursion there is	Until ANGAP or police are able to evict growers from park lands	Depends on how much incursion there is	Might occur only once, if they are effectively evicted	Low to moderate; such incursions do not seem very likely.	Through collaboration between ANGAP and the ABC, it should be possible to head off such incursions.
Rice							
Excess BOD downstream	Use of chemical fertilizers	Depends on how much fertilizer is used; this is a risk if it is used to excess	Short period of time after draining fields on which excess fertilizer is used	Depends on downstream hydrology and amount of fertilizer used	Whenever fertilizer is applied to excess	Low; since farmers pay for fertilizer, they are not likely to use it to excess	Monitor how much fertilizer is used and make sure it is not excessive.

CHAPTER 7. DIANA

7.1 OVERALL DESCRIPTION OF THE REGION

Diana is at the northernmost end of the island of Madagascar. With a population of 485 800 in 2005 and an area of 19,266 square kilometers, it has a population density of 25.2 per square kilometer, making it fairly sparsely settled. This population is not evenly distributed. The central area around Ambilobe has only 13 people per square kilometer, while the region around Ambanja has 30 and the island of Nosy Be has 155. (TBE Diana Table S2.201a, p. 157) Over history, the region has been the object of both immigration and attack, giving it a diverse Malgache ethnic composition, as well as strong influences from the Comoros Islands and the Arab world.

Figure 6.1 Location of Diana



Source: TBE Diana, p. 4

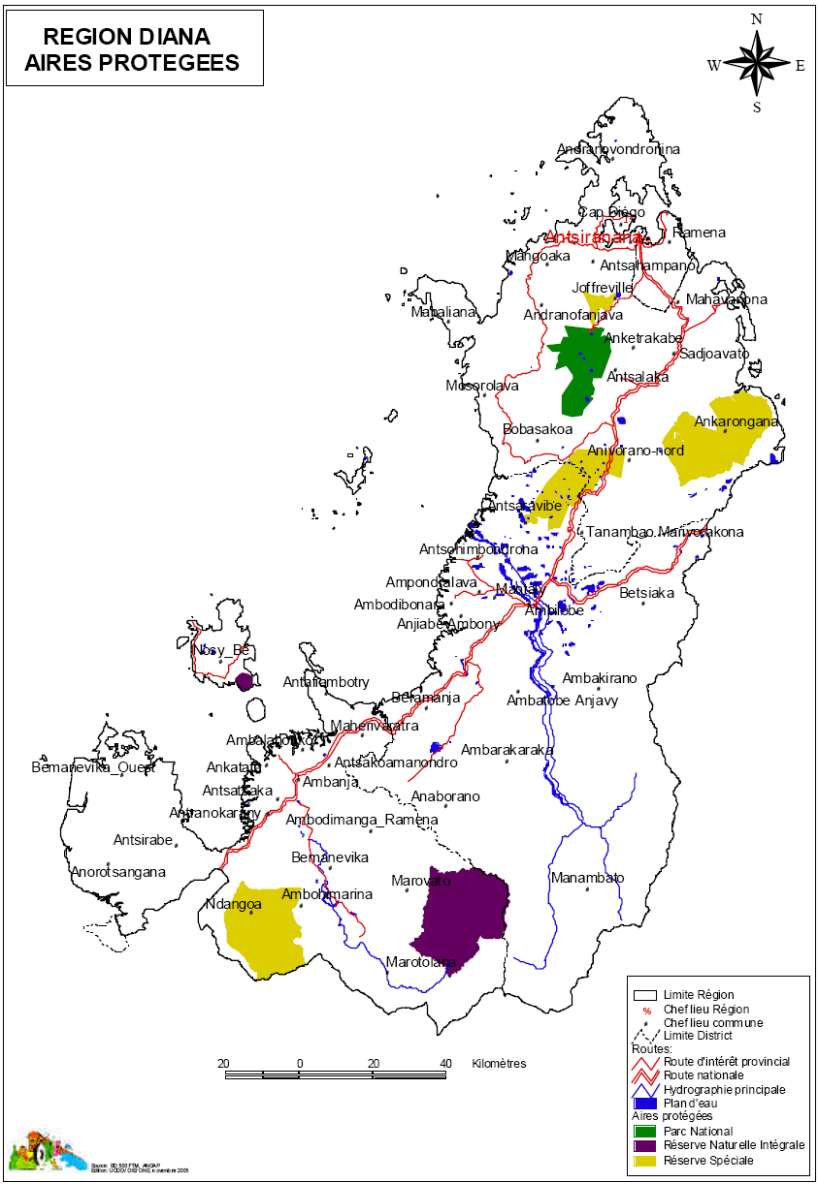
The region has a tropical climate, with daily average temperatures around 23-24 in the coolest season and 26-27 in the warmest. The weather is generally hot and humid from December to April, and dry and warm from May to November. The topography of the region gives it three distinct climatic zones. The southern area of from Nosy Be to Sambirano has high rainfall, averaging above 2,000 millimeters per year, and temperatures that consistently average about 26 C throughout the year. The northern zone, from Ambilobe up to Diego Suarez (Antsiranana), also averages 26 C in temperature, but with much greater variability over the course of the year. It has a distinct dry season from May to October, and annual rainfall of only 940 millimeters. Forming pockets within these regions, the mountains of Ambre in the north and Tsaratanana in the south are much cooler, with annual averages of 18 C at high elevations, and rainfall averaging 1,500 millimeters per year.

Diana is well suited to agriculture, but very little cultivated. Some 67% of the region's surface is cultivatable, but of that only 8.5% is actually cultivated. (TBE Diana p. 3) The region's agriculture has been characterized by the relatively strong presence of commercial and industrial crops, which cover about one third of the cultivated area. (PRD Diana p. 41) Among these, coffee and cocoa are important in terms of area cultivated and output, while vanilla, perfume oils, and spices are important economically and in terms of the image of the region. In 1999 the largest exports of

commercial products were of tuna, sugar, coffee and salt (TBE Table S2.303a, p. 159), although since then some of the sugarcane plantations have been converted to other crops. The introduction of qat, a mild narcotic, by migrants from Yemen and the Horn of Africa has led to some replacement of other crops in favor of this very lucrative bush whose leaves are chewed as a stimulant. (Personal communication, Mr. BEFOUROUACK Julien, ANGAP). Diana is a tourist destination, and tourism is a key element of the region's development plans. Visitors come to Nosy Be for its beaches, and to the inland areas to visit the national parks, which harbor high rates of biodiversity. The Bay of Diego Suarez is considered one of the most beautiful in the world. The port of Diego is a stopping point for Indian Ocean cruises, spending a single night and permitting tourists to take day trips to the Bay, the beaches, or other points of interest in the region.

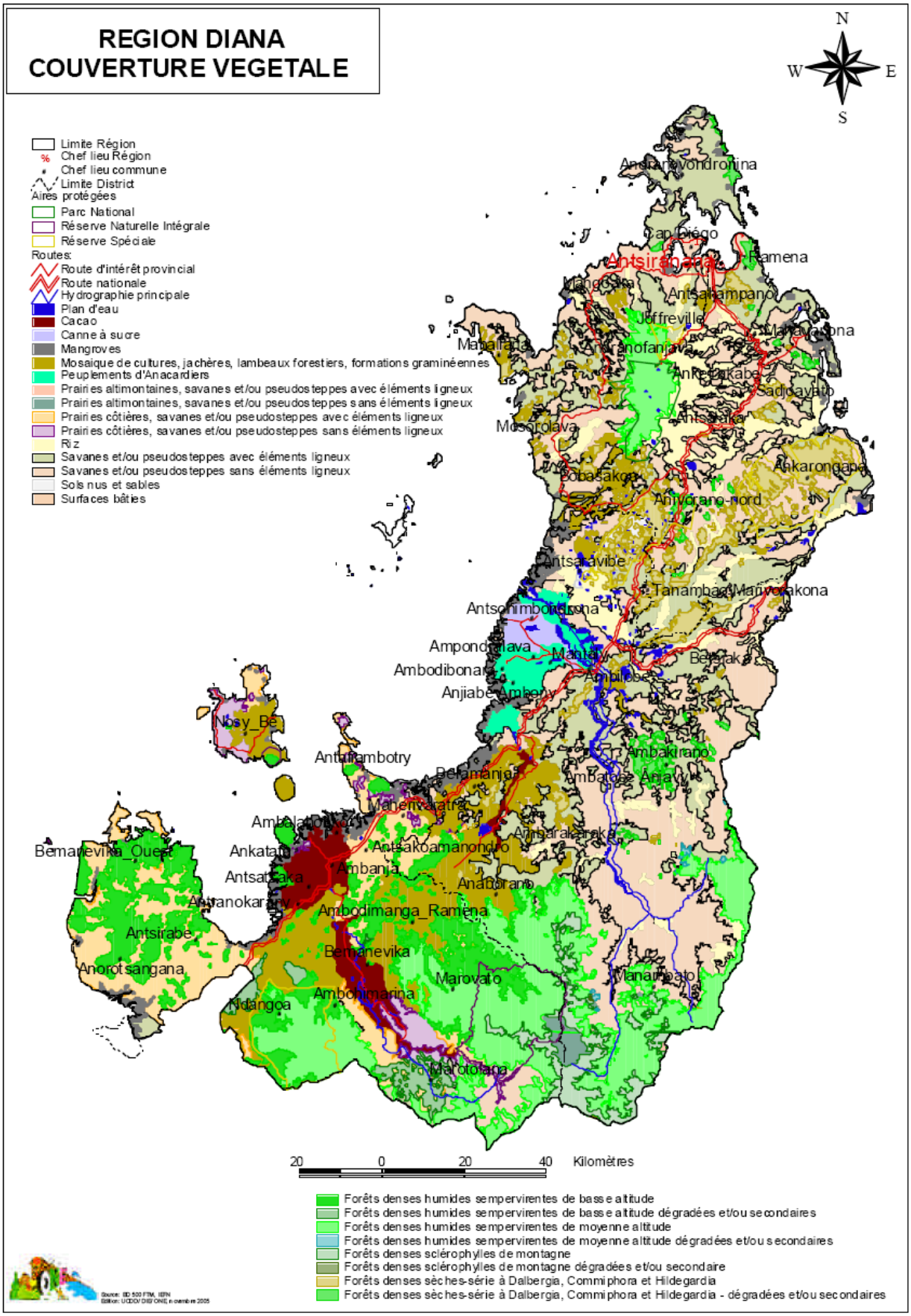
Diana still has a fairly large region of dense forest cover; some 9% of the surface area of the region is included in the protected areas managed by ANGAP. Figure 7.2 shows the ANGAP protected areas, while Figure 7.3 shows overall vegetation patterns. The protected areas essentially include low and moderate altitude dense forests, and shelter much of the wildlife and biodiversity of the region. In addition, a large area of the region, shown in Figure 7.4, is identified in the TBE as potential conservation areas; unfortunately, they do not give a source for that classification, so we cannot tell how likely they are actually to become protected areas through the SAPM. However this suggests that the ABC staff will need to be particularly vigilant with respect to the creation of new protected areas, to ensure that project activities will not have any impact on them. In addition, the TBE (Table P.R121, p. 177) lists some forty contracts issued for community-based natural resource management in Diana, specifying the communes and villages involved. Although many of these are for coastal zones and mangroves, the ABC staff should consult with this list to determine whether they are working in any of the communes involved.

Figure 6.2 Protected Areas Managed by ANGAP, Diana



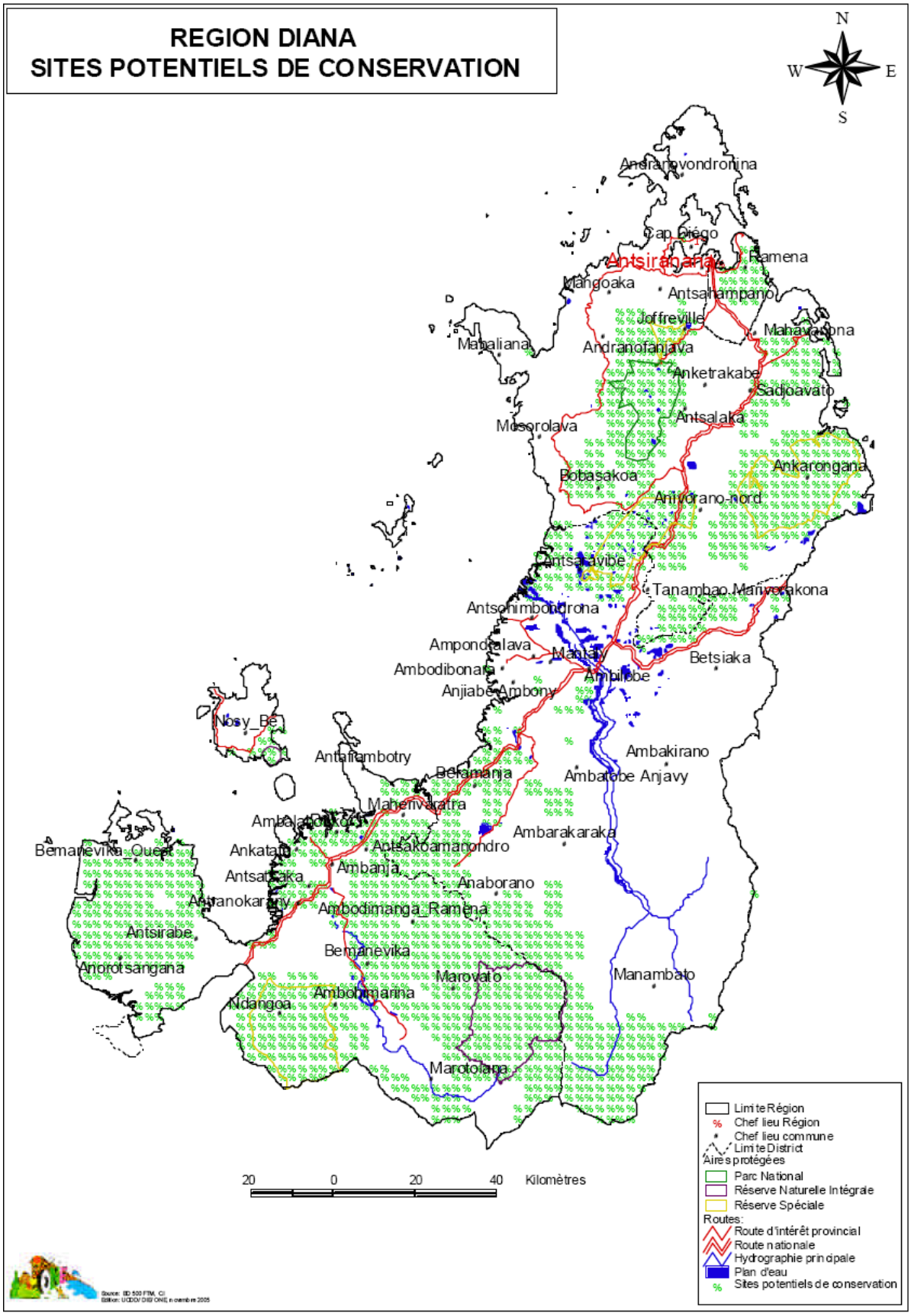
Source: TBE Map B3.2a, p. 47

Figure 7.3 Diana Vegetation Cover



Source: TBE Diana Map F1.1, p. 58

Figure 7.4 Potential Conservation Areas in Diana



Source: TBE Map B3.2c, p. 50

Soil erosion and bush fires are significant concerns in Diana as they are throughout Madagascar. TBE indicators based on satellite imagery show that the fires are most important in the southern part of the region, and least important in the north, except that they are of least importance in Nosy Be. (TBE Map F2.3.2, page 76 and related text) Most of the fires were initially set to regenerate grasslands for livestock or to get rid of agricultural waste, but then went out of control. (TBE Table F2.3.2, p. 77) Fires appear to be growing in importance. The available data show a fairly steady increase in area burned from 1810 hectares in 1994 to 12,419 in 2004. (TBE Table 2.3.1, p. 74). The data on soil erosion are thin, but appear to suggest that it is a problem throughout the region. (TBE Table F1.9, p. 69)

7.2 SUBSECTOR ASSESSMENTS

VEGETABLES

The vegetable subsector is focused on the island of Nosy Be and around Ambanja, driven by the demand from the hotels on Nosy Be. At present the hotels purchase produce grown in the highlands around Antananarivo, making fresh produce a high-priced input to their operations. The region is well suited to horticulture; it would appear to be the local culture that has kept this from being an active subsector in the past.

The ABC is working with Tatie Cris Farm (TCF), a grower and marketer of fruits and vegetables on the island of Nosy Be that has begun to supply the hotel market. They began operations in 2006, and are cultivating some 20 hectares with a wide variety of fruits and vegetables. They are committed to not using any synthetic pesticides or fertilizers, and feel this is a strong selling point for their buyers. According to their head technician, they are now supplying 10-15% of the produce needed by Nosy Be hotels.

The agreement between the ABC and TCF is that TCF will purchase their product from them to resell to the hotels and will collaborate with ATABC in training ABC growers in the cultivation of vegetables. Vegetable cultivation is new for many farmers in the area. TCF began working with the farmers in March of this year, and conducted training sessions. Since then intensive training was given by an ATABC consultant covering a full range of growing techniques including the correct establishment of a nursery, the use of raised beds, correct planting depths and spacing, digging channels near the beds for watering, and so on. Training is also given on seed treatment and on the use of plant-based pesticides. The TCF head technician said that the company would be taking an active role in collaborating with ATABC in coaching the farmers through the growing season, and in providing them with sprayers to apply the pesticides.

The farmers we interviewed prevented a range of perspectives on this collaboration. One, the head of a 17-member cooperative on Nosy Be, was very enthusiastic about growing vegetables in collaboration with TCF and ABC. He has been convinced by the ABC that he can make money doing this, and has followed his training very thoroughly. He is growing a wide range of vegetables, including leeks, green peppers, eggplants, cucumbers, lettuce, zucchini, tomatoes, and green beans. He is applying a neem-based pesticide to his plants once a week, and reports that it works, but that it is a lot of work. He said he would rather use synthetic pesticides, because he believes they would be easier, but does not have access to them. He referred to plant-based crop protection methods as “traditional” methods, a term which seemed to imply that they were inferior and backwards. The field where he is growing his vegetables was previously used to grow rice, and it is flat, so runoff and soil erosion are not issues.

A second farmer is working with the ABC on the cultivation of lettuce, onions, leeks, and green beans. He was very concerned about caterpillars on his leafy vegetables, and obtained some pesticides through a friend who was traveling elsewhere in the country. He showed us what he had bought. It was a liquid in a small clear container, with no labels. He had no idea what it was, but was planning to put it on his crops. He is growing crops on a small hillside, with a stream directly beneath it where we saw women washing dishes.

The third farmer we met, near Ambanja, was as enthusiastic as the first; he had left a job as a security guard with Tiko in order to become a farmer. His land was a sugar cane field before he began cultivating it, and it is flat. He dug the well he uses to water his plants, and is thinking of buying a hand pump to simplify this process. He is not connected with TCF. He has found markets for his own crops in Ambanja and Nosy Be. He reported that he received training in crop protection from MAEP staff, and that it only covered the use of synthetic pesticides, not artisanal treatment methods. We asked the ABC field agent who was with us about this; he said the training did cover artisanal treatments, but it was given low emphasis; most of the attention was to synthetic pesticides. The farmer told us he has had caterpillar problems on his lettuces, which he routinely sprays with a pesticide called akito[1]. Other than that, he has not had pest problems.

The cultivation of vegetables in this area certainly seems to have potential. The ATABC consultant as well as the TCF head technician are knowledgeable, professional, and enthusiastic. The cultivation and crop protection practices they are disseminating are excellent in terms of environmental impacts, if they can be financially viable. However it is clear that the training of farmers is mixed, insofar as crop protection is concerned. Even the farmer who is enthusiastically working with TCF said he would rather use synthetic pesticides if he could. These observations suggest that ABIP needs to be more closely involved with the training offered to its beneficiaries. The project must ensure that crop protection training really does place the desired focus on integrated pest management and artisanal pest control techniques, rather than paying them lip service and then going on to teach farmers how to carry out preventive spraying of synthetic pesticides. The attitude towards artisanal methods of pest control, that they are "traditional" as compared to use of "modern" synthetic pesticides, is also unfortunate. The interviews also suggest that the ABC staff should be following up with the farmers trained to encourage them both to continue using artisanal crop protection methods and to appreciate the risks posed by applying pesticides on a slope just above a stream used for household purposes.

COCOA

ABIP's work in the cocoa subsector aims to find markets for small-scale growers in which they can sell premium fermented and dried beans at a higher price, net of processing costs, than what they get for fresh beans. So far the project does not have any buyers willing to pay a premium price; at present, the price of processed beans is above the price of fresh beans only by enough to cover the cost of processing.

A lengthy discussion with the director of the cocoa company RAMEX suggested that the structure of the market makes it difficult for cocoa buyers to pay that premium from small growers. Cocoa is grown in Diana by many small growers and by a few companies with plantations. Prior to export, it must be fermented and then dried. This processing is sometimes done by small scale growers, but more often intermediaries buy fresh beans, process them, and then sell the processed beans to the

[1] The active ingredient of akito is b-cypermethrin, according to the list of pesticides approved for use in Madagscar.

exporters. The owners of large plantations process their own beans. In some cases the exports purchase fresh beans and process them themselves.

The quality of a processed bean depends on how that fermentation and drying is carried out, not on how the plants are cultivated. In order to produce a high-quality processed bean, the fermentation vat must be filled to capacity with beans that have been harvested within less than half a day. It must then be left closed for six days and not reopened while the beans ferment. After fermentation, they are spread out to dry.

