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Market Access and Poverty Alleviation

MARKET ACCESS AND POVERTY ALLEVIATION 2

# PROGRAMMATIC ENVIRONMENTAL ASSESSMENT (PEA)

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# CONTENTS

<b>CONTENTS</b> .....	<b>I</b>
<b>ACRONYMS</b> .....	<b>V</b>
<b>EXECUTIVE SUMMARY</b> .....	<b>1</b>
A. BACKGROUND.....	1
B. METHODOLOGY.....	2
C. ENVIRONMENTAL PROGRAM.....	2
<b>BACKGROUND</b> .....	<b>5</b>
A. OBJECTIVES OF THE PROGRAMMATIC ENVIRONMENTAL ANALYSIS.....	9
B. ENVIRONMENTAL LAWS AND REGULATIONS.....	10
B.1 United States.....	10
B.2 Bolivia.....	11
C. METHODOLOGY FOR PREPARING THE PEA.....	13
C.1 Scope.....	13
C.2 Study Limitations.....	14
<b>DESCRIPTION OF AFFECTED ENVIRONMENT</b> .....	<b>15</b>
A. REQUIREMENTS OF 22 CFR 216.....	15
A.1 Valleys.....	16
A.2 Altiplano.....	17
B. GENERAL ENVIRONMENTAL PROBLEMS IN THE VALLEYS AND ALTIPLANO REGIONS.....	18
B.1 Valleys.....	18
B.2 Altiplano.....	19

C.	CONSERVATION TECHNOLOGY RESOURCE.....	22
C.1	For agricultural production .....	22
C.2	For the manufacturing of agricultural products.....	24
	<b>ANALYSIS OF ENVIRONMENTAL CONSEQUENCES.....</b>	<b>25</b>
A.	BACKGROUND.....	25
B.	NOT SIGNIFICANT AND NOT CONSIDERED ENVIRONMENTAL TOPICS.....	25
B.1	Animal breeding.....	25
B.2	Development of improvements in market infrastructure .....	26
B.3	Endangered and endemic species .....	26
C.	SIGNIFICANT AND CONSIDERED TOPICS .....	26
C.1	Use of pesticides .....	26
C.2	Post-harvest technology .....	27
C.3	Indirect impacts on the conversion of natural areas to agricultural lands .....	27
C.4	New crops / new varieties .....	27
C.5	Vulnerability of irrigation systems .....	28
	<b>ALTERNATIVES .....</b>	<b>29</b>
A.	BACKGROUND .....	29
B.	ELIMINATED ALTERNATIVES .....	29
B.1	Marketing without post-harvest and/or production support .....	29
B.2	Production and Post-harvest without marketing accompaniment.....	30
B.3	Environmental management without production, post- harvest or marketing assistance .....	30
C.	DETAILED CONSIDERED ALTERNATIVES.....	30
C.1	Alternative A: Proposed alternative - MAPA 2 Project .....	30
C.2	Alternative B: reasonable alternative – MAPA 2 Project with mitigation measures for negative environmental impacts.....	30
C.3	Alternative C: no action – MAPA 2 Project is not developed .....	32
D.	PREFERRED ALTERNATIVE RECOMMENDED.....	32
D.1	Comparison of environmental impacts from alternatives.....	32
	<b>MITIGATION MEASURES AND PROPOSED ENVIRONMENTAL</b>	

<b>PROGRAM FOR MAPA 2.....</b>	<b>35</b>
A. ENVIRONMENTAL POLICY PROPOSAL.....	35
B. ANALYSIS OF INSTITUTIONAL CAPACITY FOR IMPLEMENTING THE PEA.....	35
C. ENVIRONMENTAL OBJECTIVES.....	38
D. RESULTS BY PROPOSED ENVIRONMENTAL OBJECTIVE.....	39
D.1 Intermediate Objective 1.....	39
D.2 Intermediate Objective 2.....	39
D.3 Intermediate Objective 3.....	40
D.4 Intermediate Objective 4.....	40
D.5 Intermediate Objective 5.....	40
D.6 Intermediate Objective 6.....	41
D.7 Intermediate Objective 7.....	41
D.8 Intermediate Objective 8.....	41
D.9 Intermediate Objective 9.....	41
D.10 Intermediate Objective 10.....	41
D.11 Intermediate Objective 11.....	42
E. RELATION OF THE OBJECTIVES, RESULTS AND INDICATORS TO THE OBJECTIVES OF MAPA 2 AND THE PEA.....	42
F. BUDGET.....	43
G. PROCEDURE FOR FOLLOW-UP AND EVALUATION.....	43
H. PUBLIC PARTICIPATION IN THE PROJECTS.....	44
<b>BIBLIOGRAPHY.....</b>	<b>47</b>
<b>ANNEXES.....</b>	<b>49</b>
Annex 1 Initial Environmental Examination, Environmental Threshold Decision	
Annex 2 Terms of Reference	
Annex 3 Visits and People Interviewed	
Annex 4 Some Mitigation Measures	
Annex 5 PERSUAP	
Annex 6 Environmental Impact Identification and Characterization Handbook and Proposal or Mitigation Measures	

- Annex 7 Environmental Follow-up Field Spreadsheet
- Annex 8 Model of Quarterly Environmental Report and Data Base
- Annex 9 Maps

**List of Tables**

PRIORITIZED CHAINS.....	8
PROJECT INDICATORS.....	9
OBJECTIVES, RESULTS, AND INDICATORS AND THEIR RELATION TO THE PEA .....	42
PROJECT MAPA BUDGET .....	43
STEPS FOR IDENTIFICATION AND EXECUTION OF A PROJECT .....	44

**List of Graphics**

STRATEGIC PLAN FOR THE COUNTRY IN THE 2005-2009 PERIOD .....	6
SO2 RESULTS FRAMEWORK.....	6
ENVIRONMENTAL MANAGEMENT PLANNING STAGES.....	13
COMMUNICATION NETWORK FOR ENVIRONMENTAL TOPICS.....	37

# ACRONYMS

BEO	<i>Bureau Environment Officer</i>
IADB	Inter-American Development Bank
GAPs	Good Agriculture Practices
GHPs	Good Health Practices
GMP	Good Manufacturing Practices
CPST	Center for Promotion of Sustainable Technologies
CFR	<i>Code of Federal Regulations</i>
COSUDE	Swiss Agency for Development
EA	Environmental Assessment
ER	Environmental Review
EOSOT	Economic Opportunities Strategic Objective Team
ETD	Environmental Threshold Decision
CTIF	Competitive Technological Innovation Fund
FDTA - Valles	<i>Fundación para el Desarrollo Tecnológico Agropecuario de los Valles</i> (Valleys Agriculture Technology Development Foundation)
FDTA - Altiplano	<i>Fundación para el Desarrollo Tecnológico Agropecuario del Altiplano</i> (Altiplano Agriculture Technology Development Foundation)
GDB	<i>Gobierno de Bolivia</i> (Bolivian Government)
ha	Hectare(s)
IEE	Initial Environmental Examination

IR	Intermediate Result
ISO	International Standardization Organization
MAPA	Market Access and Poverty Alleviation Project
masl	meters above sea level
IPM	Integrated Pest Management
MDP	<i>Ministerio de Planeamiento</i> (Planning Ministry)
MEO	Mission Environmental Officer
NGO	Non-governmental Organization
SO	Strategic Objective
PEA	Programmatic Environmental Assessment
ASP	Agricultural Services Program
PERSUAP	Pesticide Evaluation Report and Safer Use Action Plan
RASIM	<i>Reglamento Ambiental del Sector Industrial y Manufacturero</i> (Industrial & Manufacturing Sector Environmental Regulation)
RAU	<i>Régimen Agropecuario Unificado</i> (Unified Agricultural System)
RAI	Registro Ambiental Industrial (Industrial Environmental Record)
RITEX	<i>Régimen de Internación Temporal para la Exportación</i> (System of Temporary Importation for Final Exports)
REA	<i>Regional Environment Advisor</i>
SENASAG	<i>Servicio Nacional de Sanidad Agropecuaria e Inocuidad Alimentaria</i> (National Service of Agricultural Health and Food Safety)
SIPSyE	<i>Sistema de Planificación, Seguimiento y Evaluación</i> (Planning, Follow-up and Assessment System)
SIBTA	<i>Sistema Boliviano de Tecnología Agropecuaria</i> (Bolivian Agricultural Technology System)
UCPSA	<i>Unidad de Coordinación del PSA</i> (Coordination Unit for the Agricultural Services Program)
USAID	United States Agency for International Development
USG	U.S. Government
SPU	Safe Pesticide Use

## PROGRAMMATIC ENVIRONMENTAL ASSESSMENT (PEA) FOR MAPA 2

# EXECUTIVE SUMMARY

This document provides a detailed study of the reasonably foreseeable significant effects, both beneficial and adverse, of activities implemented by the Market Access and Poverty Alleviation Project (MAPA 2) on the environment of a Bolivia. It also provides detail concerning proposed MAPA 2 activities and mitigation measures.

## A. BACKGROUND

The MAPA 2 Project is one of many activities that contribute to the achievement of USAID's Strategic Objective 2 (SO2) for Bolivia, defined as "Increased income for Bolivia's poor."

Within this SO, MAPA 2 supports Intermediate Result 2 (IR2) "Improved agricultural technology and market access." Accordingly, the objective of the MAPA 2 Project is to "Increase the income of a significant number of poor families living in the Bolivian valleys and altiplano regions by improving agricultural technology and market access."

Notwithstanding progress to date, achievement of sustainability will require additional time and support. USAID will build upon progress made under MAPA and will provide an array of inputs to implement activities under MAPA 2 to produce outputs in three broad areas:

- Strengthening and consolidating the FTDA-Valles and commodity chains in the valleys
- Support for development activities in the Altiplano
- Regulatory and policy improvements directly related to development of agricultural commodity chains

The overall goal of this Programmatic Environmental Analysis (PEA) is:

- Define environmental objectives, results and indicators for MAPA 2 so that the project is in compliance with U.S. and Bolivian regulations and minimizes any negative environment effects that could potentially result from the project interventions.

Specific objectives are as follows:

- Analyze environmentally acceptable implementation alternatives for MAPA 2
- Describe the areas of intervention

- Identify and describe environmental issues existing in both regions
- Identify conservation technologies applicable in both regions, and propose an environmental action program

## **B. METHODOLOGY**

MAPA 2 project will implement four basic principles established by the International Organization for Standardization (ISO) in document 14001:

- Planning of the project's environmental management (PEA itself);
- Implementation and operation of identified environmental management actions;
- Measurement and evaluation of environmental management corrective actions; and
- Continuous review and improvement of identified environmental management activities.

## **C. ENVIRONMENTAL PROGRAM**

The following objectives and results to be achieved by MAPA 2 during its operation have been defined based on the analysis of potential environmental effects that MAPA 2 project actions may generate and the selection of a feasible alternative for its execution, considering environmentally practical aspects transversal to project activities:

1. Define and incorporate guidelines to identify and propose mitigation measures for those negative impacts in the chain studies. MAPA 2 and the FDTAs will require studies of the specific chain where projects will be financed. The studies will ensure incorporation of the approach described in Alternative B selected herein. On the basis of the chain studies, agricultural and market interventions will be designed that should integrate relevant mitigation measures.
2. Design and disseminate technological packages for each chain that will incorporate suitable actions and proposals in the PEA "conservation technology bank."
3. Incorporate aspects related to environmental impact identification and mitigation measures proposals and integrate them into Operation Regulations of the *Fondo Competitivo de Innovación Tecnológica* (FCI - Competitive Fund for Technological Innovation) and Trust Funds. Train technology providers or operators to incorporate environmental guidelines for submission and implementation of proposals, as necessary.
4. Integrate follow-up and assessment environmental aspects in the FDTA - Valles and FDTA - Altiplano systems in order to ensure implementation of environmental mitigation tools proposed by the different projects (terms of reference and technical proposals) financed by the Foundations. Moreover, specific evaluation processes will be defined for the PEA approaches.
5. Prepare and disseminate printed technical material: Technical handbooks on Integrated Pest Management (IPM), Good Agricultural Practices (GAP) and Safe Pesticide Use (SPU) for technicians and farmers, as well as SPU-related posters.
6. Implement a training program in SPU, IPM and GAPs for technicians and farmers, respecting the project execution procedures from FDTAS.