This means that those doing the processing must consistently have access to enough beans to fill their vat, and have that access within a quite short period. The vats are typically one cubic meter in size, and hold 800 kilograms of fresh beans and the pulp that surrounds them. One pod – the fruit from within which the beans and pulp pear year – produces about one hundred grams of pulp and beans, so the pulp from 8,000 pods is needed to fill a vat. A cocoa tree produces about sixty to eighty pods per year[2], but they do not all ripen at once. A hectare of cocoa plantation could have about 625 trees; if all of the trees gave their fruit at once, the harvest from 100 to 120 trees would be needed to produce one vat of pulp and beans for fermentation. The pods ripen with a peak season from June to August and another peak from October to December, but some pods are available throughout the year.

The challenge, therefore, is to guarantee access to enough fruit to fill the fermentation vats, especially during the non-peak periods. In the absence of enough fruit at one time, the intermediaries who collect and process beans for sale to the exporters begin the fermentation with the beans they have, then add more each day as they collect them. This means they open up the vat during the fermentation process, which leads to a low-quality product. For much of the final market a low-quality product is adequate, so the beans can be sold; however the buyers are not willing to pay a premium that exceeds the cost of processing the beans.

Several strategies could make it possible to produce a premium product. Large companies with extensive plantations have access to enough fresh beans that they can fill their vats and produce it themselves. Establishing new plantations is not likely; obtaining the land needed is difficult, and the trees take five years to begin producing fruit, so little new plantation is going on. Smaller exporters that process beans but do not have their own plantations buy the pulp from collectors or directly from the growers. In the past RAMEX has offered farmers a premium when purchasing fresh beans in the hopes of ensuring a steady supply to fill its own vats. However, there are essentially no barriers to entry to the intermediary subsector of the industry; anyone with some bags and access to transportation – even a taxi – can become a collector. There is therefore a lot of competition among collectors. If one buyer offers a higher price, the others will do the same. The farmers will sell to whoever pays the most, so it is hard to guarantee a supply once this kind of bidding war begins. In due course some of the collectors are forced out, but others continue to enter the field. This kind of process forced up the price of fresh beans a few years ago, to a point where RAMEX's client was no longer willing to pay the premium for high quality cocoa from Madagascar.

The farmers themselves can form groups and process their own beans; this is the strategy that the ABC hopes to encourage. There are a few farmer cooperatives in the region that have fermentation vats, but at present none is actually processing their beans, for lack of a seller willing to offer a high enough price. Moreover, these farmers are working within another project, run by the Malgache Association pour le Développement de l'Agriculture et du Paysannat (ADAPS, the Association for the

[2] This is according to ABC staff; this website http://www.agribusiness-madagascar.com/spip.php?article37 indicates that a tree produces 10 pods per year, but each pod has about 300 grams of pulp and seeds.

Development of Agriculture and the Peasantry), with support from the French NGO Agriculteurs Français et Développement International (AFDI, French Farmers and International Development). AFDI apparently does not want ADAPS to collaborate with the ABC, so restarting farmer processing through the ADAPS cooperatives does not look promising. The ABC is therefore investigating possibilities to form additional cocoa processing cooperatives through which they can work.

This will probably be a long process. If it is successful, the potential environmental impacts will result from the fermentation and drying process carried out at the local level. In this process, the beans lose two thirds of their weight. Much of that is due to evaporation as the beans are dried in the open are. A quite small amount of liquid comes out of vats during the fermentation process. According to the director of RAMEX this is simply water, and only a few liters are discharged per batch of beans processed. Moreover, because of the time required for trees to mature, farmers are not planting new trees, so there is no risk of extensification of cocoa cultivation into lands targeted for protection. It would therefore appear that the ABC proposed activities in the cocoa subsector will have no environmental implications one way or the other.

RICE

Cultivation of rice with ABC assistance had not yet begun when we visited Diana. The project is working on two demonstration sites to train villagers in more productive cultivation techniques, including planting seedlings in rows, mechanized hoeing, and use of fertilizer. In addition, the project is leveling one of the demonstration plots, which are slightly sloped, and training the villagers in how to do such work so they can do the same on their own fields.

The possible environmental impacts of these activities are minor. If used to excess, the introduction of fertilizer could lead to increased BOD downstream from the fields, potentially harming aquatic vegetation. However since farmers must purchase their own fertilizer, they are not likely to use it to excess. The leveling of the demonstration plot, or subsequent leveling of other fields by the farmers who have been trained, should make it easier to manage water on the rice paddies; this is one of the key objectives of the ABC interventions. With improved water management, farmers should be better able to control any runoff from their fields. Moreover, if they put in the labor to level their fields, they are likely to be invested in keeping them in good condition, which should help ensure that runoff is not a problem in the future.

7.3 CULTURAL ISSUES

As throughout the country, agricultural labor is carried out by all members of the family, with the men doing the heavy labor and the women doing the more meticulous planting and hoeing. The farmer whom we met near Ambanja was an exception to this pattern; his wife is a school teacher, and does not work in the fields, so he has to hire laborers to work with him. He is certainly the exception, however; most ABC beneficiaries are farmers who have always worked in the fields, rather than employees who decide to return to the land. Although vegetable cultivation is new to most of the farmers in the area, we do not expect it to change the gender patterns in agricultural work one way or the other.

On the question of how farm earnings are used and whether they affect standard of living, the responses were quite mixed. The two very enthusiastic vegetable growers both hope to use their earnings to invest further in agriculture, as well as to improve their housing. One of them also mentioned improving his family's nutrition, while the other alluded to the possibility of buying a car.

On the other hand, other people we met in Diana suggested that project beneficiaries may be likely to spend increases in income on immediate consumption rather than investing them in future income-generating capacity. They described the culture of the region as more easy-going than other parts of the country, with more of a day-to-day approach to making ends meet rather than a serious commitment to becoming professional farmers. The spread of qat chewing in the region, and the high profits that can be made from growing qat, may contribute to reducing interest in earning a living from the hard work of growing vegetables. Though this was definitely not the attitude of the farmers we met, we are likely to have met the most enthusiastic of them. The actual impacts of ABC activities will probably be a mix of the enthusiastic professionalism that we encountered and a more laid back approach to life.

7.4 CONCLUSIONS

The ABC activities in Diana are likely to have little or no impact on the environment. The area of greatest concern is the use of pesticides on vegetable cultivation. While some farmers are being trained in artisanal crop protection methods, others have been trained to use synthetic pesticides, and some are purchasing unidentified pesticides on local markets. It will be important for the ABC staff to continue training and follow up with all of their beneficiaries on the crop protection techniques they are using, and to encourage them to use the safest practices possible at all times. It will also be important for the ABC to engage closely with the ATABC consultant, to make sure that they are in fact placing the desired emphasis on integrated pest management and artisanal pest controls.

The project activities are not likely to lead to extensification of agriculture onto land not previously cultivated. The only activity that could possible involve creation of new fields is vegetable cultivation. So far this is not happening; farmers are cultivating on former rice paddies or former sugarcane fields. However given how much land in Diana is possibly suitable for protection, the ABC staff should pay close attention to the vegetable growers, to ensure that if anyone is considering bringing new land under cultivation it will not be land that is in fact targeted for conservation or creation of new protected areas.

Table 7.1 Environmental Impacts in Diana

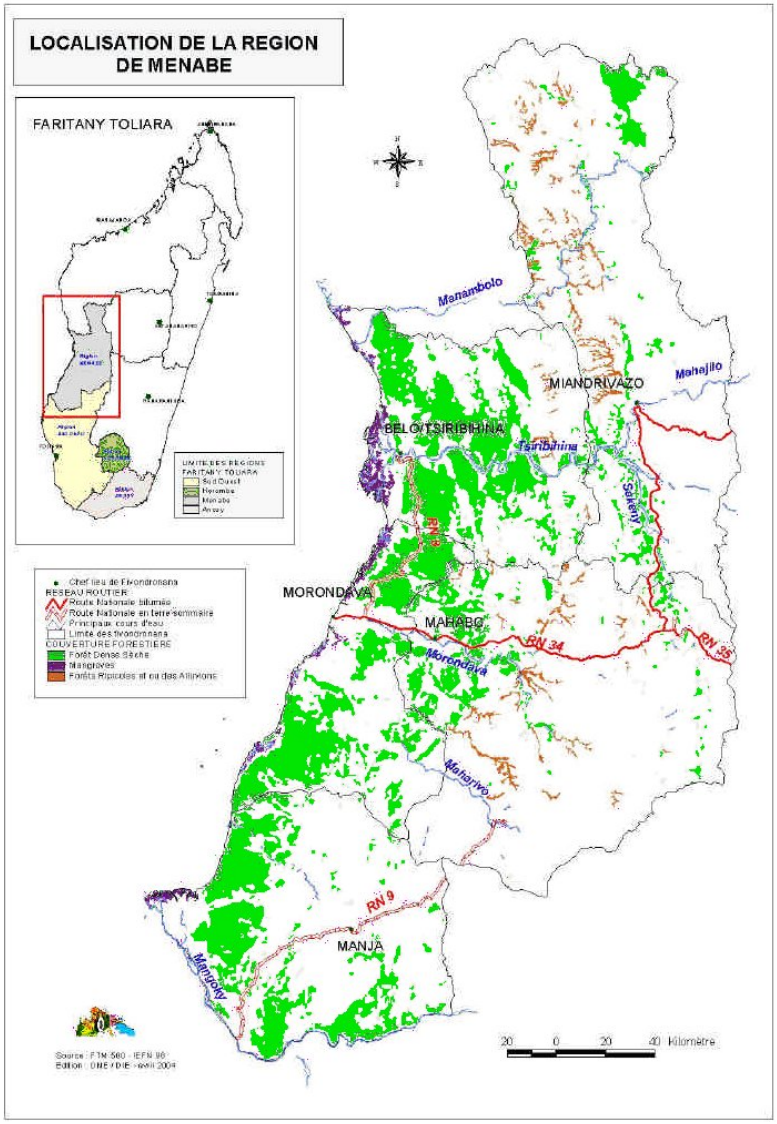
Impact	Source	Intensity	Duration	Spatial Extent	Frequency	Importance	Response
Vegetables							
Reduced use of agrochemicals as farmers learn how to use artisanal crop technique techniques	Training by ATABC consultant and TCF.	Depends on how much the use of artisanal protection techniques spreads.	As long as pesticides are not used.	Probably fairly local; depends on topography.	Ongoing as long as pesticides are not used.	Moderate benefit of ABIP activities.	ABC staff should follow up with beneficiaries on crop protection techniques and encourage them to use only artisanal techniques.
Harm to health or the environment from use of synthetic pesticides.	MAEP training on pesticide use, purchase of unlabeled pesticides on local markets	Depends on how much are used and how.	As long as pesticides are used.	Probably fairly local; depends on topography.	As long as pesticides are used.	Moderate harm from ABIP activities.	ABC staff should follow up with beneficiaries on crop protection techniques and encourage them to use only artisanal techniques. Staff should also pay close attention to content of pesticide training to ensure emphasis on artisanal techniques.
Harm to forests or other areas targeted for conservation.	Extensification of vegetable growing onto new fields.	High in areas affected.	As long as land is cultivated; permanent in the case of loss of primary forest.	Probably fairly local because cultivation is on small scale.	Constant if land is cultivated.	Low; vegetable cultivation is not now being done on new fields, and other land is probably available.	ABC staff should coordinate with conservation agencies to determine which land is targeted for conservation, and they should ensure that farmers do

Impact	Source	Intensity	Duration	Spatial Extent	Frequency	Importance	Response
							not cultivate this land.
Cocoa – no environmental impacts expected.							
Rice							
Increased BOD downstream of fields.	Use of fertilizer.	Probably low, as it is not likely that farmers will use excessive quantities of fertilizer.	A few days or weeks after application of fertilizer, depending on water management techniques.	Probably fairly small, though it depends on topography.	As often as fertilizer is applied.	Low; this does not seem likely to be a problem.	Make sure farmers are not using more fertilizer than the plants can absorb.
Reduced runoff from paddies.	Leveling fields used for cultivation of rice and training farmers to level their own fields.	Moderate; depends on extent to which this was a problem in the past.	As long as the fields are maintained and water can be managed properly on them.	Probably fairly small, though it depends on topography.	Ongoing as long as fields and irrigation channels are maintained.	Low to moderate benefit from ABIP activities.	Encourage farmers to maintain their irrigation channels so they can manage water better in cultivation.

CHAPTER 8. MENABE

8.1 OVERALL DESCRIPTION OF THE REGION

Figure 8.1 Location of Menabe



Source: TBE Menabe, p. 3

The region of Menabe is located on the west coast of Madagascar, in the Morondava river basin, which covers the western and southwestern portion of the country. With an area of 48,560 square kilometers and a population of 300,000 in 2003 (TBE Menabe p 7), the population density of less than 6.2 people per square kilometer is by far the lowest of the ABC regions. The population is dispersed throughout the region, with a slight concentration around the regional capital of Morondava.

The region is highly inaccessible. The only paved road, running west from Morondava to Antsirabe, is in very poor condition; indeed, travel on the sand roads heading north and south from Morondava is faster than on the pavement. Most of the rest of the region's road network is only accessible in the dry season, with obviously severe impacts on all economic activity.

With its 305 kilometers of coastline, the western portion of the region is characterized by sandy coastal zones, lagoons, mangroves, and coral reefs. Inland, wide valleys and plains form a depression of less than 100 meters in altitude. This is delimited to the east by a plateau attaining elevations of 400 meters, and then by an escarpment at a height of 800 meters. From there the altitudes rise further in the regions of Amoron'i Mania and Vakinankaratra.

The climate of Menabe is tropical, ranging from semi-arid to subhumid. It has two distinct seasons, one hot and rainy from November to march, the other warm and very dry, from April to October.

Annual rainfall increases steadily from a low of 600-800 on the coastal plains of the southwest to 1400 in the mountainous regions of the northeast. The average annual temperature is around 24°C, with lows of 15°C and highs of 32°C. Unusually for the southwest of Madagascar, the region is at high risk of cyclones; in February 2008 cyclone Ivan crossed over the region, one of a series of storms that devastated the country during that season.

The natural vegetation of Menabe is made up of dry deciduous forests and mangroves. Natural forests cover about 22% of the land area of the region, of which about one fifth is degraded, as shown in Table 8.1. That table does not indicate the date of those data, but does indicate that they were published in 1996. The distribution of those forests is shown in the map in Figure 8.2.

Table 8.1 Vegetation Cover in Menabe

Forest type	Area (ha)	% of region
Dense dry forest, undisturbed	740,131	15.24%
Dense dry forest, degraded	228,957	4.71%
Forests on river banks or alluvial land	70,727	1.46%
Mangroves	37,650	0.78%
Savanna with woody plants	1,973,043	40.63%
Savanna without woody plants	1,377,991	28.38%
Total vegetated area	4,428,499	91.20%
Total area of the region	4,856,000	

Source: Areas for each vegetation type from TBE Menabe Table F1.2, p. 60. Total area from TBE Menabe p. 3. Shares calculated.

As elsewhere in Madagascar, forests are subject to strong deforestation pressures linked to slash and burn agriculture. The only data available on rates of deforestation, shown in Table 8.2, are for a single year, 1999 to 2000; they show annual loss just under 6.5%. It seems unlikely, however, that this represents the ongoing rate of deforestation in the region. If it were correct, more than half the forests in existence in 1999 would now be gone, which seems unlikely even if deforestation is higher in Menabe than elsewhere in the country.

Table 8.2 Deforestation in Menabe, in hectares, 1999-2000

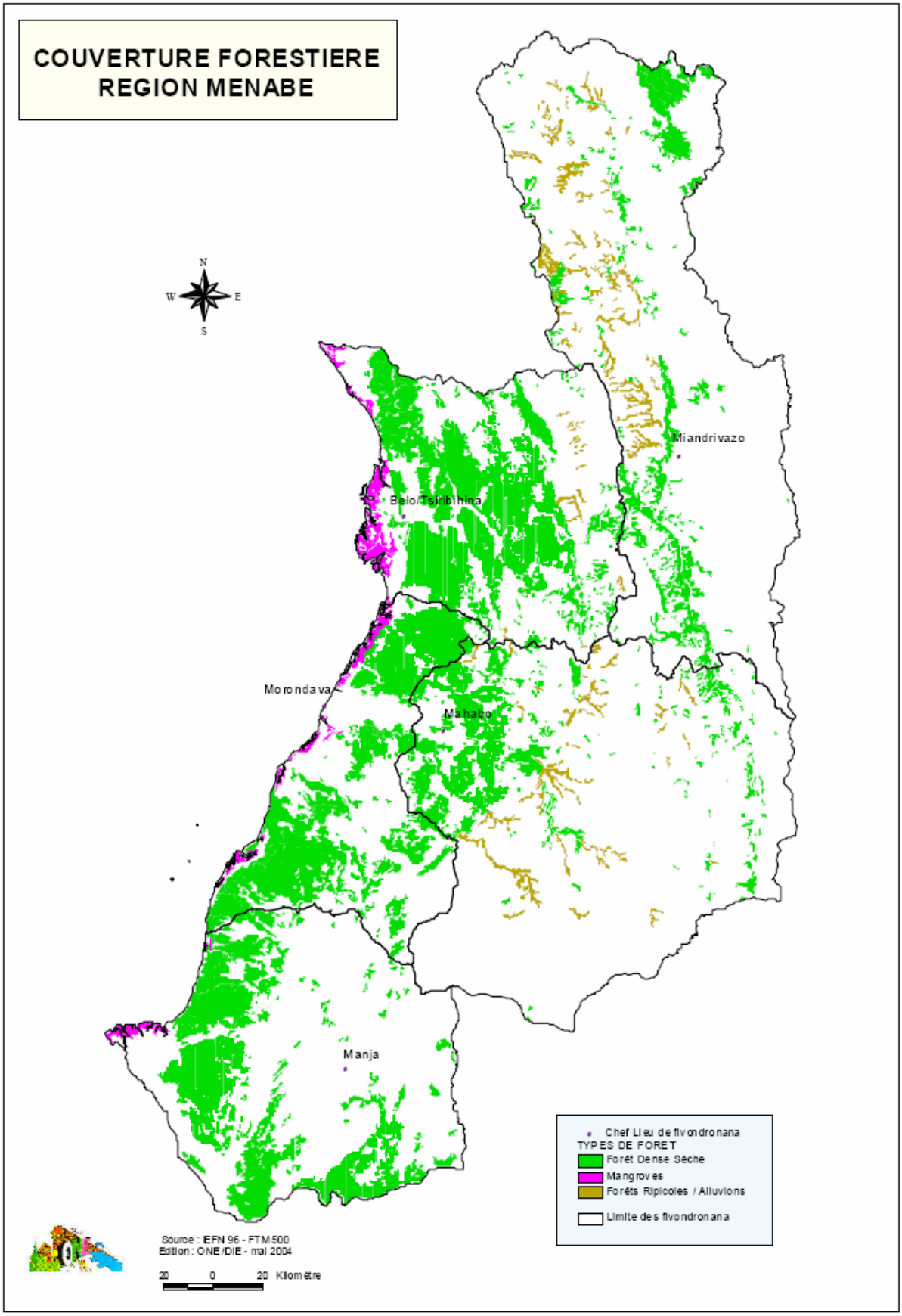
District	**Area of Forest & Mangrove**	**Forest loss**	**% loss**
Belon'i Tsiribihina	219,471	15,382	7.01%
Mahabo	101,350	8,737	8.62%
Manja	229,259	13,380	5.84%
Miandrivazo	51,886	109	0.21%
Morondava	185,827	13,074	7.04%
Total	**787,793**	50,682	6.43%

Source; Areas and forest loss data from TBE Menabe, Table F2.2.2, p. 74. Percent losses calculated from those data.

Bush fires are a problem throughout the region, although unfortunately no data are available to show the extent of destruction involved. The TBE suggests that burning grazing land in order to

encourage growth of new grasses is the major cause of such fires. Other major causes are accidents related to burning off crop residues or other plant matter, and fires related to the theft of cattle. (TBE Map F2.3.3, p. 78) Soil erosion in the region is partly caused by these fires. In addition, the climate, sandy soil conditions, and topography sloping from the escarpment to the west down to sea level all contribute to erosion. Agricultural practices to the west of Menabe in Amoron'i Mania and Vakinankaratra also lead to siltation of the rivers, irrigation systems, and ports in Menabe.