7. Promote and implement joint actions with the *Centro de Promoción de Tecnologías Sostenibles* (CPTS, Sustainable Technology Promotion Center) associated to interventions in agro-industry and/or post-harvest and manufacturing process.
8. Promote the setup and implementation of environmental management tools proposed by Law 1333, as well as follow-up and assessment processes (Environmental Briefs and Manifests, Environmental Regulation of the Manufacturing and Industrial Sector – RASIM).
9. Promote and implement organic agriculture procedures in the valleys and *altiplano* regions in accordance with market conditions, and obtain organic certifications of farms and products for those crops being promoted based on market requirements.
10. Integrate and observe environmental regulations and procedures during the introduction and validation of small, new research areas, as well as during the business dissemination process, if necessary.
11. Strengthen the *Servicio Nacional de Sanidad Agropecuaria e Inocuidad Alimentaria* (SENASAG, National Service of Agricultural Health and Food Safety) in order to improve vegetal material imports while promoting exports.



## CHAPTER 1

# BACKGROUND

Bolivia is a land-locked country with 1,098,581 square kilometers (roughly the size of California and Texas combined) of which only 1.9% is cultivated arable land, and 8% of this land is irrigated. Bolivia is the second poorest country in the Western Hemisphere, with a per capita income currently estimated at \$869. In many rural areas, the average family income is only \$150 a year. Bolivia has the second highest level of infant, child and maternal mortality after Haiti, the poorest nation in the hemisphere. National income is highly skewed, with about 60% of the Bolivian population living in poverty and 24% in extreme poverty, while around 20% of the population accounts for 64% of the national income. Rural poverty stands at over 80%. Real economic growth is negligible due to, among other factors, low levels of domestic and private investment, high levels of government corruption and inefficiency, limited and poor-quality productive infrastructure, and low productivity rooted in low levels of education and health. Bolivia's poverty is at the root of serious and recurrent social and political unrest, which in turn further hinders economic growth by discouraging much-needed investment.

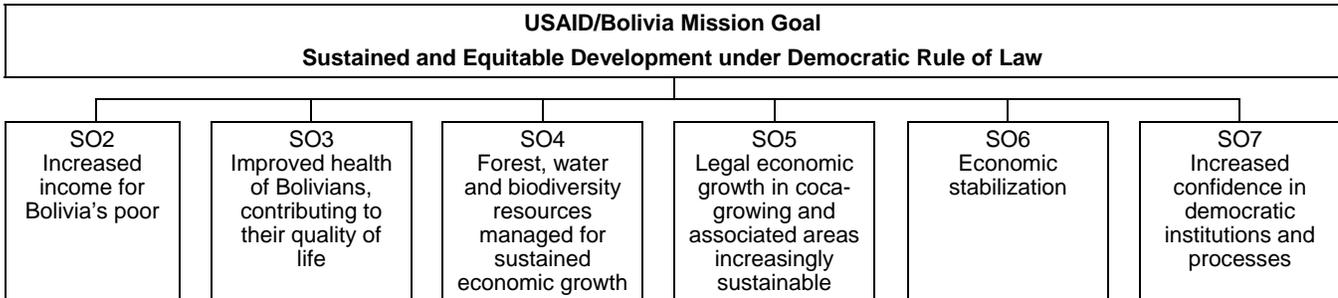
Despite important macroeconomic reforms and a certain economic stability, economic growth lags behind population growth rates. Broad based economic growth depends on overcoming a combination of constraints to growth that include the lack of a sound policy and regulatory framework, limited access to financial resources, lack of access to technology and markets, poor productive infrastructure, and low levels of education. Bolivian entrepreneurs and government officials do not know how to negotiate trade agreements, nor understand their obligations under agreements already signed.

The United States Government (USG) foreign policy priorities in the Western Hemisphere include: promoting and supporting stable, democratic governments under rule of law; reduced poverty through broad-based free-market economic growth and increased trade; and suppression of narcotics production and trafficking. USAID's assistance program is an integral part of the US Mission to Bolivia.

USAID's Strategic Plan for Bolivia for the 2005-2009 period, directly addresses the needs and priorities for development defined by the Bolivian government in its Strategy for Poverty Reduction. These plans and activities will be implemented in close cooperation with the government and civil society. Included among the long-term objectives of USAID/Bolivia are specifically: consolidation of democracy in Bolivia; increased social and economic development sustainability in legal coca production; sustainable economic growth through conservation of water and forest resources and biodiversity conservation; reduction of poverty, better public health, social inclusion and stability.

Graphic 1

**STRATEGIC PLAN FOR THE COUNTRY IN THE 2005-2009 PERIOD**



For the 2005-2009 period of its Economic Opportunities Strategic Objective, USAID/Bolivia will build upon current successes in agriculture and micro finance and work in the following areas: 1) promoting a sustainable financial system and continued micro finance development, 2) improving agricultural production (volume, productivity and quality) and market linkages, and 3) improving the enabling environment for trade and investment and making businesses in value-added exporting sectors more productive.