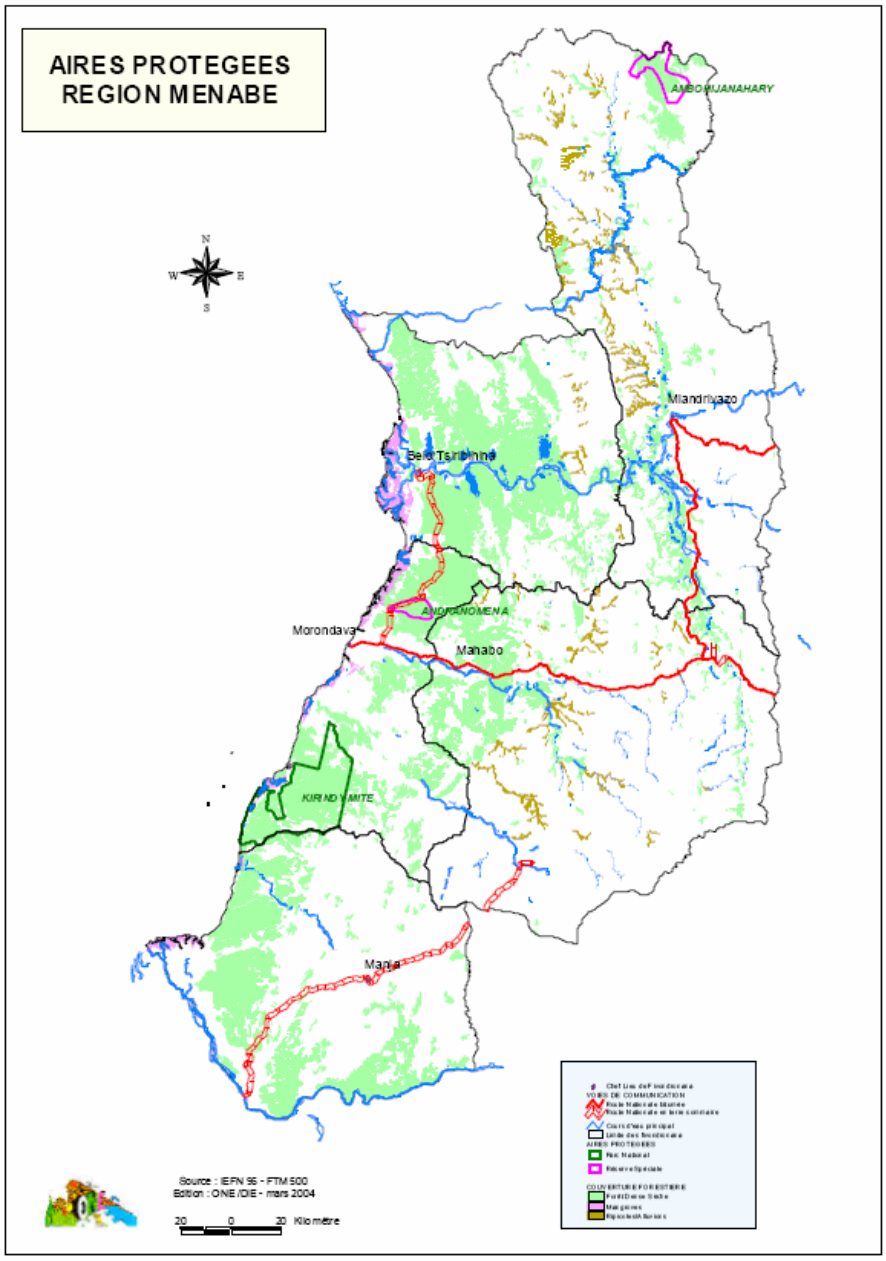
Figure 8.2 Forest Cover in Menabe



Source: TBE Menabe Map F.1.1, p. 58

Menabe is very rich in biodiversity, both in ecosystem and in species terms. Protected areas occupy about ten percent of its total area. Two of these are managed by ANGAP, the special reserve of Andranomena Special Reserve and Kirindy Mitea National Park. In addition, the Ambojijanahary Special Reserve is managed by the regional office responsible for environment, water and forests of the district of Maintirano in the region of Melaky, just north of Menabe. Lake Bedo has been classified as a RAMSAR site; that is a sensitive wetland area of particular importance for migratory birds.

Figure 7.3 Protected Areas in Menabe



Source: TBE Menabe, Map B3.2, p. 49

The most recently created protected area, Menabe Antimena, is part of the new SAPM, and is falls under category V of the IUCN/World Conservation Union protected areas classification (Cardiff University / IUCN 2003). Officially created in 2006, it is operating under a two-year temporary protected status, under the management of a Malgache non-profit environment organization called Fanamby. This arrangement covers an area of 125,000 hectares, including 100,000 hectares of dense forest of which 30,000 are a priority conservation zone, 24,000 hectares of mangroves, and 1,000 hectares of lakes. The Baobab Alley, a stretch of road where tourists can easily view baobab trees, is part of this area.

Although agriculture is Menabe's primary economic activity, only 14% of the region's arable land is actually cultivated. This rate varies substantially across districts, as Table 8.3 shows; this is to be expected given the lack of a viable road network in the region. Cultivation rates changed very little over the three year period for which data were available. The general attitude among people

interviewed for the SEA was that plenty of land is available for agriculture, and the constraints to increasing output lie elsewhere. This would appear to be well substantiated by these data. It is worth noting, however, that the TBE does not indicate how arable land is defined. In particular, we do not know whether the definition is based only on soil and rainfall characteristics, or whether areas targeted for conservation are not considered arable for non-technical reasons.

Table 8.3 Cultivated land in Menabe

District	Total area	Arable area	Area cultivated			% of arable land cultivated		
			1997	1998	1999	1997	1998	1999
Morondava	552,900	17,000	9,554	9,620	9,940	56.2	56.6	58.5
Belo/Tsiribihina	766,800	144,000	8,738	8,755	8,665	6.1	6.1	6.0
Mahabo	1,332,600	238,000	16,648	16,248	16,444	6.7	6.8	7.0
Manja	898,200	16,800	10,502	10,420	10,480	62.5	62.0	62.4
Miandrivazo	1,305,500	18,500	14,515	14,535	14,580	78.5	78.6	78.8
Total	**4,856,000**	**434,300**	**59,957**	**59,578**	**60,109**	**13.8**	**13.7**	**13.8**

Source: TBE Menabe Table F2.7a, p. 85

Agriculture in Menabe is concentrated on food production, as shown in Table 8.4. Some 91% of farmers are cultivating their own land; the others are either share croppers or tenant farmers. Livestock is also important in Menabe's agriculture, with about 500,000 head, almost all of them cattle. Grazing occupies a large area of land, and is the cause of many of the forest fires observed in the region.

Table 8.4 Area Cultivated and Output by Crop, 2001

Crop	Area (ha)	Yield (tons)	Tons/ha
Rice	31,552	68,520	2.17
Manioc	6,945	42,520	6.12
Corn	4,220	4,250	1.01
Beans	2,850	2,340	0.82
Sweet Potatoes	1,065	7,180	6.74
Lima Beans	1,105	2,285	2.07
Sugarcane	3,655	178,260	48.77
Peanuts	2,310	1,650	0.71
Tobacco	45	75	1.67

Source : TBE Menabe Tables F2.12 a-i, pp. 86-90. All data are for 2001 except tobacco, which are for 1999.

8.2 SUBSECTOR ASSESSMENTS

LIMA BEANS

ABC's support for cultivation of lima beans has involved the negotiation of contracts between the growers, the export cooperative TAMI, which is providing improved seeds free of common diseases, and the State Trading Company of Mauritius (STCM), which will export the crop. In the first year of

this activity, 2007 before ATABC, only 78 farmers received training. For the 2008 season, nearly 2,200 producers have received some 30 tons of seed on credit. Predicted output is 3000 tons, with a yield of 1.4 tons per hectare. It is hoped that this will provide 2,000 tons for export with the possibility of extending the contract to other exporting companies in order to encourage competition.

The production of lima beans involves application of confidor, a pesticide that is considered of lower risk than the locally available synthetic pyrethrioids. ATABC purchased the product in Antananarivo and the field agents are distributing it with the assistance of the model farmers. The model farmers have been trained in pesticide handling and application; they are responsible for training the members of their cooperatives or associations. In practice, many farmers have already been purchasing pesticides from local vendors in Morondava, and the ABC staff estimate that about half of them use pesticides. The ABC staff also feels that the farmers have a solid mastery of the safe handling and use of these chemicals.

However, the farmers do not have their own sprayers, which cost between one hundred and two hundred thousand ariary. The ABC has purchased nine sprayers, which are brought to the villages by the field agents when pests are observed on the plants. The model farmers have been trained in the use of the sprays, and they apply the pesticides or supervise others in their community in this task. The farmers must pay for the pesticides when they use them, so they only use them when they can afford to. The ABC staff indicated that they have also trained the farmers in the use of neem, cinders, and hot peppers for crop protection, but that these techniques are not always effective. Apparently TAMI is also providing pesticides to the farmers, which are applied by their agents.

With regard to labeling and packaging, the agrochemicals supplied by the ABC come in granules, and are provided in plastic bags. The ABC staff indicated that the s pass this on to the members of their organizations, who transfer their shares into plastic bags or other containers. The users have been trained in the appropriate concentration and doses for mixing the pesticide solutions. They were also provided with gloves, goggles and face masks. Whether they wear the protective garb when ABC field agents are not present is not known. This all suggests a mixed picture with regard to pesticide use on the lima bean crop. The ABC staff should closely monitor this activity, and reinforce the training in safe practices as needed.

Lima beans are being cultivated on alluvial soils (*baiboho*) rich in nutrients, so fertilization is not needed. Access to land does not pose a problem, and there is no expectation that new land will be cleared to grow lima beans. The farmers burn old crop residues in order to prepare the fields for planting, using fire breaks to prevent the fire from spreading out of control. They set the fires when the wind is low, to further protect against damage.

The major problem that the farmers encounter in growing lima beans is siltation of their fields, particularly after the passage of cyclones. The region is subject to movement of soil in times of extreme weather, and at times this changes the course of the rivers and buries crops planted on the river banks. In addition, some cultivation practices accelerate the problems of local erosion, notably removing plants on the river banks. These two problems of siltation and erosion can create significant local constraints on access to land.

The ABIP assistance on lima beans has also affected the farmers living in the new Baobab Alley protected area, managed by Fanamby. Like most Malgache farmers, they have been cultivating rice. However, baobab trees cannot survive when the ground is wet, and those growing near the rice paddies are dying as a result. With technical assistance from the ABC, in collaboration with Fanamby, these farmers have replaced some rice cultivation with lima beans. If this provides to be

economically viable, it should have a significant positive impact on the survival of the baobabs, which in turn will provide a boost to the region through the tourism attracted by Baobab Alley.

RICE

ABC's intervention in the rice subsector involves disseminating new cultivation techniques and providing access to improved seeds. Their assistance began in 2007, targeting 400 producers. However problems of siltation linked to the cyclones that hit that season wiped out their efforts. For the 2008 season, the project is working with 1,774 farmers, planting seeds supplied by MAEP's Centre de Multiplication des Semences (Seed Multiplication Center) in the town of Mahabo. Unlike the lima bean subsector, the project does not expect to introduce contracts for growing and purchasing, since rice markets are well developed throughout Madagascar.

Six hundred of these growers will implement SRA techniques and the others will follow SRI practices. There are a few key differences between these two approaches to rice cultivation. Using SRA – the système de riziculture améliorée, or improved rice cultivation system – the farmers plant seeds fifteen days after germination in the nursery. There is a good deal of flexibility in water management practices, and yields run to about 4 tones/ha, as compared with 2 tones/ha using traditional techniques. SRI – the système de riziculture intensive, or intensive rice cultivation system – is much more demanding in terms of management practices. Seedlings are planted only 8 days after germination, and it is essential that the water be kept at just the right levels in the fields at all times to avoid flooding them. To manage the water as closely as needed, the fields must be perfectly level, and the irrigation and drainage systems very well maintained. This requires much more labor than SRA, and therefore costs more. It pays off, however; yields to SRI cultivation run closer to 6 tons/ha. However it is often not possible for farmers to ensure the precise maintenance required, so many prefer to follow SRA.

The farmers involved with the project have been trained in artisanal crop protection methods. They have used synthetic pesticides in the past, although the ABC does not have information about how they used them. In particular, they do not know whether the training the project has provided has led growers to switch from synthetic pesticides to artisanal approaches to pest management. The project has an opportunity to have a positive impact on the environment in this subsector; additional monitoring and reinforcement of the training in natural techniques may be useful.

As with lima beans, siltation of rice paddies due to storms and shifting river channels is a significant problem for rice cultivation. This is, of course, not a problem caused by the rice cultivation; rice cultivators are the victims of a problem caused in part by nature and in part by the agricultural practices upstream from them both in Menabe and in Madagascar's central highlands.

PEANUTS

Peanuts have been cultivated by the farmers of Menabe for a long time. The ABC contribution to this subsector has been the introduction of contract agriculture, between farmer groups and a Mauritian company called Maurimad. The contracts began with the 2007 season with growers in the Mandabe region. The zone of Mandabe is considered most suitable for this activity, being a long-time source of peanuts, but its inaccessibility has limited the interventions of ATABC. Maurimad brought in a tractor in 2007 to work the fields of 89 farmers, and close to 40 hectares. They provided pesticides and committed to purchasing the entire harvest of the participating farmers. In the 2008 off-season,

Maurimad expanded its activities to work with 276 farmers on close to 300 ha in the districts of Belo sur Tsiribihina and Morondava .

Peanuts are grown in two seasons. The rainy season crop runs from December to April, in areas that cannot flood, in Mandabe, Kirindy, and Beroboka. The off-season crop, from May-June through August, is planted on baihobo. In Belo-sur-Tsiribihina it is possible to grow peanuts during both seasons.

The farmers involved with this activity have been trained in the use of the synthetic pesticide sumithion for treatment of stored peanuts. The problem arises because insects invade the nuts once they are harvested but before storage. To combat this, the pesticide is placed around the mounds of harvested nuts in order to repel the pests, but it is not in direct contact with the nuts. The training focused on preparing the chemicals, applying them, and cleaning the materials used for treatment. Maurimad has sold the sumithion, to the farmers, who must pay for it in cash. The SEA team spoke to farmers In the village of Kirindy, in the zone of the same name, about these practices.

Despite the training they have received, the farmers do not always observe safe handling practices for the chemical. The sumithion is delivered in 150 kg lots and stored in a hut, with no particular precautions apparent. Each villager comes to the hut to buy some of the chemical when needed. Normally the pesticides are not stored in homes, but if they are, the villagers reported that they did put them in places inaccessible to their children. When faced with pests on the plants themselves, rather than those on stored nuts, the farmers indicated that they purchased agrochemicals from local suppliers, and did not know the required doses. Clearly, there is a need here for the ABC staff to reinforce their training in the risks posed by synthetic pesticides.

Peanuts in the zone of Kirindy are grown on land that has been cultivated for a long time, so there is no need to clear vegetation for this crop and in addition they cannot clear unless obtaining permission. A village association was initially created in order to protect a neighboring forest. Indeed, in the event of any harm to the forest under their jurisdiction, the association must prepare a report for submission to the mayor, the local water and forest service, and the NGOs ANGAP and Fanamby. If they do need additional land for cultivation, they will obtain it only by clearing secondary forest. On the other hand, they do use fire to prepare their fields for planting peanuts. They are quite experienced in these techniques, and are able to keep fire from getting out of control.

Security is a problem in the zone of Kirindy. The farmers are obliged to spend nights in the fields protecting their crops when they are close to maturity, in order to prevent the theft of the plants. The project activities will not make this problem worse; unfortunately they are not likely to ameliorate it either.

8.3 CULTURAL ISSUES

At the family level, women are actively engaged in field work, sharing the tasks with the men. Usually women manage the household budget, but important purchasing decisions are made jointly. In the past, the women in Menabe were excluded from community decision-making. This has begun to change, however; women participate in the discussions, even if they are not at the center of decision-making. In some communes, women have created associations for the sale of artisan products, and the situation is evolving towards giving them more control over the lives of their communities.

The team's interviews in Menabe suggested that in most cases increases in income are spent on household items. Foam mattresses are a very popular item in the region, and we saw stacks of them for sale in all the towns we passed through. Clothing, kitchen utensils, and other household items are also common purchases. Some families use increases in income to rehabilitate their houses, others build new ones. Investment in agricultural tools rarely has high priority, although some families purchase food to store for the lean period, or convert their savings into purchases of cattle.

There is a temptation for the farmers to spend their earnings on items that might be considered by some to be relatively unimportant. The collectors who purchase their crops bring with them an array of appealing goods for sale, including clothes, radios, mattresses, and other items. Agricultural tools are apparently not considered likely impulse purchases, so they are not included on the merchandise trucks. If they were, this could be a reasonable time for farmers to purchase better equipment.

Children work in the fields after school hours. Education at the primary level is considered a necessity by most families, but beyond that the situation changes. Indeed, more than half of family heads in Menabe have no formal education, so the culture is not one in which extensive education is expected. The training offered by the project, by showing the farmers the utility of literacy, numeracy, and management skills, might encourage them to consider more schooling for their children.

8.4 CONCLUSIONS

On the whole, the ABC activities in Menabe should be of benefit to the region's environment and its rich biodiversity, both terrestrial and marine. In the case of Baobab Alley, for example, the ABC is working with Fanamby on the cultivation of lima beans instead of rice, in order to protect the baobabs from death by flooded roots. On the other hand, the cultivation of lima beans does involve the use of synthetic pesticides which, if improperly applied, could be harmful to human health and the environment. The farmers growing lima beans seem to have a good understanding of the risks of these chemicals, but it will still be important for the ABC staff to monitor their activities in this area. This is even more true of the peanut growers, some of whom seem lax about the issue.

The cultivation of both peanuts and lima beans involves burning crop residues in order to prepare the soil for planting. While the farmers involved have considerable experience using fire, and are applying techniques to prevent the fires from getting out of control, this always poses a risk. Lima beans, being planted on baiboho, are surrounded by humid areas where the risk of fire spreading is small. Peanuts, however, are being grown near forested areas which could be greatly hurt if fire were to get out of control.

The ABC activities in the rice subsector should be beneficial to the environment, since they involve introduction of artisanal techniques for pest management. If these techniques work, it is possible that the farmers will apply them elsewhere as well, since they are both less costly and less risky. Here, as elsewhere, however, it will be helpful for the ABC field agents to monitor the practices actually being used, and reinforce the training when that seems needed.

Table 8.5 Environmental Impacts in Menabe

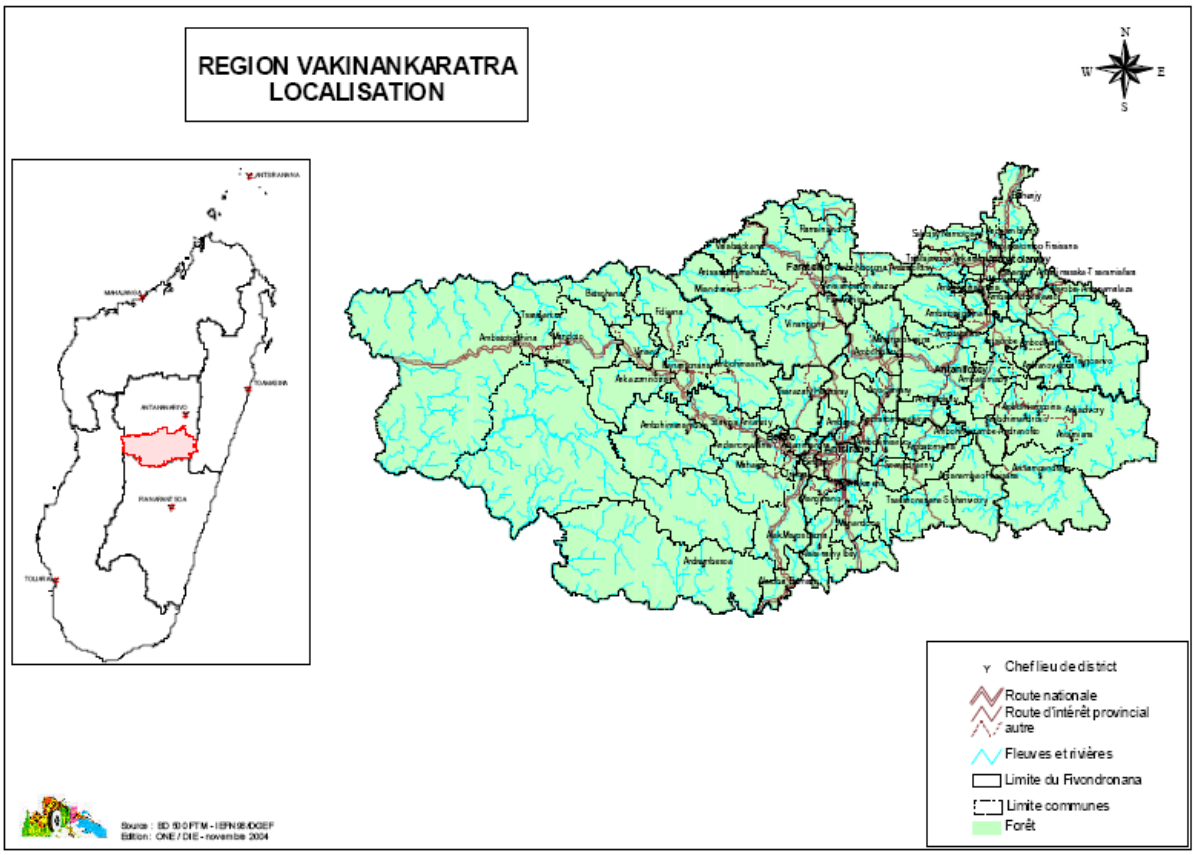
Impact	Source	Intensity	Duration	Spatial Extent	Frequency	Importance	Response
Lima Beans							
Risks to health or the environment	Treatment of crops with confidor	Depends on how the pesticides are used	Depends on the particular harm that results	Those handling the pesticides, their families. Environmental impacts would be local	Whenever pesticides are applied	Moderate; the farmers seem to be well trained in pesticide application, and in the use of lower risk pesticides but the consequences are serious	ABC field agents should monitor pesticide use and retrain farmers if needed
Loss of habitat or biodiversity to fire	Fires set to prepare fields for cultivation could get out of control	Depends on how serious or widespread the fire is	Habitat that is destroyed will be permanently lost. The risk continues as long as fire is used.	Zones adjacent to fields being burned. How far this extends depends on the fire, the weather, and so on	Once a year when fires are set to clear fields for lima bean cultivation	Moderate ; the risk seems low, but the consequences could be serious	Field agents should introduce alternatives to burning; if fire is used, they should ensure that techniques are appropriate to minimize risk
Peanuts							
Risks to health or the environment	Use of pesticides to protect peanuts while in storage	Depends on magnitude of exposure	Risk is present as long as pesticides are used; duration of specific impacts depends on how great the exposure is	Those handling the pesticides, their families	During the period when peanuts are stored	Moderate; risks to health are somewhat likely	ABC field agents should monitor pesticide use and retrain farmers if needed
Loss of habitat or biodiversity to fire	Fires set to prepare fields for cultivation could get out of control	Depends on how serious or widespread the fire is	Habitat that is destroyed will be permanently lost. The risk continues as long as fire is used.	Zones adjacent to fields being burned. How far this extends depends on the fire, the weather, and so on	Once a year when fires are set to clear fields for lima bean cultivation	Moderate ; the risk seems low, but the consequences could be serious	Field agents should introduce alternatives to burning; if fire is used, they should ensure that techniques are