Whereas the countrywide trade and competitiveness focus is important for overall broad based growth, the Mission understands that a continued focus on poverty reduction is still needed in the poorest regions. The agricultural Intermediate Result (IR), along with Title II activities, will continue to focus on improving wealth distribution to the poorest Bolivians.

The SO2 is supported by four intermediate results (IRs), the following table illustrates the framework for SO2.

Graphic 2

**SO2 RESULTS FRAMEWORK**



For five years, USAID/Bolivia's MAPA project has helped strengthened commodity chains in the valleys region of Bolivia and provided direct assistance to 20,000 small producers. MAPA activities have achieved significant results in the valleys in terms of increased household incomes by nearly 25 percent, expanded volumes of product, increased product value, access to technology, access to new markets, and access to market information.

MAPA was designed as a demand-driven strategy to improve producer access to markets, promote the formation and strengthening of enterprises, reducing production and transaction costs and increasing competitiveness along the selected commodity chains.

Under MAPA, the FTDA-Valles made significant progress towards institutional sustainability. The project helped establish, consolidate and strengthen the Foundation as a viable agricultural innovation organization capable of replicating project activities on a sustainable basis.

The FDTA-Valles is one of four non-profit organizations functioning under the Bolivian System of Agricultural Technology, SIBTA. SIBTA is a joint public-private sector effort to establish a new agricultural technology development and transfer mechanism for Bolivia. It consists of a national umbrella organization and regional foundations for four distinct agro-climatic regions: Altiplano, Valleys, Chaco and Humid Tropics. SIBTA utilizes public and donor funds to promote agricultural development and to create a market of supply and demand for modern agricultural services and technology in Bolivia.

For agriculture and livestock the foundations will use FCI as a financing mechanism and to promote agricultural innovation through an Operative Regulation. Donations will be allocated through a bidding process among the non-profit organizations, consulting companies or individual technical experts (called service providers or field operators). These donations will finance programs to improve production of agriculture products, post-harvest management and marketing.

In addition to donor provided resources, a trust fund has been established to finance current and future CFI funded projects. It was capitalized with \$8.4 million in jointly programmed local currencies generated from the PL 480 Title III program. The majority of this \$8.4 million remains in trust for use by FDTA-Valles under MAPA 2.

Notwithstanding progress to date, achievement of sustainability will require additional time and support. USAID will build upon progress made under MAPA and will provide an array of inputs to implement activities under MAPA 2 to produce outputs in three broad areas:

MAPA 2 Project is also one of the activities that contributes to achieving SO2 of the USAID in Bolivia Mission through its Office of Economic Opportunities, which seeks “increased income for Bolivia’s poor.”

Along with other USAID/Bolivia activities, the MAPA 2 project adds to the Intermediate Result 2 (IR2) of SO2 “Improved agricultural technology and market access and policy environment.” Accordingly, the objective of the MAPA 2 Project is to “Increase the income of a significant number of poor families living in the Bolivian valleys and altiplano regions, by improving technology and market access.”

MAPA 2 Project has three strategic areas of interest:

- **Strengthening and consolidating the FTDA-Valles and commodity chains in the valleys.** MAPA 2 will work to strengthen the FDTA-Valles in three key ways. First, continued support will be provided to assure that administrative systems are efficient, effective, transparent, and compliant with USAID regulations and SIBTA operating procedures. The contractor will work to make sure FDTA-Valles meets all criteria to be an eligible and attractive development organization for USAID and other donors. Second, the project will work with FDTA-Valles to achieve a transition of key MAPA 2 staff to become FDTA-Valles staff by the end of MAPA 2. Third, FDTA-Valles will be assisted to develop attractive projects that can be used to attract additional project financing

donations, particularly from US-based private donors.

- **Support for development activities in the Altiplano.** MAPA 2 will work with FDTA-Altiplano to enhance development capacity. With FDTA-Altiplano staff currently hired as consultants and limited sources of external funding, the organization has very limited flexibility in its operating costs, creating some implementation challenges.

MAPA 2 will assist FDTA-Altiplano in adapting their administrative systems to be more flexible and conducive to good development, to the extent that such assistance is feasible and acceptable to the Foundation. And MAPA 2 will assist the Foundation to establish a Trust Fund, much as was done for FDTAs Valles and Trópico Húmedo. This will make it more attractive to donors, and help assure good governance and transparent use of donor funds. The MAPA 2 assistance will involve the FDTA-Altiplano Board of Directors in adopting the necessary structure and transfer of powers and authorities to a Board of Trustees.

MAPA 2 staff will work with FDTA-Altiplano to develop projects that can be funded by MAPA 2 grant funds that will generate contributions to the Trust Fund that exceed 15 percent. MAPA 2 will physically locate one staff person in the Altiplano offices for the entire project period, and pay the Foundation for office space, support services, and provide the necessary office equipment to support that individual. Through these concrete activities, the flexibility, effectiveness, and programmatic reach of the Foundation will be increased.

Additionally, MAPA 2 will foster exchanges between it and FDTA-Valles and expose FDTA-Altiplano to the successful concepts, practices, and procedures of FDTA-Valles.

The table below describes the chains prioritized in both FDTAs where MAPA 2 can intervene under the previously described mechanisms.