Impact	Source	Intensity	Duration	Spatial Extent	Frequency	Importance	Response
							appropriate to minimize risk
Rice							
Reduced use of synthetic pesticides	Training in artisanal crop protection techniques may be applied on rice and extended to other crops if successful	Depends on whether farmer behavior changes	As long as synthetic pesticides are not used	Within the affected fields and villages	Ongoing as long as artisanal techniques are used	Moderate positive impact; it is not that agrochemicals are being used now	Field agents should monitor ongoing practices, and encourage use of artisanal methods whenever possible

CHAPTER 9. VAKINANKARATRA

9.1 OVERALL DESCRIPTION OF THE REGION

Figure 9.1 Location of Vakinankaratra

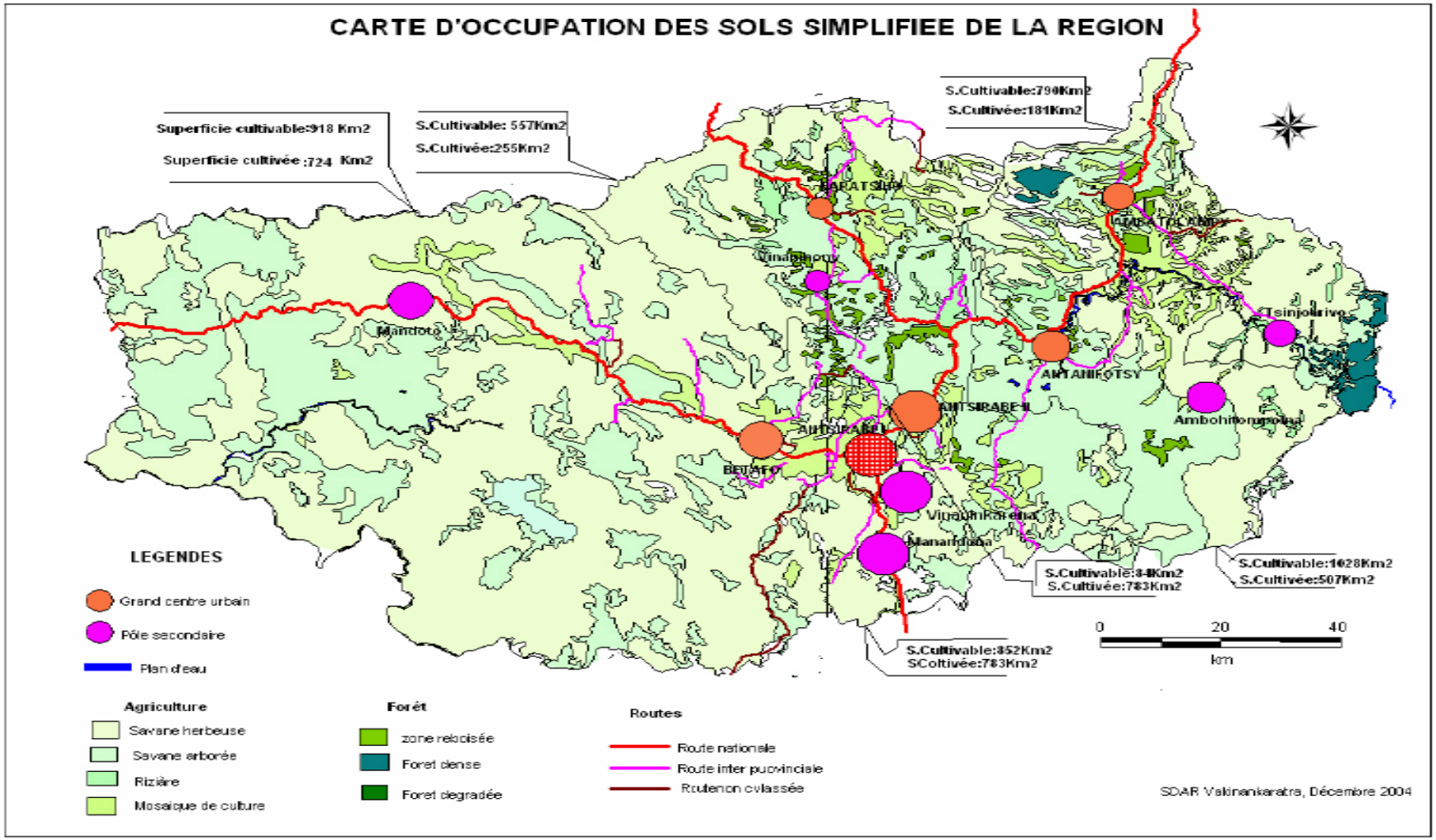


Source: TBE Vakinankaratra p. 3

The region of Vakinankaratra is in the central highlands of Madagascar. It covers 19,205 square kilometers of land, and had a population of 1,668,124 in 2004, making it the most densely settled region in the country other than that surrounding Antananarivo. The climate of the region changes considerably from east to west. The eastern and central portions of the region are relatively humid and cool, with temperatures down to as low as 3 C in winter and rainfall as high as 1800 mm/year. The western portion of the region is lower in altitude, warmer, and drier, with temperatures averaging six degrees higher than in the east and rainfall closer to 1300 mm/year.

Figure 9.2 gives some sense of the land use and vegetation cover of the region. Most of the population and the agricultural activity are in the central and eastern portions of the region. The center of the region is an area of former volcanic activity, with rich soils that lend themselves to a wide range of cultivation. The terrain is mountainous, with cultivation on slopes and in valley bottoms. Data from the region's Tableau de Bord Environnemental suggest it would appear that about half of the five districts that make up the central and eastern portions of the region are arable. In the western portion of the region, on the other hand, composed of the single district of Behafo, less than 15% of the land area is considered arable. (TBE Table F2.7, p. 90) The eastern edge of Vakinankaratra is part of the Zahamena-Mantadia tropical rainforest corridor that runs north-south through Atsinanana, Aloatra-Mangoro, Vakinankaratra, and Amoron'i Mania. This area, targeted for

Figure 9.2 Land Cover in Vakinankaratra - Source: Plan Régional de Développment, Vakinankaratra, p. 20



protection through the new Madagascar protected areas system, is relatively inaccessible, which has made it possible for its primary forest to survive. Agricultural production in Vakinankaratra is diverse. Figures 9.3 and 9.4 below show the importance of key products in terms of quantity produced, area cultivated, and revenues. The region is known as a major source of potatoes, and the charts support this impression. Vakinankaratra is also a major source of fruit, including temperate fruits such apples, peaches, and a number of tropical fruits. Between 65 and 70% of agricultural output is consumed by the growers, the rest sold on local markets or exported. Pork and dairy are also important agricultural products in Vakinankaratra. Tiko, Madagascar's largest producer of milk, yogurt, and other dairy products, is based in Antsirabe.

Figure 9.3. Agricultural Output of Vakinankaratra, Quantity and Area Cultivated

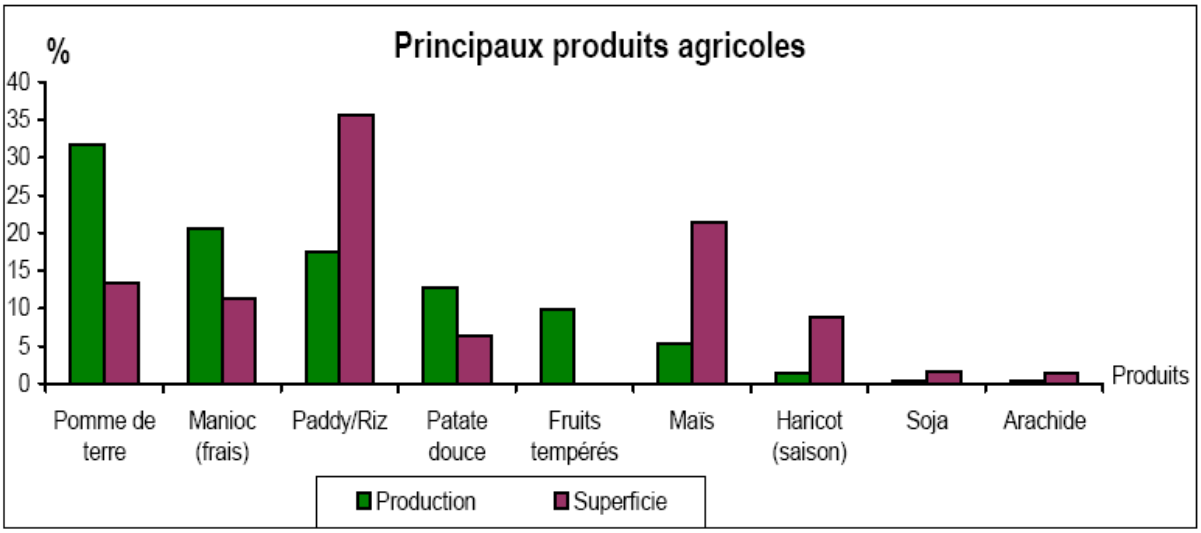
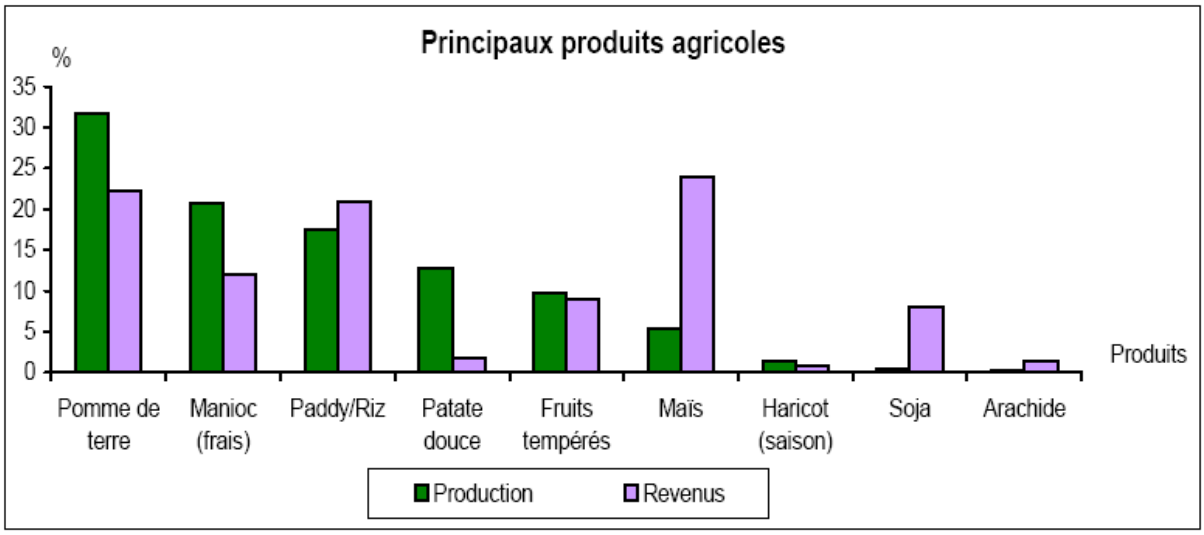


Figure 9.4. Agricultural Output of Vakinankaratra, Quantity and Revenues Generated



Source: Plan Régional de Développement, Vakinankaratra, p. 7.

Soil erosion and bush fires are major concerns in Vakinankaratra, as everywhere in Madagascar. The areas most susceptible to erosion, according to ONE data on slopes, are in the central axis of the region, in the eastern portion of the district of district of Betafo and in Faratsiho. (TBE Map F1.5, p. 54; unfortunately that map is not clear enough to reproduce here.) One indicator of actual soil

erosion used by ONE is the number of *lavakas*, or severely eroded gullies, in the region. As Table 9.1 shows, there are far more lavakas relative to area in Betafo than in any other district of the region. Throughout the region, however, people report significant concerns about siltation of rice paddies and river basins. The reported impacts of soil erosion on soil fertility are mixed. The TBE reports that in more than half of communes surveyed, the fertility of hillsides has declined in the past ten years. For river basins, 40% of communes report declines in fertility but 34% report increases. Thus the soil coming off the hillsides may be enriching the downstream fields in addition to silting up the irrigation systems. (TBE p. 61)

Table 9.1. Lavakas in Vakinankaratra, by region

District	Number of lavakas	Area in km^2	Lavaka per km^2
Ambatolampy	72	2769	0.026
Antanifotsy	39	2015	0.019
Antsirabe I			
Antsirabe II	127	3425	0.037
Betafo	1190	9107	0.131
Faratsiho	25	1709	0.015

Source: Based on TBE Table F1.9b, p. 70,

The western area of the region, in particular, is particularly subject to both erosion and forest fires. Data for 2003 and 2004 show that over eighty percent of the area burned in the region was in the district of Betafo, although that district accounts for less than half the area of the region. Most of the vegetation burned was prairie or savannah. (TBE Table F2.3.1, p. 75) The reasons for these fires are quite mixed. On the positive side, fires are not often set to clear land for cultivation, and they are not harming what is left of the tropical forest on the eastern edge of the region. On the other hand, 28.5% of the fires are simply described as criminal, and another 2.5% are set in order to hide the traces of cattle thieves. Among the other causes, regeneration of grazing land accounts for 18%, burning crop residues for 9%, games for 2.5%, and other causes for 14.2%. (TBE p. 79)

At present there are no protected areas in Vakinankaratra, so encroachment due to expanded cultivation is not likely to be a problem. On the other hand, consumption of plantation and secondary forest as fuelwood, charcoal, and inputs to manufacturing is a major concern. Most households burn wood or charcoal as their primary energy source, as throughout the country. Placing additional pressure on the resources, several industries in Antsirabe use wood as the primary energy source for their factories, among them the textile company COTONA and the Star brewery. In response to this pressure, the region has issued a decree (Arrêté N° 003 REG/VAK/SG/DGAT/ENV du 2 novembre 2004) mandating the establishment of wood plantations to replace consumption of wood as a source of fuel, a primary product for manufacture, or for charcoal production. Data on reforestation from the TBE suggest that this decree is having a significant impact. Hectares reforested rose from about 500 per year between 2000 and 2003 to over 42,000 in 2004, and the number of trees planted each year rose from a million or less to seventy six million over the same period. Most of the plantations are of pine and eucalyptus, and they are overwhelmingly occurring in the district of Ambatolampy. (TBE Table F3.4a, pp. 97-99)

9.2 SUBSECTOR ASSESSMENTS

POTATOES

Vakinankaratra is known throughout Madagascar as a center for the cultivation of potatoes. The crop is grown in three different seasons – during the rainy season, in the off season on rice paddies, and in the so-called intermediate season – so annual yields are high.

The growers targeted by the ABC have been cultivating potatoes for a long time, but have just begun working with the ABC. The first potatoes to be grown through this collaboration will be the 2008 off-season crop, planted in rice paddies. The ABC intervention is focused on improving the quality of potatoes grown so that they can be exported to Mauritius, where demand for potatoes is high. To that end, in May 2008 a group of leader peasants were sent to CEFFEL, a local agricultural research and training center, to learn new cultivation techniques. These techniques have not yet been applied yet, so the results are not yet known.

Work in the potato subsector as a whole is focusing on disease management at present. According to the director of FIFAMANOR, a research, training, and seed production organization supporting agriculture in Vakinankaratra, four varieties of potato are being grown in the region. Spunta is the traditional variety, preferred because its long shape is considered good for making French fries. However spunta is susceptible to bacteria and mildew. These diseases can be treated with use of fungicides, but most peasants cannot afford the treatment. Even if they could, agronomists do not consider ongoing treatment with pesticides to be the best way to produce potatoes. FIFAMANOR is researching other varieties, and has identified some that are resistant to fungus, including ones called diamondra II (there is also a non-resistant diamondra I) maharivo and avotra. Peasants do not wish to begin cultivating the new varieties, however, because to do so they must buy seed, rather than using their crops from the previous year to obtain seed at no cost. Moreover, the resistant varieties are round rather than oblong, and therefore not considered suitable for French fries. Finding cultivation practices that are effective, safe, and will be accepted by the peasants, will be an ongoing challenge.

The training offered by ABC and provided by CEFFEL did not include any information on use of synthetic pesticides or chemical fertilizers. CEFFEL only works with artisanal means of crop protection, doing research into treatments with sisal, cow manure, and other mechanisms. At least some of the peasants with whom the ABC will be working, including those in Manandona, had previously received training from FIFAMANOR, which included the use of fungicides (mancozeb) and insecticides (cypermethrin) to treat the potato crops. If they are willing to adopt artisanal alternatives, then the ABC involvement should reduce risks to human health and the environment. If they are not, however, the ABC field agents should probably consider training them in safe use of synthetic pesticides. FIFAMANOR may have in fact done such training, but the villagers with whom we spoke indicated that the only thing they had learned was what dose of synthetic pesticides to use, and on what schedule. Those who can afford synthetic pesticides may find artisanal pest management systems to be too much work, in which case the ABC will be able to improve matters by teaching them how to continue their current practices more safely.

ONIONS

Onions are a relatively new crop for Vakinankaratra, so many of the villagers with whom the ABC will work in this subsector have never grown them before. They are grown on rice paddies in the off

season. The 2008 season will be the first one for which the ABC will provide assistance, so there are no results yet from this activity.

ABC is offering assistance throughout the onion subsector production chain. To strengthen peasant organizations, they have provided management training and improved access to credit. They have provided training in onion cultivation through CEFFEL to a group of leader peasants. CEFFEL is doing extensive training on the crop to determine which varieties grow best on which schedule, and to identify the best mechanisms for fertilization and protection from pests and disease. The peasants who were trained learned about composting and the use of cow manure, comfrey, and neem to protect the plants against parasites. Some of the peasants with whom the project is working had already been trained by CEFFEL in the context of a different project, and they reported that the techniques they learned had increased yields significantly. The action plan indicates that the ABC will work with the growers on watering and irrigation, to ensure that the crop can survive a lack of water if rainfall is insufficient. They are also training the villagers on storage of the onions after harvest to lengthen the period of availability into periods when a higher price can be obtained.

If these activities are carried out as planned, the ABC activities should have no negative environmental impacts, and may have positive ones. Since onions are grown off-season on rice paddies, this crop will not contribute to soil erosion or lead to encroachment into forest areas targeted for protection. The training on composting and artisanal pest control methods may encourage peasants to try these approaches on other crops as well, which should enrich the soil while possibly replacing synthetic pesticides. It will be valuable for ABC field agents to monitor what the targeted groups are actually doing with respect to crop protection, however, to reinforce their training in safe pest control methods if needed.

RICE

The ABC has not yet begun field work on rice cultivation, so we could not meet with peasants who will be engaged in this activity. The ABC will be working in the district of Betafo, in a zone targeted for new agricultural investments in order to achieve the Madagascar Action Plan goal of tripling rice output by 2012. They expect to introduce techniques similar to those of other regions, including planting the seedlings younger than is traditional, planting them individually rather than in clumps, and planting in rows so that hoeing is easier. There is not enough water in the agricultural investment zone for irrigation, so rice cultivation will take place only in the rainy season. This means they do not have to worry about water management and irrigation issues. However it does leave open the possibility that, although the activities will focus on level plains, peasants will observe the yields from rainy season rice and expand cultivation onto steep slopes, creating erosion problems.

Where such erosion may be an issue, it is important for the ABC to ensure that peasants know how to prevent it. Where possible, the best way to do this will be to coordinate with other projects specifically focused on erosion, to build on the complementarities among the different projects in the region. The Director of Rural Development for Vakinankaratra indicated that the choice of target villages for ABC work was specifically intended to pair them with the activities of the Bassins Versants et Périmètres Irrigués project (BVPI – river basin and irrigation project), so that the two projects could work together. As the ABC moves ahead on rice cultivation, they should meet with the BVPI project to ensure that all opportunities for collaboration are pursued. To the extent that the two projects are not, in fact, working in the same regions, the ABC field agents must pay close attention to the choice of fields for introducing rainfed rice, and work with villagers on erosion control techniques as needed.

Increasing the yields of rainfed rice to the desired levels will also require use of fertilizers of some sort. The ABC is recommending the use of compost, which should be of benefit to the soil. The training in composting through the project could also lead to its use on other crops in the area, which would further benefit the soil.

CORN

Corn is an important source of food or income in Vakinankaratra during the lean period. The ABC has not yet begun working on corn cultivation; they expect to train growers in the selected villages in August 2008, and plant the first crops in September-October. The sites where the project will work have not yet been identified.

Three new elements will be introduced in corn cultivation:

- use of improved seeds
- use of fertilizer
- planting hedges in order to control erosion

Erosion due to cultivation on steep slopes is the major risk that these activities may pose for the environment; this can harm both the cornfields themselves and downstream irrigation systems or rice paddies. The action plan only refers to the use of hedges to deal with this issue, and does not specify whether the fertilizer used is to be chemical or biological (compost). As the ABC begins planning its activities in more detail, and once the specific sites have been chosen, they should consider whether a wider range of erosion controls will be needed. In other regions where the ABC is also working on corn, they are also training peasants in intercropping, cutting the green stalks and leaving them to decompose on the fields, and planting corn within live vegetation that helps both to enrich the soil and to hold the earth. All of these techniques should be considered in Vakinankaratra as well. If needed, the ABC staff may want to work with the staff of BVBI or other erosion projects in order to learn more about erosion control.

9.3 CULTURAL ISSUES

As elsewhere in Madagascar, both men and women play an active role in agriculture, with tasks allocated between them in fairly standard ways. Men are responsible for tasks requiring strength or for the use of animals, while women take on those that require patience and attention to detail. Even in Betafo, where we met with an agricultural cooperative that does not accept men, the members rely on their husbands or on hired laborers to undertake heavy tasks that are not typically the responsibility of women. Children typically begin school at age six, and apparently stay there until about age fourteen; however some are probably missing school in order to work in the fields. The ABC activities are not expected to have any noticeable impact on this allocation of labor among household members.

Based on what we heard in our interviews, peasants in Vakinankaratra seem to be fairly purposeful in their use of increased revenues. In Manandona, they indicated that their earnings enable them to save for the lean period, either eating their own crops at that time or storing them to sell when prices are high and using the money to improve their standard of living. The president of the women's cooperative in Betafo said that the members use their increased earnings to invest in new activities and improve their nutrition. They are purchasing dairy cattle, which enables them both to eat better and to earn money by selling milk, yogurt, and cheese. Where possible they are expanding

their cultivation onto more fields, as well. The president is well aware of the riskiness of agriculture, and is encouraging her members to diversify their activities as much as possible so as to reduce that risk.

The state of the irrigation systems in some parts of Vakinankaratra may lead to conflicts over water. The infrastructure is in bad condition, making it difficult to control where water flows. There are water users' groups in some communities, whose mandate is to manage the allocation of water among the different fields to ensure everyone has access. However the state of the infrastructure means that there is not always enough water to go around. There are, as a result, cases in which peasants reroute the water flows to direct them to their own crops, taking the resource away from their neighbors in the process. The ABC's work on potatoes and onions depend on these irrigation systems. While they should not make these water allocation problems worse, the ABC staff should be aware of the possibility of such problems, and should strive to ensure that they do not keep project activities from being effective.

9.4 CONCLUSIONS

The impacts of ABC activities on the environment in Vakinankaratra are likely to be positive as often as negative. On the positive side, we may see decreased use of synthetic pesticide use, as peasants trained by CEFFEL begin using artisanal controls. The field agents should pay close attention to the activities in communities whose peasant leaders have been trained, and encourage them to apply these techniques as much as is feasible. On the down side, the cultivation of corn, and to a lesser extent the extension of rainfed rice cultivation, may lead to soil erosion if plants are grown on steep slopes. We recommend that the field agents pay close attention to where these activities are taking place, and introduce a wide range of soil conservation techniques in order to prevent erosion. Collaboration or training with BVPI or other projects working on erosion may be a good way for the field agents to become better acquainted with effective ways to safely cultivate on slopes.

Table 9.2 Environmental Impacts in Vakinankaratra

Impact	Source	Intensity	Duration	Spatial Extent	Frequency	Importance	Response
Potatoes							
Less use of synthetic pesticides	CEFFEL training provided by ABC only includes use of artisanal crop protection methods so growers may shift to this approach.	Depends on whether beneficiaries would otherwise have used synthetic pesticides	As long as synthetic pesticides are not used	Within the affected fields and villages	Ongoing as long as artisanal techniques are used	Could be high positive impact if pesticides were previously used in unsafe ways.	Field agents should follow up on CEFFEL training and encourage use of artisanal pest control products.
Less use of synthetic pesticides	Introduction of resistant potato varieties, if peasants are willing to grow them	Depends on whether beneficiaries would otherwise have used synthetic pesticides	As long as synthetic pesticides are not used	Within the affected fields and villages	Synthetic pesticides were used every few weeks, so improvement will be comparable	Could be high positive impact if pesticides were previously used in unsafe ways.	Field agents should encourage use of resistant varieties.
Onions							
Possible decreases in use of industrial agrochemicals	Training on use of artisanal pest control techniques and composting through CEFFEL	Depends on whether beneficiaries would otherwise have used agrochemicals	As long as synthetic pesticides are not used	Within the affected fields and villages	Ongoing as long as artisanal techniques are used	Positive impact will be only moderate, since onions are a new crop	Field agents could continue to encourage use of artisanal pest control methods and composting
Rice							
Soil erosion if rainfed rice cultivation spreads onto tanety, reduced fertility of tanety	Peasants who observe the yields from rainfed rice in plains of Betafo may decide to expand cultivation onto hillsides as well	Depends on slope of hillsides and agricultural practices	As long as hillsides are cultivated in unsafe ways	Depends on topography	Ongoing as long as slopes are cultivated	Probably low; it depends on success of rainfed rice on plains and peasants having the resources to expand cultivation onto hillsides. If	Field agents should meet with staff of BVPI or others working on soil erosion in the region to raise this possibility. They should also warn

Impact	Source	Intensity	Duration	Spatial Extent	Frequency	Importance	Response
						this occurs it will probably be beyond the duration of the project	peasants of the hazards of cultivating on slopes rather than plains.
Corn							
Soil erosion	Cultivation on steep slopes without adequate soil conservation	Depends on slopes and practices used	As long as slopes are cultivated	Depends on downstream topography	As long as slopes are cultivated	Moderate; scale of ABC activity is not large	ABC staff should train with BVPI or other erosion projects to make sure they are well trained in all techniques for preventing erosion; not only planting hedges.

CHAPTER 10. SYNTHESIS

The assessment of the ABIP activities and the visits to the six regions where the project is working have brought to light several areas in which ABC activities may raise some environmental concerns. Each of these is discussed in general terms in this chapter, synthesizing the observations from the six regional chapters. The last chapter of this report details the actions recommended in order to respond to each of the issues as they arise in different contexts.

10.1 CROP PROTECTION

Pests and disease will always be a problem in agriculture, and the ABC activities in Madagascar are no exception. The project has anticipated these issues, and has taken a proactive approach to addressing them. This has been thoroughly developed in the crop protection plan, the most recent version of which is included as an appendix to this report (Appendix 2). This plan sets out all of the detailed actions already taken or planned with regard to training in crop protection, integrated pest management, pesticide safety, and good agricultural practices (GAPS) for the ABIP subsectors. It also provides the schedule for other key actions, including providing the ABCs with Material Safety Data Sheets (MSDS) for all commonly used pesticides; inventorying Restricted Use Pesticides (RUPs) still in use by farmers; and the possibility of repeating some training if it proves necessary. The crop protection plan was developed with the express purpose of ensuring that the practices in place were appropriate and realistic given the constraints facing Malagasy farmers.

Because the ATABC staff have already worked extensively on ensuring that ABIP crop protection will avoid use of synthetic pesticides as much as possible, and will take necessary precautions when they are recommended, the SEA team did not have to place quite as much emphasis in this area as would otherwise have been needed. In general, the team found that project's approach is strong. It involves a series of steps:

- Use good agricultural practices that will strengthen plant resilience and reduce the need to apply artisanal or synthetic pesticides
- Use plant varieties that are less susceptible to known pests
- Use other integrated pest management techniques such as intercropping crops with plant species that will repel pests
- Emphasize the importance of protection of natural enemies of the pests
- Assess the actual extent and nature of the pest problems
- Treat plants or seeds with natural substances that are inexpensive and pose little risk to health or the environment, such as hot peppers, papaya leaves, neem, cow manure, and so on.
- Treat plants with synthetic agrochemicals only as a last resort and then, choose the least toxic products.

This approach to crop protection should address the several distinct risks posed by the use of agrochemicals:

- to human health, particularly if more toxic products are used and without the use of protective equipment and safe usage and storage practices are not followed. This includes specific risks to pregnant or nursing women and their infants, who may be more susceptible to low-level exposure than the people actually applying the products.

- to agriculture, if products are used excessively; this can lead to residues on the plants and to the development of resistant strains of pests and to the destruction of natural enemies of the pests. Poorly managed pesticide use can also harm grazing livestock, and may even harm humans if meat or dairy products are eaten.
- to the terrestrial and aquatic environment, with impacts on biodiversity, endangered species and other flora and fauna. These may be the result of poor choice of pesticides, i.e. persistent products, excessive pesticide use, accidental dispersal of chemicals being stored pending use, or poor management practices in use or disposal of chemicals and contaminated materials.

The project's major activity to ensure that these practices are followed has been and will be training of ABC staff, model farmers, and all beneficiaries. The training activities have been carried out (and will be carried out) by a number of different people; project staff, including both the main crop protection expert in the Tana office and the field agents, specialist consultants hired by the project, and other organizations with expertise in crop protection, including MAEP staff, private farms, and other agricultural training or research centers that work on contract to ATABC. The training courses are designed to emphasize a selection or all of the following steps:

1. Use of GAPs for each crop, so as to improve plant resilience to pests.

2. Precise identification of which pests are affecting the crops.

3. Regular field monitoring of pests to measure the actual and potential damage that the pests are causing. There is a tendency among those inexperienced with pest management to rush ahead with use of synthetic pesticides, when sometimes the actual harm being done is not great enough to warrant it. The training provided by the project is designed to emphasize the importance of not giving in to that temptation. There is also a tendency among agronomists and pesticide vendors to establish a routine schedule for preventive spraying with synthetic pesticides, irrespective of the level of pests observed. This temptation must also be resisted, and action taken only when pests are actually on the plants in sufficient quantity and when damage threatens the viability of the crop to warrant intervention. The ABCs do encourage preventive application of artisanal pesticides; this is an acceptable approach because they do not pose a risk to the environment.

4. When some action must be taken, the first choice is the use of artisanal products or mechanical means to get rid of the pests as much as possible, and when synthetic pesticides are necessary to choose the least toxic products.

5. Synthetic pesticides are used following the dose indicated on the label to control the pests. Along with the temptation to rush ahead to introduce synthetic pesticide treatments, there is also an instinct to think that if a little is good, more is better. This is not true of synthetic pesticides, as they pose risks such as the development of resistance by the pests and threats to human health. The importance of using them when necessary and at the recommended dose is therefore emphasized in the training programs.

6. The training course must emphasize the correct method of using pesticides because this is the least understood aspect of pesticide use and the most damaging to humans and the environment if improperly integrated. When pesticides must be used, the training courses work on how to do so safely. Among the techniques emphasized are:

- Wearing proper protective clothing. Given the cost of such clothes, the project sometimes recommends locally-available alternatives, such as putting thick or heavy plastic bags over the hands before touching the chemicals, wearing long pants and long sleeved shirts, a hat, shoes to prevent skin contact.
- Staying upwind of the spray, when a sprayer is being used and spraying early morning or evening when wind is at its lowest
- Washing oneself, the equipment, and other contaminated items at a safe distance from drinking water supplies
- Avoiding the use of pesticide containers for household uses
- Storing unused pesticides in a safe place beyond reach of children

7. When synthetic pesticides are used, the practice of alternating products should be introduced, so as to avoid the development of resistant strains of pests. The choice of products should be limited to those that can safely be used in Malagasy conditions and that comply with US safety regulations. Given the limited choice of synthetic pesticides in Madagascar, however, this practice is not always feasible.

Discussions with ATABC staff highlighted several limitations on the extent to which these recommendations can be implemented. Many of the GAPs, IPM methods, and monitoring techniques considered standard in the United States are presently not possible in Madagascar, for lack of knowledge, resources or trained field agents. The farmers do not have the money to purchase protective clothes, sprayers, or other items that make the use of pesticides both easier and safer. At present, they have neither the knowledge nor the resources to apply monitoring techniques that would enable them to determine exactly what pests are present and in what quantities before applying treatments, whether synthetic or artisanal and the level of proficiency of field agents do not permit them to assist farmers on these issues at the present time. The research has not been done to identify effective IPM techniques for many of the problems that plague Madagascar's agriculture. All of these factors combine to constrain the options available to Malagasy farmers at this time to protect their crops from pests.

Moreover, in many cases where synthetic pesticides must be used, the only ones available are on the USEPA's list of restricted use pesticides (RUPs), to be used only by or with supervision of a certified pesticide applicator.[1] There are no certified pesticide applicators who could supervise use of these products by Malagasy farmers, and there are no alternate pesticides available in the country. The project is not recommending the introduction of any pesticides that are banned or severely restricted in the United States, so this does not require an EIE in order to comply with MCC environmental guidelines. It also is not recommending the introduction of any pesticides that are banned or restricted in Madagascar. However the use of RUPs means that it is particularly important for farmers using synthetic pesticides to appreciate the risks involved, so as to avoid harm to themselves, their families and communities, and the natural environment.

The evidence gathered from our field visits, while necessarily anecdotal rather than representative, presents a mixed picture with regard to the actual content and impact of training. In some regions training is being carried out by agricultural organizations that are themselves committed to using artisanal approaches to pest control, and that cultivate the plants that they use for this purpose. In Nosy Be, for example, technicians from Tatie Cris Farm will be training farmers in production techniques and crop protection. They use mainly artisanal methods; this is one of their strong points

[1] Time did not permit the SEA team actually to determine which pesticides are being used in each region; information on use of RUPs comes from ATABC staff.

in selling vegetable to the hotels that are their main buyers. In Vakinankaratra, ABC model farmers have received training at CEFFEL, an agricultural research and training center that is similarly committed to using artisanal approaches to crop protection.

In some villages, however, it was not as clear that the training really emphasizes use of artisanal controls rather than synthetic pesticides. Elsewhere in Diana one farmer told us that he had been trained on pesticide use, but had not received any instruction on the use of artisanal controls – or "traditional" methods, as many people refer to them. (The fact that these are commonly referred to as traditional pest control methods is in itself unfortunate, as it suggests a bias towards "modern" synthetic chemicals.) The field agent accompanying us on that visit said that the training had been conducted by staff of MAEP in 2007 before ATABC, and it had included some discussion of artisanal controls, but the emphasis had been strongly on the use of synthetic pesticides. Moreover, the training or specific instructions in pesticide use generally includes preset treatment schedules, even for synthetic pesticides, rather determining the need for treatment based on the presence of specific pests. Some of the farmers who are using artisanal pesticides controls told us they would rather use synthetic pesticides, because it would be much less work, and they wished the project would provide them with such products. Most seemed to simply dismiss the possibility of access to any industrially produced agrochemicals as beyond their means, irrespective of what they might have preferred.

On the other hand, in a number of places farmers told us that they already use agrochemicals that they buy themselves, without any involvement of ABIP or the ABCs. This was the case among peanut growers in Menabe, potato growers in Vakinankaratra, and rice growers in Amoron'i Mania in 2007 before ATABC. In these cases the activities of the project did not include crop protection, or agrochemicals and training in their use were provided by the buyer of the crop. In general, these farmers seem to be doing preventive application of synthetic pesticides, and have not considered the possibility of using artisanal treatments instead. None of them had any protective gear, as they could not afford to buy it. Some indicated some awareness of appropriate safety practices, such as keeping themselves upwind of the product when applying it, and washing themselves and their equipment away from water sources after pesticide application. It was not clear to what extent they applied these practices, however. When we asked field agents or government officials about problems caused by pesticide use, they indicated that they had not heard of any illnesses or drinking water contamination, and seemed to assume that as levels of use are generally low, there probably had not been any problems. The director of FIFAMANOR, an agriculture research center in Vakinankaratra, said that when farmers buy pesticides on their own, they often use them in such low concentrations, in order to save money, that in fact they do not pose any risk either to their own health or to the health of the pests they are trying to eradicate. Unfortunately, this technique very effectively builds up resistance to the pesticides, so it is harmful rather than simply neutral.

Although such use is not an ABIP responsibility, ABIP has nevertheless an opportunity to have a positive impact with its own beneficiaries, whether or not synthetic pesticides are part of the subsector action plan. In this case, a more structured training session is called for, through which beneficiaries will learn about safe practices, the use of protective equipment and, where feasible, artisanal alternatives to synthetic pesticides. Additionally, ABIP training on artisanal pest controls in one subsector may encourage farmers to shift to them elsewhere, which would also be a positive outcome.

Given the timing of the project, the resources available, and the modest level to which the project itself is actually responsible for introducing new pesticide use, we must be equally modest in our recommendations for further action in this area. The project strategy, of encouraging artisanal pest management techniques before any synthetic pesticides are used is appropriate. In the context of

the crop management plan already being followed, this translates into paying close attention to the content of training offered by subcontractors hired by the project. MCA staff in Tana, should also make sure that trainers from MAEP or the various research organizations in the regions place emphasis on the use of artisanal methods that is intended by the project, and that the farmers do in fact receive this message.

Once training has been given, it seems necessary to follow up in more detail to ensure that farmers are applying what they have learned. While the ABCs cannot control what the farmers do, the ABCs can pay closer attention and provide reminders wherever the practices observed are unsafe for human health or the environment. Our recommendation, described in greater detail in the Environmental Management Plan, is that additional detail be added to the technical monitoring forms completed by the field agents, so that they collect additional information about what the farmers are actually doing. In doing so, ABC staff will have to follow up on crop protection practices and will be in a position to take action if needed.

10.2 EROSION AND CULTIVATION ON STEEP SLOPES

Soil erosion is a serious problem throughout Madagascar. Much of the country is characterized by steep slopes that are regularly cultivated or are burned to encourage growth of young grasses for livestock. These practices lead to extensive erosion which reduces agricultural potential of fields and leads to siltation of downstream rivers and irrigation systems.

It is not possible to precisely specify the percent slopes to be considered steep. The impacts of cultivation on soil erosion depends on many factors in addition to slopes; these include soil consistency, vegetative cover, volume and force of rainfall, and the shape and orientation of the slope. In some contexts a 5-10% slope would be considered moderate and 10-20% considered steep; in others a steep slope is more than 33% or even 50%. ABIP must rely on the judgment of the ABC staff in assessing whether erosion is a serious concern, based on their familiarity with agricultural activity throughout the region.

Erosion problems arise at many scales. Within the narrow valleys and steep slopes of Amoron'i Mania and the somewhat wider valleys of Vakinankaratra, the problem is local; downstream villagers know exactly where the sediment clogging their irrigation systems is coming from, and those cultivating on the slopes can see where their soil is going. The problem also arises at much larger scales. In Boeny and Menabe, sandy soil is carried over long distances to be deposited in the harbors of Mahajanga and Morondava and to clog the paddy rice in the plain of Marovoay and the Dabara canal system. This problem crosses regions, as well, as the deforestation of the mountain slopes of Amoron'i Mania and Vakinankaratra hurt those living across the border in Menabe.

The ABIP is working on several crops that often are grown on slopes and could, if carried out improperly, contribute to soil erosion. Corn is routinely grown on slopes too steep for other cultivation; it is among the subsectors targeted in Boeny, Atsinanana, and Vakinankaratra. Vegetables may also be grown on slopes. At present this is not a problem with onions in Amoron'i Mania or potatoes in Vakinankaratra, but some of the vegetable work in Diana is on sloped land, and it could become an issue elsewhere. Geranium is also grown on slopes rather than in valley bottoms, and thus requires attention to erosion.

Where this is already an issue, notably on corn in Atsinanana, the ABC field agents are encouraging the use of several techniques designed to both strengthen the soil and reduce erosion. These

include cutting the cornstalks immediately after the harvest and leaving them to decay in the fields rather than burning them, intercropping, planting hedges, and growing in live vegetative cover that stabilizes the soil. It is not clear yet how many villagers will actually adopt these techniques. They require additional work, which adds to the costs of production, and Malgache farmers are conservative with regard to adopting new and unfamiliar practices. The field agents are working on demonstration plots with some of the new techniques, which they hope will lead to adoption in the future.

In many regions ABC crops are not now being grown on steep slopes, but this could begin in the future. The field agents have a general awareness of techniques for minimizing the risk of erosion, but if they do begin working on crops that are cultivated on slopes, it will be useful to strengthen their knowledge. The ABC field agents are introducing simple agricultural techniques for managing erosion such as planting on contours, cultivating within live plantations, and growing hedges. More complex techniques, such as the digging of ditches uphill from the fields to capture surface water flow and the construction of wood barriers or gabions to stop the formation of lavakas, may also be of use where the problems are severe.

The introduction of more sophisticated techniques may be done efficiently by collaborating with other projects that focus specifically on soil erosion, so as to benefit from the complementarities among the different projects in a single region. The Programme de Lutte Anti-Erosive (PLAE) is active in Boeny and Amoron'i Mania, the Programme de Bassins Versants et Périmètres Irrigués (BVPI) is active in Boeny, Amoron'i Mania and Vakinankaratra, and the Projet de Défense et Restauration des Sols in Vakinankaratra all have considerable expertise with both mechanical and biological techniques for preventing soil erosion. The Office National pour la Nutrition is also working in several regions to deal with sedimentation of irrigation systems and prevent soil erosion. Where any of these projects is working in the same villages as the ABC, collaborating directly with them will be helpful in making the best use of available knowledge. Where they are not working in the same villages, as is more often the case, it may be useful for the ABC field agents to receive training from the other projects on the introduction of erosion management techniques. This is not needed across the board, but will be useful where the ABC staff are working with farmers cultivating particularly steep slopes, and in region where the formation of lavakas is a particular problem.

More narrowly, the livestock activities in Boeny could also contribute to erosion problems if they become more widespread or are not managed as well as they appear to be at present. Uncontrolled goats are likely to graze on plants that are now stabilizing hillsides and may have been planted precisely for that purpose. The MAEP strategy for preventing this appears to be to direct herders to keep their goats within enclosures all of the time; however our discussions suggest that this is not financially viable and herders will not comply with it. This does not appear likely to become a problem during the life of the current ABIP project because the number of goats is small and they are apparently well managed, but it may become more serious in the future. To head off that possibility, the ABC should ensure that all of the concerned actors in the region – the herders, MAEP, and the erosion control projects – are aware of the issue and communicating with each other about realistic ways to prevent grazing goats from destroying vegetation intended to stabilize slopes and prevent erosion.