Table 1

**PRIORITIZED CHAINS**

Geographic Region	Production Area	Geographic Region	Production Area - non traditional	Production Area - traditional
Valleys	Onion (organic and traditional - sweet) Table grapes Peach, plum and apricot Berries (raspberry, blueberry, blackberry) Herbs (oregano, anise, cumin) Peppers (Ají, paprika) Tomato Peanut New Opportunities (cut flowers)	Altiplano	Onion (organic and traditional - sweet) Peas (sweet and China) Herbs (Oregano) Quinoa flower Maca Carrots	Garlic Fava Beans Potato Organic quinoa real

**Regulatory and policy improvements directly related to development of agricultural commodity chains.** The third area of support under this contract will be policy and regulatory improvement in areas key to the development of the agricultural commodity chains targeted under this effort with priority given to the policies and regulations that directly constrain the development of the chains, such as obstacles to the importation of plant materials and other inputs and those that inhibit increasing exports. Improving the regulatory functions of the Bolivian organization responsible for plant protection, animal health and food safety, *Servicio Nacional de Sanidad Agrícola, Ganadero e Inocuidad*

*Alimentaria*, (SENASAG) is if one of the regulatory improvements that would be most beneficial to expand access to markets and increasing competitiveness. Taxation procedures have also been considered as a possible area of intervention.

Major indicators of the results at the end of the MAPA 2 Project are reported in the following table:

Table 2

**PROJECT INDICATORS**

	Allocated
1. Increase in family income for 20,000 homes	
Valleys	5%
Altiplano	5%
2. Improved access to technology (production, processing and marketing) and marketing services	
Valleys	16,000
Altiplano	4,400
3. Improved or established agricultural production chains	
Valleys	16
Altiplano	4
4. Strengthened farmers' organizations	
Valleys	16
Altiplano	4
5. SENASAG	
Modified procedures	3
Operating computer system	1
Trained staff	27
6. Farmers enrolled in RAU	3,000
7. Reduced RITEX reimbursement period	50%

## A. OBJECTIVES OF THE PROGRAMMATIC ENVIRONMENTAL ANALYSIS

PEA's central objective for MAPA 2 is:

- To define an operation system that MAPA 2 may institutionalize for routine review and documentation of project activities in order to ensure compliance with U.S. and Bolivian regulations and to reduce the negative effects on the environment that could potentially result from project activities.

Specific objectives are as follows:

- Analyze the different alternatives for MAPA 2 implementation such that they involve environmentally acceptable aspects.
- Provide a general description of intervened areas;
- Identify and provide a general description of environmental impacts existing in both regions;

- Identify conservation technologies applicable according to MAPA 2 intervention level in both regions;
- Identify priorities and establish environmental objectives suitable for MAPA 2.

## **B. ENVIRONMENTAL LAWS AND REGULATIONS**

### **B.1 UNITED STATES**

22 CFR 216 (*Code of Federal Regulations*) defines environmental procedures that USAID must follow for new activities. First an Initial Environmental Examination (IEE) must be prepared. The IEE recommends the classification for proposed activities in one or more of the following categories to the BEO (Business Enterprise Office).

22 CFR 216 applies to:

- All new or supplementary programs or activities financed by USAID,
- Changes to existing programs that involve new components or a significant expansion of activities,
- Import of supplies not included in the previous environmental assessment, and
- Adverse environmental impacts not foreseen in the previous environmental assessment.

In summary procedures are applied as follows:

The person that initiates the activity prepares an IEE to determine whether the activity will receive a:

- **Negative Determination:** No other environmental action is required during the project unless circumstances change or additional information becomes available that would indicate that the proposed activities have a negative environmental impact. A negative determination could also involve negative environmental impacts, but these are not considered significant, which is not the case in a positive determination. Typically, with a negative determination, application of environmental guidelines could sufficiently reduce the impacts.
- **Positive Determination:** Requires preparation of either an Environmental Assessment (EA) or a PEA. An EA is required when the nature and location of the proposed activities have been established in sufficient detail for an appropriate examination of its potential environmental impact. A PEA is necessary when the nature and location of the proposed activities have not been determined in sufficient detail for an appropriate examination of its potential environmental impact.
- **Categorical Exclusion:** Identifies some or all proposed activities as belonging to those specifically excluded from additional environmental review under USAID environmental regulations.

**Initial Environmental Examination:** The first review to be done of the possible, logical and foreseeable environmental effects that could result from the proposed activities. It will serve as the basis for the Environmental Threshold Decision (ETD). The ETD is the official Agency decision, based on the IEE, which determines if a proposed activity will have major consequences that would seriously affect the environment.

Elements of an IEE are:

- Description of activities.

- Environment requirements in the originating country.
- Environmental considerations in project activities.
- Environmental determination.
- Mitigation, monitoring and evaluation measures.

An initial decision proposal must be included in preparing the IEE that must be approved by:

- MEO (Mission Environmental Officer)
- BEO

The REA (Regional Environment Advisor) fulfills an advisory role.

If the ETD includes a positive determination for some part of the proposed activity, 22 CFR 216 requires a process of analysis to identify the important issues that must be covered in the environmental assessment.

The MAPA 2 Project received a Positive Determination in the ETD that was determined by its IEE, which recommended preparation of a PEA before beginning any technology introduction or improvement. Included in Appendix 1 are the IEE and the ETD for the MAPA 2 Project.

Since some specific programs of the MAPA 2 Project are not yet defined and the Project will initiate completely new activities in the Altiplano, it is recommended that the Economic Opportunities Team prepare a PEA (Terms of Reference, Appendix 2) that should take into account the previous PEA and the PEA evaluation (from MAPA).

In addition, the Economic Opportunities team must ensure that all environmental documentation from MAPA 2 is translated into Spanish; all the necessary information is provided to all counterparts/agencies; also ensure that contractual documentation for the recommended environmental activities associated with MAPA 2 be included; and that all USAID environmental safety measures be incorporated.

Likewise, the MAPA 2 Project IEE had a Categorical Exclusion, described in Section 22 CFR 216.2 c) (2) for all aspects related to training, research, technical assistance and institutional building activities that are briefly described in that section. The MAPA 2 Project IEE provided an explanation of activities required to achieve the expected results. Among these activities are: applied agricultural research, technology transfer, improved production for current crops and introduction of new crops.

## **B.2 BOLIVIA**

The following Bolivian laws are related to MAPA 2 activities:

### **B.2.a Environment Law 1333** (April 27, 1997)

Law 1333 regulates the environmental management, prevention and control of environment, air and water contamination, and management of hazardous solid and liquid wastes. The Ministry of Planning (MDP) is responsible for implementing and enforcing this law, including issuing environmental licenses when necessary and classifying projects according to the category of its potential impact on the environment. MDP has classified potential SIBTA activities as exempt from providing an environmental impact assessment.

### **B.2.b Environmental Regulation for the Industrial Manufacturing Sector** (RASIM - *Reglamento Ambiental para el Sector Industrial Manufacturero*)

This regulation targets reduction of environmental contamination by industry and an increase in its eco-efficiency, reducing risks to man and the environment. This applies to activities that involve operations and processes that transform raw materials, inputs and commodities for final or intermediate products, whether in the stages of implementation, operation, maintenance, closure or abandonment of an industrial activity.

Articles in this regulation refer to legal requirements for location of industries and the steps required for its operation in compliance with environmental regulation.

Every industrial activity must be enrolled. The legal representative must obtain and complete the Industrial Environmental Record (RAI, *Registro Ambiental Industrial*).

Annex 1 to this regulation, “Industrial Classification by Contamination Risk” provides a description of industrial activities and their categories (three categories: 1 & 2, 3, 4). After the relevant environmental authority categorizes the activity in question, either an Environmental Impact Assessment, Environmental Management Plan, Project Description and/or a Industrial Environmental Manifest must be prepared.

RASIM also includes several articles that regulate everything from preparation of required environmental documents to final disposition of solid and liquid wastes, as well as infractions and sanctions for non-compliance.

### **B.2.c Animal Health**

Resolution 328 of Andean Vegetation and Animal Health (October 30, 1992), Resolution 451 and Supreme Decree 25729 on Vegetation and Animal Health (April 7, 2000) are the regulations that control import and export of agricultural products, including plant material, to and from Bolivia. In some cases they could apply to MAPA 2 activities. SENASAG will oversee compliance with these regulations.

**Article 66 of Chapter IX (Agricultural Activity Law)** establishes that agricultural production shall be developed in such a way that sustainable production and use systems can be achieved, taking into account the following aspects:

1. Soil use for agricultural purposes shall be subject to practical standards that ensure agricultural ecosystem conservation.
2. The Ministry of Agriculture will promote execution of plans for restoration of agricultural use lands in the different regions of the country.
3. The Ministry of Agriculture will establish the relevant regulations and technical and control standards for slash-and-burn (*chaqueos*), clearing, farming, use of agricultural machinery, agro-chemical use, crop rotation, cultivation practices and grassland use.

Likewise, **Article 67** in the same chapter provides that “Agricultural research institutions responsible for technology generation and transfer shall direct their activities toward increasing productivity indices over the long term.”

Annex A of the **Water Pollution Regulation**, “Maximum Permissible Limits for Parameters in Receiving Water Bodies,” sets forth that there are clearly established limits for agro-chemical concentrations according to the appropriate water use (mainly irrigation water in the MAPA 2 activities) among other factors.

## C. METHODOLOGY FOR PREPARING THE PEA

### C.1 SCOPE

No scoping study was prepared after the positive determination was made by the ETD for some EO components. Nevertheless, the IEE and the PEA Terms of Reference (Appendix 2) established several potential environmental issues. During preparation of the PEA, the issues for the MAPA 2 PEA were identified based on project documents, interviews and field visits.

The MAPA 2 Project will internalize an environmental management process based on four basic principles for implementation that have been established by ISO 14001. Therefore, the methodology used to prepare this Programmatic Environmental Analysis will adapt to and adopt such principles as guidelines:

- Planning of the Project's environmental management (PEA itself);
- Implementation and operation of identified environmental management actions;
- Measurement and evaluation of environmental management corrective actions; and
- Continuous review and improvement of identified environmental management activities.

Environmental management planning determines various key points to implement activities, evaluating in a practical manner the possible environmental impacts and the activities necessary to achieve an environmental administration from the organizational bases.

The following table describes the stages included in environmental management planning.

Graphic 3

#### ENVIRONMENTAL MANAGEMENT PLANNING STAGES

Identify project activities with environmental implications
Legal framework applicable to the activities
Define environmental performance criteria starting with environmental policy
Establish environmental objectives and indicators
Define the Environmental Program

The most important documents consulted are detailed below:

- PEA of the MAPA Project
- Environmental Review (ER)
- 22 CFR 216
- Environmental Law 1333 of Bolivia
- Environmental Management Assessment of the MAPA Project (2001 to 2005)

- MAPA 2 Contract
- Logical Framework and intervention plan in the Bolivian altiplano
- MAPA 2 Project IEE
- Pesticide Environmental Report Safety Use and Action Plan (PERSUAP)

A series of visits and interviews (not structured) were conducted with participants in the FDTA - Valles and FDTA - Altiplano in order to obtain complementary information pertinent to the objectives of this document (Appendix 3).

## **C.2 STUDY LIMITATIONS**

This PEA was prepared with the following limitations:

- A scoping study was not prepared after the ETD was issued. Relevant issues were incorporated into the PEA during its preparation.
- The specific nature, scope and location of the MAPA 2 field activities in the altiplano region have not been completely defined. Nevertheless, this document incorporates the objectives, results, indicators and system of follow-up and evaluation that will be implemented in the region.

## CHAPTER 2

# DESCRIPTION OF AFFECTED ENVIRONMENT

### **A. REQUIREMENTS OF 22 CFR 216**

Title 22 of the Code of Federal Regulations, Part 216 (22 CFR 216) requires the PEA to describe succinctly the environmental settings of the area(s) to be affected or created by the alternatives under consideration. The descriptions shall be no longer than is necessary to understand the effects of the alternatives. Data and analyses shall be commensurate with the significance of the impact with less important material summarized, consolidated or referenced.