While the interregional erosion problems go far beyond the scope of ABIP or ATABC activities, they are worth noting because MCA may be able to raise them at the national level. Government officials in Menabe cited the problems, referring to the burning of fields by herders in Amoron'i Mania (and perhaps Vakinankaratra) as the source of much of the sand that is clogging rivers downstream. While government officials in all three regions concerned acknowledged the problem, they all also

feel they cannot address it because their mandates only extend within the borders of their own regions. MCA, however, because of its national scope and because it is working in regions that are both causing and suffering from this erosion, may be in a position to raise it at the national level so that it does receive attention. Insofar as it is possible, we recommend that MCA use its national position and perhaps influence to raise the problem of erosion in cross-regional watersheds at the national level so that it can receive the attention it deserves.

10.3 AGRICULTURAL EXTENSIFICATION

One of the possible impacts of agricultural extensification in Madagascar is the loss of primary forest rich in biodiversity as it is converted to agricultural land. Most of the agricultural extensification in the six regions where the ABCs work is onto idle land, and involves clearing brush or secondary forest. Returning this land to cultivation could have implications for erosion, as people plant on steep slopes that is better left under natural vegetation. The issues this may cause are discussed above in the section on the erosion. However the return to agricultural use of previously cultivated land does not pose a threat to biodiversity, since overgrown land will not contain the same species mix as primary forests. Extensification into primary forest, on the other hand, will threaten the country's biodiversity; this risk is the focus of this section.

In Menabe, ABIP has had a positive impact on biodiversity. At the Baobab Alley site, ABIP has encouraged beneficiaries to grow lima beans instead of rice, whose flooded fields drown the baobab trees for which the region is famous. In Boeny, one ABIP village is on the border of a protected area - Andranomandevy adjacent to Ankarafansika National Park. Field agents are aware of this, and would not work with farmers if they were to encroach on the protected area (which at present they are not).

In two other regions, Atsinanana and Amoron'i Mania, agricultural extensification could threaten the remaining forest of particular biodiversity importance. Most of this is tropical rainforest in the corridor running north-south along the western edge of Atsinanana and into the eastern edge of Amoron'i Mania. This forest is not well served by existing roads, which is why it has not been destroyed. For the same reason, it is for the most part not near any ABC activities, as bringing agricultural produce to market from villages in those areas would be quite difficult. However, there are also some patches of forest that MEEFT is targeting for protection in Atsinanana, and such patches may exist in other regions as well. In addition, ANGAP and other organizations are managing protected areas in most of the regions that could be affected by ABC activities if agricultural extension occurs in adjacent villages.

Because neither MCA nor the ABCs has created a spatial data system showing the location of ABC activities, we could not overlay ABC villages with the locations of protected areas or the forest zoning plans being developed by MEEFT. A GIS of this type would be very interesting, but is not really necessary in order to determine whether ABC activities could pose a risk to biodiversity. The ABC staff knows where the protected areas are in their regions, and they know when their villages adjoin such areas. When that is the case, they should coordinate with the organizations managing the protected areas – usually ANGAP, though other organizations are also beginning to manage protected areas in Madagascar – to make sure the boundaries are clear and any extensification does not encroach on key forests or other vegetation. In all six regions, the ABC staff should meet with the regional office of Eaux et Forêts to determine whether there is a forest zoning plan that identifies other areas in which protecting the vegetation is important. We know this is an issue in Atsinanana; it could also be the case elsewhere. Wherever there are areas targeted for protection,

the ABC should either avoid working near (or in) them, or should ensure that their activities do not lead to extensification into sensitive areas.

10.4 CONSUMPTION OF WOOD BY DISTILLERIES

The ABCs are supporting the production of geranium oil in Amoron'i Mania and until 2007 they were supporting production of niaoli oil in Atsinanana. Geranium is also grown in Vakinankaratra, although at present it is not an ABC subsector. The distillation process for these plants raises several environmental concerns, one of which is the impact of use of wood fuels on forest resources. In Atsinanana, the environmental staff of MCA reported that one distillery was using one stere (cubic meter) of wood per day when in operation, and another was using 2-3 steres per day. Without knowing how many days per year the distillery operated, it is hard to know whether this placed a significant burden on fuelwood resources in the area. However this is moot; the prices for niaoli oil turned out to be too low for the activity to be economically viable, and it was discontinued.

In Amoron'i Mania, geranium distillation is likely to consume about 300 steres of fuelwood in the first year, although this may increase if geranium yields rise. This accounts for only 0.22% of total fuelwood consumption in the region, so it is not a major impact. However obtaining more specific information on how much wood is used, of which species, and where it comes from may be useful. If this rises in the future, collaboration between the ABC and projects engaged in reforestation may be of interest.

10.5 PLANT TRANSFORMATION

The transformation of plant matter – distilling for essential oils and fermentation for cocoa – can also have environmental impacts that require attention. As well documented by the MCA environment staff, niaoli distillation wastes in Atsinanana created a variety of concerns related to disposal of plant residues after distillation and channeling waste water out of the distillery so it did not contaminate local water supplies. At present the activity is not financially viable and has been discontinued, but it may resume.

In Amoron'i Mania the plant residues are not a problem. Geranium leaves can and are being composted, and this compost is highly sought by farmers near the distillery, as they do not have enough livestock to adequately fertilize their relatively nutrient-poor fields. The liquid waste which flows out of the distillery in some quantity is rich in organic matter; however the MCA environment staff felt this could safely be used for irrigation. The ABC staff should make sure that the distillery operators set up a hose or other system to do this, rather than allowing the effluent to enter surface waters and potentially a local water supply.

In Diana the ABC is working with the cocoa subsector in an effort to locate a buyer for high quality beans fermented and dried by the growers. At present there is no buyer, and there are no farmers working with the ABC in this subsector. Should this work out, questions may arise about the environmental impacts of cocoa fermentation. This does not appear to be a matter for concern, however. The beans are fermented and dried, and there is no physical residue that must be disposed of at the end of the process. A very small amount of liquid comes out of the fermentation tanks – a few liters per batch of 300 kilograms of beans, according to the director of RAMEX – so disposing of this on the ground does not appear to pose a problem.

As discussed in chapter 2, all industrial activity, even small-scale artisanal activities such as artisanal distillation and cocoa fermentation, is apparently required to obtain an operating permit from MECI under Law 99-021. Furthermore, any activity required to obtain such an operating permit is also required to carry out an EIE under MECIE. It would appear that these requirements have not been followed for any of these activities; in the case of cocoa fermentation, the activity began before the laws were passed. Because the activities have been initiated by their promoters, and not by ABIP, the project is not directly responsible for carrying them out. However, as ABIP is providing technical support to the activities, the ABC staff should follow up with the promoters to make sure they comply with the law and that the environmental impacts of such activities are taken care of before they become engaged with any transformation activities.

10.6 CULTURAL ISSUES

Gender

Gender issues can enter into the ABIP project in several different ways. There are fairly consistent divisions of labor in the communities targeted by the project, both within agriculture and in broader family responsibilities. Men typically do the heavy labor; digging, plowing, tilling, cutting trees to clear fields, applying pesticides, and anything involving animal traction. Women handle the tasks requiring meticulous attention and skill; planting seedlings, weeding, and hoeing. They also collect brush after men have cut trees, often assisted by children. Women are responsible for managing the home and children. In most villages, both men and women interviewed said that household decisions, particularly about expenditure and livelihood strategies, were made jointly, although in some cases one sex or the other had primarily authority in this area. While there are some exceptions to these patterns, such as in Amoron'i Mania where women have to do more heavy labor because men have often moved to the city to look for jobs, the patterns are fairly consistent across the six ABIP regions.

ABC staff are well aware of these divisions of labor. Broader cultural norms do mean that men are more active in public meetings and are more often the model farmers or the direct interlocutors of ABC field agents. Within the scope of specific ABIP interventions, however, ABC staff are ensuring that each group learns the techniques appropriate to its responsibilities. Thus they work with men on techniques such as construction of raised beds or erosion control, and with women on planting and weeding techniques for rice. This is as it should be. Everyone is well aware of the divisions of labor, and neither gender would feel it appropriate to learn new techniques for activities carried out by the other. Thus misunderstandings about gender roles in agriculture will not constrain the success of ABIP activities. Where there are exceptions to the customary gender-based division of labor – as, for example, in the case of women-headed households – it is essential for those who actually carry out each task to be trained in new techniques, to be ensure that those who need the training receive it, irrespective of gender.

In a broader sense, changing gender roles in the targeted villages is not the major thrust of the project. For example, while they encourage women to participate in group meetings – as the SEA consultants did in the course of our work – they do not invest significant amounts of time specifically in bringing women in. In some villages visited by the SEA team only men came to the meetings, while in others both genders were equally represented. Even when women were present, though, they sometimes – though certainly not always - were more reluctant to speak than men. In the village where we were accompanied by a female ABC field agent, the village women were more outspoken than usual, although some of the very outspoken women were in villages with male field

agents. It is important for the field agents to continue encouraging women to participate in community meetings, to ensure that their role in both community and household decisions is factored into the design and implementation of project activities.

In a few places there are women's organizations separate from the non gender-specific cooperatives and organizations. In Vakinankaratra, for example, we met with the president of a dynamic cooperative of female farmers. The ABC is happy to work with them, as they are enthusiastic and interested in the assistance that the project can provide. However the ABC is not explicitly encouraging other women to form similar organizations above and beyond work on the development of non gender-specific groups. Similarly, the project is not attempting to make changes in gender roles within the household, to encourage men to take more responsibility for children or home management or to shift the balance of influence in household decision-making. We consider this appropriate, in light of the fact that ABIP is an agricultural marketing project, not one whose primary purpose is to change social relations at the village level.

A third gender consideration is much more specific than the first two. Because women bear and nurse children, they may be more susceptible than men to the possible health impacts of the misuse of pesticides. In the training on pesticide use and management, this must be made clear, emphasizing that the risks posed are not only to the men actually applying the chemicals but also to others who may be working in the fields at the time or from exposure to products stored in the homes. Although the ongoing training may include this issue, it should be made explicit in the crop management plan, to ensure that it does not slip through the cracks.

Impact of Increased Incomes

The overall aim of ABIP is to increase rural incomes. Any assessment of the environmental and social impacts of the project should consider how that money will be used, and how spending decisions may affect the environment or human development. To that end, the SEA team regularly asked questions about how increased income would be used. The responses should be considered only anecdotal, for many reasons. The question was often perceived as odd, which may have led to unreliable responses. We could not actually get expenditure figures, and people may in fact spend their money in quite different ways from how they think they are spending it. To the extent that we did get interesting responses, they have more bearing on standard of living or social conditions than on the environment. In the long run, if projects like ABIP improve living standards, the most important environmental impacts may come from the changes in consumption patterns that result from increased incomes. Richer people often shift from fuelwood to charcoal as a cooking fuel, with significant impacts on forests. If they are able to purchase motor vehicles, this will have impacts on air quality. More importantly, it will lead to demand for good roads, which can in turn lead to changes in development patterns, land use, forest use, and many other things. These kinds of changes go far beyond what can be predicted from a few simple interviews in a handful of villages, though in the long run they may be the most important impacts of the project on the environment.

The social impacts of increased expenditures varied, to some extent by region. In many parts of the country, respondents indicated that expenditure decisions went first to improved nutrition. Local public officials mentioned that small groceries were springing up in villages, suggesting increased spending on food that could not be produced by the farmers. Then it was put into livestock purchases, as a business investment or indicator of wealth and social status, or into improvements in their housing, to improve standard of living. In some communities people reported purchasing school supplies for children, though few mentioned spending on the boarding costs required for their children to continue their educations beyond primary school. Aside from livestock purchases,

there were few mentions of expenditures on agricultural implements or other inputs to increase agricultural output. In general, however, these are expenditures that foreigners or outsiders would consider desirable, in that they improve health and perhaps education, and may improve the chances for children to have easier lives than their parents.

Some expenditures will improve the quality of life, but may not necessarily contribute to "development," depending on how that is defined. Foam mattresses are popular in Menabe, as they are much more comfortable than traditional ones. Clothes and kitchen items are popular in many parts of the country. In several regions men use the money to buy bicycles, which seemed to be perceived more as a convenience or pleasure than as a way to bring items to market or in other ways contribute to increased incomes. Radios are also frequent purchases. All of these clearly make life more comfortable or enjoyable, without necessarily improving well-being in the long run the way food and education do.

On the other hand, in Boeny and Diana many people indicated that increases in income would largely go for parties and feasts, for exhuming deceased relatives, or for visits to distant family. In those regions, a number of people suggested that there was an ethos of "life is easy, the sun is shining, there's lots of fruits on the trees – why work hard?" So increases in income went less into making permanent improvements in lifestyle, and more into short-term pleasures. It goes well beyond the scope of the project – especially as it is a project aimed at furthering free market activity in agriculture – to suggest that people's preferences in use of their own earnings are not furthering their own development; the ABCs instead will simply have to accept such uses of increased incomes.

10.7 CUMULATIVE IMPACTS

One of the cross-cutting themes that runs through any strategic environmental assessment is the possibility of cumulative impacts that are greater than the sum of any of the individual consequences of the project. In carrying out the field work for this SEA, the team has carefully looked for such impacts, between subsectors within a region and across regions.

We have not found them. In a few specific sites it is possible that cultivation of one project crop on slopes might cause erosion that affects the fields on which another project crop is being grown; however this combination of impacts will be no different from siltation of crops that are not being grown with ABC assistance. There is a slight possibility of complementary between the objectives of beekeepers and geranium distillers in Amoron'i Mania, if the distillers were to engage in reforestation to replace the fuelwood they consume. However this is unlikely; the fuelwood consumption is low at present and distillers are not under any obligation to reforest.

Cumulative impacts could also occur if the impact of a single subsector was greater because, say, 20 villages are involved instead of only 5. This also is not the case. The villages are not close to each other so the possible environmental impacts of one have no bearing on the impacts of another. Nor are there significant economies of scale to be achieved by responding to several environmental impacts at once. Overall, therefore, there are no significant combined impacts of ABIP activities.

On a much larger scale, there are combined impacts across the regions of Menabe, Amoron'i Mania and Vakinankaratra, but these go far beyond the activities of ABIP. As already discussed, the agricultural practices of Amoron'i Mania and Vakinankaratra are contributing to significant sedimentation problems downstream in Menabe. Those practices are occurring in the western

portions of the highlands; these are not the areas where ABIP is active. Thus while these interregional impacts are important, they are not connected with ABIP.

CHAPTER 11. ENVIRONMENTAL MANAGEMENT PLAN

This report has identified aspects of the current or anticipated activities of ABIP that may have important negative or positive impacts on the environment, as summarized in the previous chapter. This chapter discusses those impacts in turn and specifies the measures recommended to mitigate them, the schedule for implementation of those measures, the designation of responsibility for implementation, and the expected outcomes. At the close of the chapter, a table is presented that summarizes the tasks involved in carrying out this environmental management plan, indicating who is responsible for each task and specifying timing. This table is accompanied by an operational checklist for the ABC staff to consult in implementing the EMP.

11.1 CROP PROTECTION

IMPACTS

From the outset of the ABIP activities, the potential threats to human health and the environment from the improper use of synthetic pesticides for crop protection have been recognized as a critical concern. This has been addressed by the project in several ways. First, and most importantly, the agricultural practices introduced throughout the project are based on GAPs for the crops; use of raised beds for vegetables, planting rice seedlings in rows, thinning seedlings as they grow, use of improved seed for corn and other crops, introduction of fertilizer where it had not been used before, and other techniques. All of these strengthen the plants, enabling them better to resist the impact of predators even without use of pesticides of any sort.

In addition, the project has undertaken an ever-expanding set of activities specifically intended to ensure appropriate selection, use, handling, and storage of pesticides, set out in the Crop Protection Plan.

Still, the pesticides are not always used properly by the project beneficiaries. Their practices derive from activities, attitudes and beliefs that preceded and continue independently of ABIP. Rolling back these precedents makes any program of proper pesticide management a challenge. Moreover, the poverty of the project beneficiaries means they cannot afford to implement many of the practices recommended by the Plan. To have an effect, the message of safe pesticide use must be repeated and reinforced. The Crop Protection Plan being implemented by the ATABC project is the essential instrument in the effort to protect human health and environment while also offering farmers the benefits of a measured program of crop protection. The Crop Protection Plan includes several options for farmers in improving crop management and crop protection practices. Though many cannot be introduced at this time, they are included for future reference as crop management is improved amongst beneficiaries.

EMP RECOMMENDATIONS

To support the implementation of the Crop Protection Plan, the ABC staff should monitor pesticide use by beneficiary farmers in the field, assess whether appropriate safety and environmental protection measures are being applied, and reinforce the training, if needed. The monitoring and evaluation of pesticide use by program beneficiaries should be conducted on a systematic basis as part of the routine monitoring and evaluation (M&E) already being implemented by the ATABC program. Currently, M&E data collection by field agents includes a technical tracking sheet about

project beneficiaries, completed when innovations recommended by the project are introduced .. To date this technical tracking sheet has not included detailed questions on pesticide use. It should be complemented by questions related to

- what substances are used
- how much (or what concentration) is used in each application

With time and most likely as soon as one year from now, additional questions could be included with further introduction of IPM practices. At present, the only IPM practice being used is the application of artisanal products and this point would be covered by the above mentioned questions.

The objective of collecting this information is to ensure follow-up of the training provided through the Crop Protection Plan. If pesticides are improperly used, the ABCs should follow up with remedial training (to reiterate messages of proper pesticide use conveyed in prior training), ongoing education and advice to targeted farmers, and/or demonstrations *in situ*. The scope of these activities could be broad (larger groups of farmers) or narrow (targeted at selected farmers known to apply improper practices). In either case, model farmers should be incorporated into any such remedial training in order to provide a continued means for conveying the necessary information and advice to beneficiaries.

In addition to these ongoing activities, field agents should be encouraged to flag observations of significant and improper pesticide use and to communicate this to the regional coordinator at the level of the ABC, and to the production team at ATABC in Tana. Remedial actions such as further training with the entire group of beneficiairies or with specific individuals, will be taken following the analysis of the situation and discussion with MCA

Finally, it is useful to reinforce the importance of using artisanal pest management techniques before synthetic chemicals. To this end, close attention should be paid to the content of the training offered by organizations hired by the project to conduct this training. The ATABC program should verify that these training activities do place the proper emphasis on natural methods preferred by the ATABC program and that farmers receive this message effectively. This message should be further emphasized by ensuring that the ABCs maintain a collection of updated MSDS sheets, to ensure that they are aware of the risks of the synthetic pesticides available in Madagascar and of the procedures that must be followed when using them. The present collection of MSDS sheets has been compiled by the pesticide expert at ATABC. An update of these sheets will be necessary eventually (every 3 years should be sufficient) and taken in charge by the coordinating body of the new ABC structures.

DESIGNATION OF RESPONSIBILITIES

ATABC's lead pesticide expert currently provides the technical leadership in the development and implementation of the Crop Protection Plan. The program's M&E specialist will take the lead in modifying the tracking sheets. Field agents will provide the information on technical tracking sheets on an ongoing basis. In addition, they should report any major incidents or problems observed in the field on a real-time basis. The RTSO (responsable technique et socio-organisationel) and the regional coordinator will review all of the data. With the pesticide expert, the RTSO and regional coordinator will define remedial actions needed to respond to problems identified.

IMPLEMENTATION SCHEDULE

The technical tracking sheets should be revised immediately to incorporate questions on pesticide use by program beneficiaries . These tracking sheets are completed following the introduction of innovations in farming activities, and should be introduced as soon as they are available.

EXPECTED OUTCOMES

The proposed mitigation will reinforce the implementation of the Crop Protection Plan through systematic monitoring, evaluation and response geared to pesticide use by beneficiaries. It is anticipated that these measures will help the program promote appropriate pesticide use and crop management methods, further introduce innovative crop management and protection methods, such as IPM, and trigger progressive or remedial training or other actions where necessary. As a result, it is expected that greater protection of human health and environment will be realized at the same time that ABIP goals are being realized.

11.2 EROSION AND CULTIVATION ON STEEP SLOPES

IMPACTS

Cultivation on moderate and steep slopes is a significant cause of soil erosion throughout Madagascar, leading to reduced soil fertility, the siltation of rice paddies and reduction in water quality. When ABIP activity appears to pose such a risk, as in Atsinanana, the ABC field agents are offering some techniques for minimizing the risk of erosion. Strengthening their knowledge through collaboration with other projects working on erosion is recommended. In addition, erosion can result from livestock activities; although these play a small role in ABIP, attention to potential impacts is recommended.

EMP RECOMMENDATIONS

Several existing efforts to prevent soil erosion that are underway could serve as training and knowledge resources for the ABC field agents and ultimately for lead farmers and others in their communities. The Programme de Lutte Anti-Erosive (PLAE) in Boeny and Amoron'i Mania and the Programme de Bassins Versants et Périmètres Irrigués (BVPI) in Amoron'i Mania and Vakinankaratra have considerable expertise with both mechanical and biological techniques for preventing soil erosion. The Office National pour la Nutrition is also working in several regions to deal with sedimentation of irrigation systems and prevent soil erosion. Where any of these projects is working in the same villages as the ABC, collaborating directly with them will be helpful in making the best use of available knowledge. Where they are not working in the same villages, as is more often the case, it may be useful for the ABC field agents and also, if possible, model farmers to receive training from the other projects on the introduction of erosion management techniques. This is not needed across the board, but should be considered where the ABCs are working with farmers who have to cultivate on particularly steep slopes.

As with the crop protection activities, it will be useful for the technical monitoring forms completed by the field agents to include a question that flags the presence of cultivation on steep slopes where erosion is a risk and that identifies any erosion control mechanisms used or to be used. This information is best collected when beneficiaries are initially selected. It will be used to determine whether additional training of ABC field agents is required, and to keep track of project impacts on the environment.

With respect to the livestock activities in Boeny, the ABC should ensure that the herders working with the project, the staff of the various erosion control projects, and the appropriate MAEP personnel are coordinating to ensure that goats do not cause harm to vegetation. If problems do arise, the stakeholders should collaborate on a choice of strategies; keeping the goats in enclosures, fencing in some susceptible vegetation, ensuring that goats cannot wander unchecked, or negotiating agreements with farmers who want the goats to eat crop residues because of the fertilization provided by manure.

DESIGNATION OF RESPONSIBILITIES

The ATABC M&E specialist and the ATABC production team will revise the technical tracking sheets to incorporate the new questions. The field agents will collect the data, which will be reviewed by the RTSO. He or she will determine whether it is useful to seek specialized training for the field agents from other projects working in this area. If so, the s/he will propose the training program, drawing upon expertise from existing anti-erosion efforts in the same locations where possible.

Regarding the possibility of livestock harm to crops in Boeny, the ABC director should maintain contact with the other stakeholders so as to be aware if this is a risk. If it is, the RTSO with the collaboration of the ATABC regional coordinator should facilitate coordination among the stakeholders to determine the best solution.

IMPLEMENTATION SCHEDULE

The technical tracking sheets should be revised as soon as the EMP is approved. The revised tracking sheets should be employed with new beneficiaries at the time of their inclusion and with existing beneficiaries who are cultivating on steep slopes during the next round of M&E data gathering by field agents. In Boeny, the communication with other stakeholders should occur at once, and should be repeated at least three times a year to flag any changes in the situation.

EXPECTED OUTCOMES

By incorporating queries related to cultivation on steep slopes into the technical tracking by field agents, an immediate opportunity is created for sensitizing field agents to the need to pay attention to the possible adoption of erosive practices. In this respect, the proposed measures potentially have a beneficial, preventive effect since these field agents can engage project beneficiaries on such practices before they occur. If and when cultivation on steep slopes does occur, field agents can be armed with better information and technical resources to provide relevant advice and training to the involved farmers. As such, the field agents can become a means for helping to reverse erosive cultivation practices.

11.3 AGRICULTURAL EXTENSIFICATION

IMPACTS

The extensification of agriculture could generate new erosion, or may involve encroachment on important reserves of primary forests and biodiversity resources. The erosion problems have already been discussed in section 11.2; if farmers plan to bring more land under cultivation, field agents must encourage them to do so on land that will not pose those risks. Encroachment into areas of key biodiversity implies a significant and probably long-term, if not permanent, loss of these unique resources. Accordingly, it is critical to avoid any such loss. While most extensification

prompted by ABIP activities will be onto idle land that was previously cultivated, some of it may occur in the vicinity of protected areas or special forest zones that should be kept off limits to such encroachment.

EMP RECOMMENDATIONS

The first critical step in keeping ABIP activities from encroaching upon critical natural resources is to establish clearly the location of these activities relative to the location of protected areas and special forest zones. This knowledge should be formally incorporated into the M&E data compiled by the ATABC project. A one-time query should be incorporated into the M&E data gathering efforts to determine whether any current beneficiary parcel lies within five kilometers of any protected areas or special forest zone. (As any new parcel is included in the project, comparable location information should be obtained.) All parcels falling within the established distance would be assigned to a "watch list" of parcels. At present ABIP is working near only two protected areas, Ankarafansika National Park in Boeny and Baobab Alley in Menabe, so obtaining this information will not be an onerous task.

In addition, the ABC directors should routinely confer with the regional offices of Eaux et Forêts and with the DRDR to keep abreast of ongoing activities that may lead to designation of new SAPM protected areas or zones targeted for conservation. Whenever a targeted zone adjoins or is within a protected area, the ABC staff must collaborate with the organization managing that protected area to make sure ABC activities will not have any negative impacts.

Insofar as possible, the ABC should avoid working adjacent to or within protected areas or zones targeted for conservation. If there are overriding factors that make it necessary or desirable to work in such areas, the ABC staff, in collaboration with the manager of the protected area, must verify that any newly cultivated areas are not encroaching on land that must be protected. The director should report to MCA on his contacts with Eaux et Forêts, the DRDR, and any organizations responsible for new protected areas. Needless to say, the project may not provide any support to farmers who are actually cultivating within protected areas.

DESIGNATION OF RESPONSIBILITIES

ABC regional directors should maintain contact with ANGAP, Eaux et Forêts, and the DRDR to be aware of the locations of all protected areas and zones targeted for conservation. The ABC staff should coordinate with the managers of the protected areas if needed. The ATABC M&E specialist is responsible for incorporating a location query in the technical tracking sheets. Field agents will gather the required location information for each new parcel when beneficiaries are selected and for existing parcels located in close proximity to protected and other special areas.

IMPLEMENTATION SCHEDULE

Data gathering instructions should be prepared immediately by the ATABC M&E specialist for field agents to identify the location of all current beneficiary parcels relative to current and anticipated protected areas and special forest zones. Location data will be compiled by field agents with regard to existing beneficiaries immediately and with regard to new beneficiaries as the latter are selected. If ABC directors are not already aware of forest zoning plans or plans to create new protected areas, they should confer with the appropriate agencies in the regions immediately. Coordination with the managers of protected areas, if needed, will be ongoing.

EXPECTED OUTCOMES

The measures required under this EMP provide the means to avoid the extensification of parcels participating in ABIP that would result in encroachment on protected areas and special forest zones. Safeguards will be established several ways. Coordination between ABIP management and staff and the authorities responsible for protected areas and other special areas is the primary means of organizing efforts to avoid or deter possible encroachment. This coordination will be informed and supported by the proposed additions to the monitoring system, which will also sensitize field agents and regional coordinators to the need to avoid working with parcels that fall within critical proximity of such areas and zones.

11.4 CONSUMPTION OF WOOD BY DISTILLERIES

IMPACTS

Deforestation, in part attributable to high fuelwood demand, is a significant environmental problem in Madagascar. The SEA team did not find the current magnitude of fuelwood use by ABIP-supported distilleries (for geranium leaves in particular) to be significant. Nonetheless, because deforestation is such an important problem for the country, the use of fuelwood by the distillers should be subject to some oversight, so as to at least to determine if there are any viable alternatives to unsustainable practices. In this respect, firewood use by distilleries deserves scrutiny in the environmental management focus of ABIP. Certainly this conclusion is even more compelling if there are any tendencies in ABIP to scale up the distillation processes using firewood.

EMP RECOMMENDATIONS

The quantity of wood used in distillation is a linear function of the quantity of leaves harvested and distilled. An increase in wood use will therefore be immediately obvious if the output of this industry increases, so special monitoring of the quantity of wood use is not needed. If the distillation activities increased greatly in scale, they would come under the jurisdiction of MECIE and would require a PREE; however this seems unlikely.[1] However, it is possible that modest increases in wood use could create local shortages of specific species, or harm activities that depend on other uses of the trees (such as beekeeping), in which case the ABC may wish to encourage distillers to seek alternate energy sources, to use more efficient equipment, or to contribute to reforestation efforts in the area.

DESIGNATION OF RESPONSIBILITIES

If the output of the industry increases substantially, the ABC director will review these recommendations to assess whether mitigation measures are necessary.

EXPECTED OUTCOMES

Firewood consumption by distillers will continue but at levels that do not distinguish this subsector as a major contributor to deforestation in the ABIP regions.

[1] A PREE would be required if wood consumption exceeded 150 hectares of forest per year. At current levels the SEA team estimated it at less than one hectare.

11.5 Distillation, Fermentation, and Other Processing

Impacts

Liquid and solid residues from processing of agricultural output could pose threats to human health, environmental quality and natural resources. The SEA considered the possible impacts from distillation of niaoli and of geranium leaves and the fermentation of cocoa. As noted elsewhere in this report, only the distillation of niaoli appeared to pose problems, especially related to the management of solid wastes. Because this subsector is not currently financially viable and has been suspended under ABIP, the concerns are moot at this stage.

Nonetheless, it is possible that this activity may resume, or that new agricultural products could be transformed through future ABIP activities. Moreover, it appears that all of these activities may be required to have industrial operating permits under Law 99-021, and to carry out EIEs under MECIE. If this is in fact how Law 99-021 is being applied, then ABIP must be sure that the promoters of these activities are in compliance, or they should cease to collaborate with them.

EMP Recommendations

If a new transformation process is to be introduced, an EIE should be conducted if required by law by an individual who is experienced in the essential oils subsector and the management of its wastes. Regardless of whether the law requires an EIE, feasible mitigation measures should be proposed to the extent practicable. If niaoli activities resume, attention should be put on managing excessive wastes.

The ABCs must determine whether Law 99-021 and MECIE have been followed by the promoters of these activities prior to working with them (or at once, if work has already begun). MCA should seek the advice of the Ministry of Environment, Water and Forests, and Tourism to determine exactly how Law 99-021 is being applied to small artisanal industries, to determine whether in fact these procedures are required.

Designation of Responsibilities

MCA, with assistance from ATABC if needed, should consult with the Ministry of Environment, Water and Forests, and Tourism to determine how Law 99-021 is being applied in this case. If in fact industrial permits and EIEs are required, then ABIP should not collaborate with any operators who have not followed these procedures. When an environmental review is not required, ABC staff, under the direction and supervision of the ATABC production team, will ensure that appropriate waste management practices will be implemented and observed.

Implementation Schedule

The review will be implemented on an as-needed basis. It must be completed prior to the adoption of the new process.

Expected Outcomes

One or more new processes may be proposed for integration into the activities supported by ABIP but since these are undefined at this stage, possible impacts cannot be known. Instead, a review will be required at the time any new process is proposed. This approach offers environmental oversight commensurate with the expected impacts, namely that significant impacts will require mitigation

and monitoring. We believe that this approach is prudent because it provides adequate safeguards for the environment without unduly hindering the adoption of promising agricultural processing approaches.

11.6 One-Year Review of EMP

One year after the EMP is initiated, a review of the Plan and its effectiveness will be conducted. This review will be performed by MCA environmental staff. The review will evaluate the following issues:

- ABIP's compliance with the requirements of the Plan
- Adequacy of the Plan's measures to provide sufficient environmental protection for the impacts identified in the Plan
- Completeness of the scope of the Plan to identify all potential, significant impacts
- Other issues for review may be deemed appropriate by the stakeholders.

In the event that compliance with the Plan is incomplete or any of the Plan's measures are inadequate for the task of mitigating significant risks, corrective actions will be defined and adopted to redress these shortcomings. The corrective actions should be in place within one month after the completion of the internal review.

In the event that the Plan is deemed incomplete in its scope, the Plan will be revised and augmented to recognize any missing significant impacts and to propose mitigation measures to address them. Revisions to the Plan should be finalized and the revised Plan in implementation within one month after the completion of the internal review.

11.7 Monitoring EMP Implementation

The responsibility for monitoring the implementation of the EMP lies with MCA, as does responsibility for over monitoring of ABIP activities. The ATABC project will assist with this monitoring as needed, by providing the data with which to carry it out. Developing the details of this aspect of the project M&E system will be part of the implementation of the EMP.

11.8 Summary and Operational Checklist

On the following pages, tables providing a summary of the tasks to be implemented under the EMP and an operational checklist of actions to be consulted by the ABC staff are presented.

Table 11.1 Summary of Environmental Management Plan

Source of Impact	Task	Who is Responsible	When	Level of Effort	Regions Affected
Crop Protection	Implement crop protection plan	ATABC pesticide specialist, ABC staff as set out in the crop protection plan	As set out in the crop protection plan.	Part of ongoing work	All regions.
	Modify M&E tracking sheet to include pesticide questions	ATABC M&E specialist with input from ATABC pesticide specialist	Upon EMP approval	5 days	All regions.
	Fill in M&E tracking sheets	ABC Field Agents	Concurrent with other M&E data gathering; this is done during the course of the season following introduction of project innovations and at the end of each cropping season	Several days per crop season per field agent (for all tracking sheet work combined, not for this question) depending on the type and number of innovations introduced	All regions.
	Recommend corrective actions if any	RTSO & ATABC pesticide specialist	Ongoing	1 day per crop season	All regions.
	Transmit recommendations to beneficiaries	Field agents or specialized experts	As needed	Part of ongoing work	All regions.
	Verify that all training emphasizes use of artisanal controls prior to synthetic pesticides	ATABC pesticide specialist	As needed	1 hour per training course	All regions.
	Update of MSDS sheets	The structure that will replace the ABCs after the end of ABIP	Every 3 years	3 days to contact on pesticide companies for product lists and MSDS of newly introduced products to Madagascar	Task carried out centrally; data sheets distributyed to all regions.
Erosion and Cultivation on Steep Slopes	Modify M&E tracking sheet to include questions about cultivation on steep slopes	ATABC M&E specialist	Upon EMP approval	3 days	Task carried out centrally.
	Fill in revised M&E tracking sheets	ABC Field Agents	For new beneficiaries: at selection. For existing beneficiaries: concurrent with other M&E data	Several days per crop season per field agent (for all tracking sheet work combined, not for	All regions

			gathering.	this question) depending on the type and number of innovations introduced	
	Review data and determine whether additional training on soil conservation techniques is needed	RTSO	Ongoing	Following tracking by field agents, 1 to several days per crop season	All regions.
	Organize training	RTSO, ATABC coordinator	As needed	1 day per training	Central organizational responsibility.
	Carry out training	Formal trainer assigned by the ATABC production team	As needed	1-2 days per training, depending on length of course and prep time needed	Regions in which training is needed.
	In Boeny, coordinate with herders, erosion control projects and MAEP regarding harm to vegetation caused by goats.	ABC director	Immediately, and three times per year thereafter.	Half day three times per year	Boeny
	If goats pose a risk to vegetation, facilitate coordination among stakeholders to choose appropriate solution.	RTSO	When needed, if it is.	1-2 days when needed	Boeny
Agricultural Extensifica-tion	Identify locations of all protected areas or zones targeted for conservation in the region, by conferring with DRDR, Eaux et Forêts, ANGAP, and other organizations if needed. Inform MCA/Env of any changes in protected areas in the region.	ABC directors	Confer with other stakeholders immediately. Stay routinely informed about ongoing activities in the region to remain aware of any new proposed protected areas.	One day immediately; remaining up to date will be the result of routine contact with DRDR and other stakeholders.	All regions
	Insert question in M&E tracking sheet for individual beneficiaries to identify parcels within a specified distance of protected areas.	M&E specialist	Modify sheet immediately	3 days for M&E specialist	Central responsibility
	Identify beneficiaries within specified distance of protected areas	Field agents enter the data. RTSO and regional coordinator review it.	Once for each beneficiary at the start. Once for each beneficiary for each crop season	3 days for field agents and 3 days for regional coordinator	All regions complete the sheet; however proximity to protected areas is only expected

				Several days per crop season per field agent (for all tracking sheet work combined, not for this question) depending on the type and number of innovations introduced	to be an issue in Menabe and Boeny.
	Coordinate with managers of protected areas as needed.	ABC staff	Ongoing	1 day/year per village near a protected area	All regions
Consump-tion of Wood by Distilleries	If output increases substantially (by more than four times current levels), assess whether action on fuelwood use is needed.	ABC directors	When (or if) output increases by more than four times current levels.	1 day	Atsinanana and Amoron'i Mania
	If action on fuelwood use is needed, design and carry it out.	ABC director, RTSO and ATABC regional coordinator	If needed.	1 month	Atsinanana and Amoron'i Mania
Distillation, Fermenta-tion and Other Processing (Waste Manage-ment)	Consult with the Ministry of Environment, Water and Forests, and Tourism about implementation of Law 99-021.	MCA lawyer	Immediately	5 days	Diana, Atsinanana and Amoron'i Mania
	If new plant processes are proposed or niaoli is resumed, carry out an EIE if required by law prior to work on the subsector.	Entrepreneur/promoter	As needed	1 month	Diana, Atsinanana and Amoron'i Mania

Table 11.2 Operational Checklist for ATABC Staff

ABIP Timing	Source of Environmental Impact	Action by ABC Staff	Action completed	Completion confirmed by compliance monitor
At New Beneficiary Selection and of New Targeted Zones	Cultivation on Steep Slopes	Identify cultivation on steep slopes. Identify erosion control mechanisms used and/or needed. Field agents encourage the use of best management practices.	☐	☐
	Agricultural Extensification	Determine if proposed targeted zones are in close proximity of protected area or zones intended for conservation. Field agents encourage the use of best management practices.	☐	☐
At Subsector Selection	Crop Protection	Identify subsector-specific appropriate pest management methods.. Field agents encourage the use of best management practices.	☐	☐
	Distillation, Fermenting and Other Processing	Determine whether new processing will be initiated. If so, conduct environmental review. Field agents encourage the use of best management practices.	☐	☐
During Implementation of Supporting Activities	Crop Protection	Complete M&E queries related to pesticide use by beneficiaries on targeted crops. Determine remedial training, if necessary. Field agents encourage the use of best management practices.	☐	☐
	Cultivation on Steep Slopes	Identify cultivation on steep slopes. Identify erosion control mechanisms used and/or needed. Field agents encourage the use of best	☐ ☐	☐ ☐

		management practices.		
	Agricultural Extensification	Identify protected areas and zones in consultation with regional authorities. Determine if participating villages/parcels are in close proximity of protected area or zone. Coordinate with regional authorities regarding ABIP activities in/near protected areas and zones. Field agents encourage the use of best management practices.	☐ ☐ ☐	☐ ☐ ☐
	Consumption of Wood by Distilleries	Monitor scale of wood use by participating distilleries. Field agents encourage the use of best management practices.	☐	☐
	Distillation, Fermenting and Other Processing	Advise distilleries on proper management of liquid effluent and solid wastes. Field agents encourage the use of best management practices.	☐	☐

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APPENDIX 2. INDIVIDUALS INTERVIEWED

OVERALL

Ms. ANDRIANARISOA Miadanahanta, Consultant, MCA Cellule Environnement

Ms. CHIASSON Hélène, Production Expert, ATABC, Chemonics International

M. PELLETIER Daniel, ATABC Chief of Party, Chemonics International

Ms. RASOANANDRIANINA Lalanirina, Consultant, MCA Cellule Environnement

Mme RAHARIMALALA Voahangy, Chef d'Unité Système d'Information Environnementale, ONE

Mr. SCHROEDER Alan, International Environment, Agriculture, and Biodiversity Consulting Services (MCC Pesticide consultant)

AMORON'I MANIA

Ms. HAJARILALA Volomboahangy, Paysan Leader, Présidente Association Morabe, Ambondromisotra.

Mr. RAKOTOARISOA Patrick, Agent technique Chemonics, Ambositra

Mr. RAKOTONARIVO François Maxime, Paysan Leader , Antoladrano Imito

Mr. RANDRIARIMANANA Hugues, Technicien vulgarisateur, ABC

Mr. RARIVOMANANA Philibert, Directeur régional de Eaux et Forêts, Ambositra

Mme. RASOANANDRASANA Victoire, peasant leader, village of Ambondromisotra

Mr. RAZAFINDRAVONY Germain Chef d'équipe PLAE, Antenne 2 Soavina, 033-14-291-24, plae.a2@wanadoo.mg

Mr. RAKOTOMAMPIONONA, DDR, 032-04-091-51, imania@moov.mg

Ms. ROBSON Landisoa Bruno, Coordonnateur Régional Amoron'I Mania, 033-15-100-93, landi@chemonics-abc.mg

Peasants in the village of Imito, cultivating geranium and raising bees.

ATSINANANA

Marie ANGE, Director, ODDIT Toamasina office.

Thomas ERDMANN, Regional Coordinator, Eco-Regional Initiatives Program (ERI). Toamasina. 033-14-694-41. Tom_Erdmann@dai.com

Dr. Michel JAHIEL, Conseiller Technique, Centre Technique Horticole de Tamatave (CTHT), Centre de Transformation et Conservation de Produits. Toamasina. 032-07-011-86. ctht@moov.mg.

Mr. JAONINA Mamitiana Juscelyno, Atsinanana Regional Director of Rural Development, Tamatave

Germain RATSIMAHARIVONY ANDRIANANGATAHINA, Coordinateur Régional Atsinanana, ATABC. Vatomandry. 033-15-100-95. Germain_maharivony@yahoo.fr

Faly SAMPSON, Regional Director of Water and Forests, MEEFT Regional office for Atsinana, Tamatave.

Villagers in Tsarajoro groupement, rural commune of Mahatsara, District of Brickaville.

Assembled staff of the ABC in a general meeting.

BOENY

Mr. ANDRIAMANANORO Mialy, Director, SAF-FJKM, Mahajanga, Boeny

Mlle. Diamondra, Assistant Coordinator, ABC Boeny

Mr. HARIRNAIVO, SOPAGRI, Mahajanga, Boeny

Mr. MAOR, herder, Marovoay

Mr. RAJAOFERA Mamisoa, Coordonnateur Régional, SAGE. Mahajanga, Boeny. 032-02-616-78. sagemjn@mel.moov.mg

Dr. RAKOTONDRANALY Patrick, Responsable Inter-régional, Unité de Prévention et Sécurisation Nutritionnelle, Office National de Nutrition, Mahajanga, Boeny. 033-12-546-35. pen-mahajanga@yahoo.fr, rpu.mahajanga@yahoo.fr.

Dr. RAKATOVAO Jacques Roland, Veterinary Inspector, Regional Director of Rural Development, Mahajanga, Boeny. 032-02-377-27, 034-08-253-67. rakatorolan@yahoo.fr.

Mr. RANAIVOMANANA Mahery Tiana, Manager, ABC Boeny, Mahajanga. 033-34-00-625 mahery@mac-mada.org.

Mme. RANOROARISOA Robine, Service Régional des Eaux et Forêts, Mahajanga, Boeny.

Mr. RASAMOELINA Laza, Coordinator, ABC Boeny.