In Bolivia, the diversity of ecosystems allows for a number of agricultural products suitable for tropical, warm or cold climate areas. However, it should be noted that only 1.8% of the total surface area of Bolivia is cultivated.

MAPA 2 Project's work area comprises the valleys in the Departments of Chuquisaca, La Paz, Cochabamba, Tarija and Santa Cruz, located between 1500 and 3000 masl.

The Bolivian altiplano is an extended area (840 km long and 140 km wide) that includes the Department of Oruro and significant portions of the Departments of La Paz and Potosí. Average altitude in the region is 3,600 masl, with maximum altitudes of 4,000 masl.

Soil, climate, relief, ecological and water features, as well as land use history among these departments and the municipalities within each of them, vary to a greater or lesser degree.

MAPA 2 intervention in the Bolivian valleys and altiplano will be concentrated in relatively restricted areas where agricultural production has been developed in the past and/or is currently developed.

Since these small areas have unique micro-climates, environmental data available specifically for them are scarce or nonexistent.

It should be noted that MAPA 2 interventions in both regions will not affect protected areas, natural reserves, archaeological sites or endangered species. These protected areas were excluded during the initial screening of potential areas for project implementation. In addition, the interventions will take place on parcels that were productive in the past or are still productive. However, if the MAPA 2 Project activities are expanded in the future to

other regions, the location of these protected areas will be taken into consideration due to their importance for the country.

This document includes the following maps:

- Map N° 1 shows areas subject to MAPA 2 interventions in the valleys. It should be clarified that MAPA 2 interventions do not take place in protected regions.
- Areas in the altiplano that will be subject to MAPA 2 interventions have not yet been defined; however, protected areas or regions will be avoided. Map N° 2 herein shows the entire Bolivian altiplano.
- Map N° 3 displays protected areas in Bolivia.

### A.1 VALLEYS

**Location.** Bolivian valleys are part of the Sub-Andean geographic zone and extend over 16% of Bolivian territory (175.772km<sup>2</sup>). They make up a belt located in the country's central section and form part of the Departments of La Paz, Cochabamba, Santa Cruz, Chuquisaca and Tarija. MAPA 2 Project will have interventions in the upper, central and lower valleys of Cochabamba, mesothermal valleys of Santa Cruz, upper valleys of Chuquisaca, and the lower valleys of Tarija and La Paz.

Ecological system setting:

- **Climate** – Valleys are located between 1,000 and 3,000 masl, and mean temperature ranges from 16 to 22 °C, *i.e.*, climate in these valleys is temperate to warm temperate. Rainfall varies among the valleys in different departments. Cochabamba has a 400-650 mm annual rainfall; Chuquisaca from 200 to 1500 mm; Santa Cruz receives from 328 to 750 mm, and Tarija ranges from 300 to 550 mm.
- **Physiography** – As mentioned before, Bolivian valleys form part of the Bolivian Sub-Andean zone. Soils in the valleys are generally fertile and of types I, II and III. Vegetation changes among departments: Forest extends over limited surface areas in La Paz and Cochabamba while they become larger in Tarija, Santa Cruz and Chuquisaca.
- **Hydrology** – Valley rivers belong mainly to the La Plata and Amazon basins. Main rivers are the Rio Grande, Mizque, Pilcomayo, Bermejo and others.
- **Land Use** – In general, land in the valleys is good for producing vegetables, potatoes, barley, maize, wheat, beet, sweet potatoes, peach, strawberry, blackberry, cherimoya, etc., thus being an important region for the Bolivian agriculture and economic life. However, the percentage of cropland is low compared to the total country surface area.

**Protected areas.** Among protected areas located within the departments with valleys are Carrasco-Ichilo National Park, Tunari National Park, Incallajta Archeological National Park, Cordillera de Sama Biological Reserve, Taraquia Flora and Fauna National Reserve, Amboro National Park, Iñaño National Park and Integrated Management Natural Area, and El Palmar Integrated Management Natural Area. However, as mentioned above, MAPA 2 intervention will not affect these areas since it will be developed in regions of prior agricultural production located outside protected areas.

The following section includes a basic description of the valleys where MAPA 2 will undertake interventions by

dividing them into upper, central and lower valleys.

**Upper valleys.** Comprised of the northern group, these are the first depressions in the southern mountains located to the south and east of the Bolivian altiplano. The Central Mountain Range (Cordillera Central) is composed of hills and valleys with an optimal climate and fertile lands that allow for intensive agricultural activity. They are made up of scarce forest but with shrub vegetation and crops at altitudes between 2,800 and 3,000 masl.

**Central or intermediate valleys.** These are actual valleys in the true sense, with mesothermal characteristics: wide depressions crossed by permanent-flow rivers with a channel that widens into extended beaches and areas appropriate for cropping covered by brushes. Vegetation covers increases while altitude decreases, and the relief changes. These valleys are located between 2000 and 2800 masl and are distributed throughout Luribay (La Paz), Quillacollo (Cochabamba), Camargo (Chuquisaca), Turuchipa (Potosí), San Lorenzo (Tarija) and Vallegrande (Santa Cruz).

**Low Valleys.** They comprise the southern group. They are mesothermal, as well, and have been formed in deep areas or alluvial depressions. In general, they are closed, with reduced beach areas and lush vegetation. Altitudes range from 1500 to 200 masl, and the climate is warm and slightly humid, with temperatures that sometimes reach 30° C in the shade and periodic rainfall. In some places, this type of valley is known as *vegas* (fertile lowland). They are located in Quime (La Paz), Totorá (Cochabamba), Incahuasi (Chuquisaca) and San José (Tarija).

## A.2 ALTIPLANO

**Location.** The altiplano – also known as “Andean Ecoregion” – is located in western central and south Bolivia, between the Eastern Mountain Range (Cordillera Oriental) to the west (border with Chile and Peru) and the Western Mountain Range (Cordillera Occidental) to the east. It is approximately 840 km long and 140 km wide. Average altitude in the area is 3,600 masl.