Mr. RASOLOZAKA Ihary Nirina, Chef de Service Appui Technique, ANGAP, Mahajanga, Boeny. 033-07-070-50.

Mr. RAZAFITRIMO Mamonjisoa, Directeur de l'Equipe Exécutif, Programme de Lutte Anti-Arosif, Marovoay, Boeny.

Villagers in Fokontany of Andranomandevy

DIANA

Mr. ANDRIATAMBEZANA, Coordonnateur Régional Diana, ATABC 033-15-100-96 andretasanda@yahoo.fr

Mr. BEFOUROUACK Julien, Chef Service Appui Technique, ANGAP, Antsiranana. 032-40-860-35 angapdie@wanadoo.mg

Mr. RAZAKARIVONY Fiaferana Hary Mamy, Directeur d'Agence, Ramanandraibe Exportation (RAMEX) 032-07-160-27 ramex_amb@wanadoo.mg

Mr. WILSON Mahavito, Chief Technician, Tatie Cris Farm

Mr. WURFEL Razandry, Agent de District Nosy Be, MCA

President of a Nosy Be farming coop, other peasants in Nosy Be and Ambanja

Menabe

Mr. Zino Dauber Pascal, Assistant Chemonics Menabe, 032-51-273-48

Mr Mamy, Responsible Communication ABC Menabe

Mr. Venty Odile, Directeur du Complexe Parc National Kirindy Mitea Réserve spéciale Andranomena , 032-04-692-25, ventyodile@yahoo.fr

Ms. Rakotoarimanana Jocelyne Vololona, Directeur Ministère de l'Environnement, des Eaux et Forêts, et du Tourisme, Morondava

Mr Raonitsoa Nivondrahona Paul, Directeur FANANAMBY Morondava, 032-04-923-50, p.raonitsoa@fanamby.org.mg

Mr Eric Loubien, Agent technique de terreain Chemonics,Miary

Mr Rakotomamonjy Gilbert, Vice –Président Fokontany Anilivaly, Miary

Mr Remisy, Conseiller Fokontany Ankilivaly, Miary

Mr Fanomba Yvonne Suzanna, Agent technique de Chemonics, Mahabo

Mr Andriamandry Elson, Vive président Fokontany Tanandava I, Mahabo

Mr Ravolomaharavo, conseiller Fokontany Tanandava I, Mahabo

Mr Andrianarison Martin, Vice Président GTDR Menabe

Vakinankaratra

Mme. Pauline, President of Cooperative Féminine Miary, Betafo.

Mr. RAJOVOVOMENJANAHARY Sergio, Mayor, Manandona.

Ms. RAKOTONDRANAIVO Joséane Voahangy, Regional Director for Rural Development, Vakinankaratra.

Ms. RANDRIAMBAO Malatiana, Chef, Circonscription de l'Environnement, des Eaux et Forêts, Antsirabe, Vakinankaratra. 032-40-630-13, malala3@hotmail.com

Dr. RASAMIZAFIMANANTSOA A. Herman, Directeur, FIFAMANOR: Centre de Développement Rural et de Recherche Appliqué, Antsirabe, Vakinankaratra. 033-08-341-31, 032-07-116-61, it.fifamanor@moov.mg, fifamanaor@netclub.mg

Mr. RAZAFIMAHEFA Heriniaina, Directeur ABC Vakinankaratra. 033-23-004-54, heriniaina@mca-mada.org

Mr. RAZAFITSALAMA Tsiry Fanantenana, Regional Coordinator, ABC, Vakinankaratra. 033-04-73-822. tsiry_fanantenana@yahoo.fr

Ms. VOLOLOMPANANTENANA Sylvia, Training Director, CEFFEL. Antsirabe, Vakinankaratra. 033-02-020-42

Members of peasant organization, Manandona
Deputy Mayor, Manandona

APPENDIX 3. PLAN DE PROTECTION DES VEGETAUX, JUILLET 2008[2]

MEMORANDUM

Objet: Plan d'intervention en matière de produits agrochimiques, Projet ABIP - 014, Madagascar
Date: Juillet, 2008

Ce document présente les plans d'actions relatifs à l'utilisation de produits agrochimiques, soit les engrais et pesticides, dans le cadre du Projet ABIP – 014. La formation et la sensibilisation en matières de pesticides et de sécurité pour l'homme et l'environnement est une composante essentielle des plans d'action préparés pour chaque région et filière. La formation consiste à décrire les différents types de pesticides et leur toxicité relative, la notion de doses et périodes favorables à leur utilisation et la nécessité du port de vêtements protecteurs (PPE) et le traitement approprié des contenants vides pour diminuer les risques de contamination. La formation se concentrera également sur les techniques alternatives dont la lutte intégrée et la fertilisation raisonnée à l'utilisation de produits pesticides et fertilisants. Ces formations seront données lorsqu'une intervention phytosanitaire a été identifiée comme innovation à la réussite de la culture. Elles répondent à des problèmes de nutrition et de parasites des plantes identifiées dans certaines filières appuyées, problèmes qui constituent des contraintes majeures (goulots d'étranglement) à la hausse des rendements et par conséquent à l'augmentation des revenus des producteurs.

Les objectifs des actions à entreprendre :

- Informer les responsables des ABC sur l'utilisation des pesticides
- Informer les responsables des ABC et ainsi les paysans des choix de pesticides à faibles risques en tant qu'alternatifs des produits plus toxiques tels que les RUPs.
- Informer, identifier, et changer les attitudes de travail et les réactions des paysans
- Promouvoir des comportements rationnels en matière d'utilisation de pesticides
- Informer sur les équipements de protection nécessaires et les dispositions à prendre pour le traitement des conteneurs vides et la manipulation sécuritaire des produits
- Développer la capacité d'agir et de résoudre des problèmes dus aux pesticides (en cas d'urgence)
- Faciliter la mise en place d'une démarche globale de prise de conscience et de prise en compte de la santé, sécurité et environnement dans les lieux de travail des paysans agriculteurs

Les paysans qui cultivent ces cultures seront formés en matière de bonnes pratiques agricoles (GlobalGap) ce qui comprend les mesures sécuritaires d'application des engrais et pesticides et sur le choix judicieux de ces produits (i.e. produits à faible impact tel que mentionnée dans le rapport d'A. Schroeder). Les agents ABC seront également formés pour être formateurs en matière de pesticides. Des parcelles de démonstration chez des paysans-leaders seront utilisées comme moyen additionnel de diffusion des techniques et un suivi régulier sera réalisé au cours de la période de culture par nos agents de terrain afin d'assurer l'adoption des notions de bonnes pratiques vulgarisées chez tous les paysans. Les filières du projet ABIP -014 non mentionnées dans le Tableau 1 feront aussi l'objet de suivi par nos agents de terrain et un soutien sera donné aux paysans qui voudront appliquer des intrants. Il est important de noter que très peu de pesticides et d'engrais sont utilisés par les paysans si les crédits ne sont pas disponibles car l'achat de ces produits demeure prohibitif pour la plupart d'entre eux.

[2] The Crop Protection Plan (formerly referred to as the Pesticide Action Plan) is a living document that is being modified as needed with the evolution of the project. This is an up-to-date version as of July, 2008. Actions taken to implement this plan are described in the monthly reports provided by the ATABC staff to MCA.

La formation initiale du personnel ABC et des paysans et les séances de vulgarisation et de suivi effectuées par la suite par le personnel des ABC, traiteront des questions des RUPS et du port des vêtements et équipements protecteurs (Personal Protective Equipment ou PPE).

Pour ce qui des équipements personnels protecteurs (PPE), à notre connaissance, il n'y a pas d'organisme d'applicateurs de pesticides certifiés à Madagascar. Il y a aucun doute qu'il serait préférable que tous les paysans utilisent des équipements protecteurs lors d'un traitement, mais il serait difficile de fournir un tel équipement à tous les paysans et, de plus, il n'est pas évident que ces paysans utiliseraient ces équipements même si ils sont disponibles. Les expériences avec d'autres projets et dans d'autres pays, ont démontré que pour plusieurs raisons (ex. inconfort, chaleur excessive, lourdeur), ces équipements ne sont pas utilisés en dépit du danger d'intoxication relié à l'application des produits toxiques tels que les pesticides. Au besoin, il sera fourni des équipements si nécessaires aux usagers dont le nombre sera évalué après l'analyse des produits encore en usage par les bénéficiaires. Nous optons pour l'approche de prévention, soit prévenir les risques d'intoxication en encourageant l'utilisation des alternatives biologiques et l'approche de la lutte biologique. Lorsqu'un traitement d'un pesticide est jugé nécessaire, nous recommandons le choix de produits à faible risque (dont la liste sera remise aux ABC et ainsi aux paysans) avec les consignes nécessaires pour réduire le contact du pesticide sur la peau, dans les yeux et sur les personnes qui pourraient se retrouver dans les environs lors de l'application. Parmi ces consignes, on notera l'importance du port de vêtements couvrant le corps en entier (pantalons et chemises longues, casquette, gants et chaussures) et le souci de traiter en absence du vent pour éviter la dérive et de travailleurs sur les lieux pour une contamination directe et, si possible, en absence des organismes bénéfiques aux cultures.

En ce qui concerne les filières où il y aura intervention, nous tenterons de minimiser les impacts en suivant la démarche de la fertilisation raisonnée pour l'application des engrais, et de la lutte intégrée pour l'application des pesticides.

La fertilisation raisonnée se résume à :

- l'utilisation de doses, quantités et fréquences selon les caractéristiques du milieu (sol, climat, proximité d'eau de surface ou de zones de captage) en évitant les excès afin que le surplus ne se retrouve pas dans les cours d'eau avoisinants;
- l'adoption d'une période d'épandage reliée aux stades sensibles de la plante, selon le principe de "la bonne dose au bon moment";
- choix d'engrais naturels en premier lieu et d'engrais de synthèse en dernier lieu.

Les principes de la lutte intégrée sont :

- l'identification des organismes ravageurs et bénéfiques présents;
- le dépistage et l'évaluation régulière des populations relatives d'organismes ravageurs et bénéfiques;
- l'utilisation de seuils d'intervention;
- le choix et l'intégration de moyens de lutte biologiques, culturaux et physiques lorsqu'une intervention est nécessaire et l'utilisation de pesticides de synthèse en dernier lieu;
- l'évaluation des impacts des moyens de contrôle;
- Les précautions de transport, de conditionnement et d'emploi des produits.

Les tâches suivantes viendront compléter la démarche :

- Finalisation des listes des produits prohibés, autorisés et disponibles à Madagascar et Compilation des fiches de sécurité (MSDS) des produits autorisés et disponibles à Madagascar et susceptibles d'être utilisés dans les zones d'intervention

- Les interventions soit en engrais ou pesticides seront exécutées selon le cahier de charge ou les fiches techniques reconnues par le MAEP de Madagascar pour chacun des ravageurs des cultures ciblées);
- Sensibilisation des 'acteurs de pesticides' : importateurs, vendeurs et revendeurs sur les effets des pesticides (Activité continue).

Le tout sera pris en charge par l'équipe Chemonics en collaboration avec le MAEP et l'ABIP et avec l'appui de consultants externes au besoin. Le suivi de la démarche énoncée ci-dessus permettra de minimiser les impacts sur l'environnement et la santé des exploitants.

Le Tableau joint à la présente récapitule les actions envisagées par MCA-Madagascar (ABIP/ABC/Chemonics) pour les produits agrochimiques.

	ACTION	ZONE	CIBLE	RESPONSABLE	Date d'exécution
-A-PA init.	Formation de formateurs sur les pesticides comprenant les pesticides, leur usage, les RUPs, les précautions d'emploi (transport, stockage, manipulation, équipement de protection personnel, traitement des conteneurs vides, etc..), les risques et dangers liés à l'utilisation des pesticides et leurs impacts sur la santé humaine et l'environnement	Les 5 zones d'intervention	ABI/ABC : RTSO (Responsables Techniques et Socio Organisationnels) - CR (Coordinateurs Régionaux de Chemonics)	MCA-Madagascar Collaboration avec les Directions Régionales du Développement Rural (DRDR) de Vakinankaratra et Ambositra	Du 03 au 06 mars 2008 à Ambositra
		Les 5 zones d'intervention	Agents de district (AD) et Agents de Terrain (AT) de chaque ABC	RTSO et CR, formateur externe au besoin	Du 15 mars au au 30 juin 2008
-B-PA init.	Formation/Information sur la gestion sécuritaire des pesticides, les pesticides prohibés, les RUPs et la lutte intégrée.	Les 5 zones d'intervention	Responsables ABIP, Directeurs ABC	MCA-Madagascar (Expert en pesticides de MCC)	Rapport reçu début juillet
Rec A.S.	Développer des méthodes de contacter les paysans (par exemple un plan de communication) pour une utilisation sécurisée des pesticides et des messages IPM	Les 5 zones d'intervention			Personnel de l'ABC a un contact direct et régulier avec paysans utilisant plusieurs méthodes de communication
-C-PA init.	Actualisation des listes de produits disponibles dans chaque zone d'intervention en regard aux produits autorisés à Madagascar pour l'année 2008 et les produits prohibés ou à usage restrictif et compilation des fiches de sécurité (MSDS)	Les 5 zones d'intervention		ABC/Chemonics	Déjà fait. Un manuel de MSDS à remettre à tous les ABC
Rec A.S.	Finir la collecte ses MSDSs pour les pesticides les plus utilisés	Les 5 zones d'intervention		ABC/Chemonics	Même chose que pour le point précédent.
-D-	Inventaire des produits RUPs	Les 5 zones	Paysans	ABC/Chemonics	Ces

	ACTION	ZONE	CIBLE	RESPONSABLE	Date d'exécution
PA init.	encore en usage par les paysans encadrés et proposition de formation à ces paysans	d'intervention	encadrés par ABCs utilisant les RUPs		informations proviendront des fiches de suivi du S&E
-E-	Analyse des pesticides utilisés par les paysans et des équipements et fourniture d'équipements protecteurs nécessaires (à inclure dans le RFP pour équipements des ABCs)	Les 5 zones d'intervention	Paysans encadrés par ABCs utilisant les pesticides nécessitant le port d'équipements.	ABC/Chemonics	Déjà fait. Fourniture des EPI aux ABC se fait lorsqu'on juge qu'une intervention est nécessaire dans une filière. Formation lors de la distribution
Rec A.S.	Dotation de EPI aux paysans leaders des coopératives Développer une méthodologie pour déterminer le taux d'utilisation des EPI parmi les Paysan-leaders et appliquer des actions correctives pour les cas ou les EPI ne sont pas utlisés.	Les 5 zones d'intervention		ABC/Chemonics	Même chose que pour le point précédent
-F- PA init.	Formation sur la fertilisation raisonnée et Suivi	BOENY (formation intégrée dans les techniques de SRA)	2541 paysans dont 70 paysans-leaders pour la culture du RIZ	ABC/Chemonics (Formateurs en SRA – AT – AD – CR – RTSAO)	Du 30 janvier au 28 février 2008. Suivi jusqu'à la récolte (août 08)
		AMORON'I MANIA	1328 paysans et 70 paysans-leaders pour la culture de RIZ répartis sur les saisons culturales Déc à Mars 08 / Juillet à déc 2008 / saison pluviale 2008-2009	ABC/Chemonics (collaboration avec DRDR Ambositra)	En début de chaque saison de culture
		ATSINANANA	1245 paysans répartis sur les saisons culturales Mars à Juin 08 / Juillet à nov 2008 / nov 2008 à mars 2009	ABC/Chemonics (collaboration avec formateurs externes)	En début de chaque saison de culture
Rec A.S.	Etablir des guides techniques IPM / GAP pour chaque filière avec les contraintes majeures (insectes, maladies, déficit en nutriments, …) Les outils et techniques de IPM potentiellement utilisables,	Les 5 zones d'intervention			Cette tâche nécessite un personnel hautement qualifié et plusieurs cycles (années) de

	ACTION	ZONE	CIBLE	RESPONSABLE	Date d'exécution
					cultures pour chacune des filières. N'est pas possible à l'intérieur de ce projet.
-G- PA init.	Formation sur la lutte intégrée et pesticides (gestion intégrée des pesticides) / suivi	BOENY	900 paysans dont 30 paysans-leaders pour la culture de MAÏS	ABC/Chemonics (Formateurs en protection des végétaux – RTSO - CR et AT)	A partir du 1er avril 2008. Suivi jusqu'à la récolte (août 08)
		MENABE	550 producteurs de RIZ	ABC/Chemonics (CR - AT)	Pour toutes les saisons
		MENABE	Filière ARACHIDE : 50 paysans pour la saison 2007-2008 et à définir pour saison 2008-2009	ABC/Chemonics (CR – Formateurs externes)	Janvier à Mars 2008 et Avril à juillet 2008
		MENABE	1750 producteurs de POIS DU CAP dont 55 paysans-leaders par saison	ABC/Chemonics (CR – AT- Paysans leaders – Formateurs externes)	Mars-Juin 2008
		VAKINANKARATRA	400 paysans adoptant la filière OIGNON dont 12 paysans leaders	ABC/Chemonics (Formateurs externes – AT pour le suivi)	Mars 2008-02-26 Suivi : jusqu'en septembre 2008
		VAKINANKARATRA	479 paysans adoptant la filière POMME DE TERRE dont 179 pour la saison nov 07-mai 08, 100(mai à oct 08) et 200 (oct 08 à mai 09)	ABC/Chemonics (Formateurs externes – AT pour le suivi)	Formation prévue pour chaque saison
		VAKINANKARATRA	500 paysans adoptant la filière MAÏS dont 200 pour la saison oct 07-juin 08 et 300(sept 08 à juin 09)	ABC/Chemonics (Formateurs externes – AT pour le suivi)	Formation prévue pour chaque saison
Rec A.S.	Reprendre / refaire les formations	Les 5 zones d'intervention	AT, Paysans-leaders, paysans	ABC/Chemonics (Formateurs externes – AT pour le suivi)	Selon les besoins
Rec A.S.	Formation des agents ABC sur les GAP (bonnes pratiques agricoles)	Les 5 zones d'intervention	AT	ABC/Chemonics	Nos innovations pour chaque filière sont basées sur les GAP. Nos formations sont ciblées

	ACTION	ZONE	CIBLE	RESPONSABLE	Date d'exécution
					sur nos innovations et donc conformes avec GAP
Rec A.S.	Faire le suivi des paysans sur les bonnes pratiques agricoles, les outils IPM , les problèmes d'utilisation sécurisée de IPM et les techniques utilisées Rapport à MCA Madagascar	Toutes les filières ou on préconise les traitements phytosanitaires	Paysans	ABC/Chemonics	Le programme S&E inclut le suivi des innovations en matière d'utilisation de produits phyto. Ce suivi se fait quelques fois pendant la culture.
Rec A.S.	Formation des paysans agriculteurs sur les GAP par filière, par type de traitement, et d'utilisation de produits phytosanitaires, par types de contraintes, ….	Les 5 zones d'intervention	Paysans	ABC/Chemonics	Ce point a déjà été traité plus haut
-H- PA init.	Inventaire des problèmes phytosanitaires des cultures maraîchères suivi d'une formation sur la lutte intégrée et pesticides	ATSINANANA	A définir (paysans –CULTURES MARAICHERES)	A définir	Utliser documents GTZ pour l'inventaire Formation au besoin
		DIANA	1069 paysans (filière CULTURES MARAîCHERES) dont 35 paysans leaders	ABC/Chemonics (Formateurs externes – AT pour le suivi)	Utliser documents GTZ pour l'inventaire Formation au besoin
Rec A.S.	Identifier les principales espèces ravageurs : insectes, de mites de mollusques, de nématodes, de maladies, de rodent et oiseaux …. Avec rapport à MCA Madagascar			ABC / Chemonics	Utliser documents GTZ
- I - Rec A.S.	Travailler avec des acteurs experts (CLM), les distributeurs, le service de protection des végétaux, ECOCERT et Voarisoa Observatoire pour accès aux informations, aux matériels et à l'expertise qui peuvent être utilisés par et pendant la formation			ABI/ABC/Chemonics	En continu et au besoin
- J -	Formation sur les techniques d'entretien des letchis	ATSINANANA	ABC et 115 paysans-leaders	ABC/Chemonics (formateurs spécialisés externes)	Février 2008 à Avril 2008
-K- Rec A.S.	Travailler en collaboration avec Crop Life et Voarisoa Observatoire pour fournir	Les 5 zones d'intervention		MCA	Ceci n'est pas dans notre mandat

	ACTION	ZONE	CIBLE	RESPONSABLE	Date d'exécution
	bonnes pratiques en matières de stockage des pesticides, certification pour les opérateurs/propriétaires de magasins d'intrants.				(Chemonics) Cette tâche est de l'essor de Crop Life.
-L- Rec A.S.	Etablissement d'un tableau de correspondance entre la liste des matières actives contenues dans le rapport (Annexe 1) et les noms commerciaux de produits disponibles dans les points de vente et chez les paysans	Les 5 zones d'intervention		ABI/ABC	1er septembre 2008
-M- Rec A.S.	Suivi des pesticides à risques et facteurs de réduction des risques	6 régions, notamment celles non couvertes par la mission de Alan		Cellule Environnement	
-N- Rec A.S.	Audit des paysans sur les meilleures pratiques (production, lutte intégrée et sécurité) par rapport aux formations dispensées aux ABCs et paysans	6 régions		Cellule Environnement	30 novembre 2008
-O- Rec A.S.	Rapport d'avancement sur les recommandations du rapport d'Alan			Cellule Environnement	15 novembre 2008
-P- Rec A.S.	Mission de suivi sur les pesticides à risque et les facteurs de réduction et d'augmentation des risques			Cellule Environnement	1er septembre 2008

N.B. En bleu : Recommandations de Alan Schroeder
Même couleur de remplissage : Même groupe d'activités/ Tâches liées