**Population.** Less than 0.1% of the Bolivian and Peruvian altiplano region has been subject to urban development. In Bolivia, the Department of Oruro and the satellite city of El Alto are the areas with the highest population.

Rates of rural migration to urban centers are high where a great part of the Bolivian altiplano agricultural production is commercialized and consumed. Urban development generally is not planned, and basic utilities in these areas are quite precarious.

Ecological System Features:

- **Climate** – There are large climate variations on the Bolivian Altiplano both among and within departments. The western part of the altiplano and the Cordillera Oriental foothills are classified as dry climate, specifically, steppe climate (cold and dry winter). The area adjacent to Lake Titicaca is considered a mesothermal or temperate climate (dry winter). Finally, the lower foothills of the Cordillera and a section of the Altiplano are classified as cold climate – tundra. This classification is based on Vladimir Koeppen’s categories. Koeppen proposes a climate classification that takes into consideration the temperature and humidity variations, as well as mean values in hottest or coldest months.
- **Physiography** – The altiplano is made up of flat, high lands. It includes the mining city of Oruro – located to the very center of the region – the Department of La Paz further north and the city of Potosí (over 4,000 masl) to the south. In accordance with the capacity of the soil to allow water infiltration, the altiplano has silt, gravel and sandy

terrain that are considered semi-permeable.

- **Hydrology** – Water sources that drain the Bolivian altiplano come from the Closed or Lake Basin that in turn comprises three sub-basins: Titicaca, Desaguadero and Poopo.
- **Land Use** – The altiplano is characterized by traditional agriculture, which is adapted to weather conditions. Land is cultivated by means of animal traction and local plowing and harvesting tools. Artificial irrigation is not used; planting and harvest periods are fixed; there is a rigorous land rotation system, and natural manure is used for fertilization. Generally there is only one annual harvest.

**Protected Areas.** The protected areas system of the Bolivian altiplano extends over 92,154 ha and includes six natural reserves: the Ulla Ulla National Reserve, located in the Camacho Province of the Department of La Paz, with 15,000 ha and aimed at preserving vicuñas, mammals and birds; the Cerro Comanche Sanctuary, located in the Province of Pacajes (Department of La Paz), with 74 ha, was created to preserve the grassy areas (*pajonales*) and the *puya Raimondi* (*puya raimondii*); the Wildlife Shelter in the Province of Cercado (Department of Oruro) with 11,000 ha established to preserve the vicuña.

In addition, the Bolivian altiplano includes the Eduardo Avaroa Andean Fauna National Reserve, the Sajama National Park and the Wildland Relict Areas.

The MAPA 2 Project activities will be developed in small restricted areas that do not affect ecological fragility areas.

## **B. GENERAL ENVIRONMENTAL PROBLEMS IN THE VALLEYS AND ALTIPLANO REGIONS**

### **B.1 VALLEYS**

#### **B.1.a Erosion**

Erosion due to changes in plants genetic map, wind, and water are the greatest problems in the valleys. These types of erosion have natural and/or man-made causes. Natural causes include features such as steep geological formations, dryness, winds and erratic behavior of river or other water sources, etc. Loss of agricultural land due to wind and water erosion is about 60 ton/ha/year in some areas.

Main man-made causes for erosion are due to human intervention with a non-rational use of resources such as deforestation, overgrazing, soil compaction, nutrient extraction rate higher than reposition rates, inadequate irrigation practices and other factors.

#### **B.1.b Salination**

In some areas where annual rainfall is limited and crop irrigation practices are inadequate, salination appears or increases. Such areas are located in the valleys south of Tarija and Chuquisaca, with a rainfall of 300 – 400 mm/year.

#### **B.1.c Contamination by agrochemicals**

This is the second greatest environmental problem related principally to high input technified agriculture in the valleys. Sometimes the use of agrochemicals (fertilizers, pesticides, herbicides and plaguicides) without technical criteria, in excess and/or inadequately provokes contamination of soil, water and crops. This condition is worsened by the use of unauthorized agrochemicals with toxic and even carcinogenic affects.

In general, agrochemicals are over-used, and farmers prepare mixes with several different pesticides, thus reducing

their effectiveness and contributing to the rapid formation of pest resistance.

Likewise, the use of agrochemicals can contaminate nearby sources of water used by inhabitants in various manners, and herbicides can destroy soil structure by compacting it and reducing its use potential. Furthermore, the use of appropriate safety equipment for agrochemical application is almost non-existent in the region.

#### **B.1.d Inappropriate application of agrochemicals**

In order to maintain or increase production, generally of products with market demand, agrochemicals are applied (mostly nitrogenated and phosphorated compounds, nitrites, phosphates, urea, pesticides and herbicides). Applications do not follow an appropriate calendar schedule, and information regarding agrochemical types and dosages is not disseminated among farmers.

Another problem is the irregular or non-existent use of safety equipment during application of agrochemicals. Very frequently, farmers who apply those agrochemicals do not even wear footwear, and even less other necessary equipment. Likewise, equipment is not carefully stored or washed after application. In some areas, women and even children can be seen applying pesticides. Economic considerations as well as the fact that farmers are simply not accustomed to using safety equipment and/or lack knowledge about harmful health effects are some reasons for this situation.

#### **B.1.e Deforestation to prepare fields**

In some regions it is necessary to increase production areas by the practice of slash-and-burn or *chaqueo*. This practice contaminates the air with CO<sub>2</sub> emissions and creates a high risk of fire spreading. Farmers prefer vegetation burning in order to reduce costs (particularly labor) and incorporate ash into the soil. There is no custom of re-planting or increasing vegetation in areas adjacent to where the slashing and burning occurs.

Deforestation destroys the ability of trees to purify the air and therefore is a practice that damages the ecosystem and its balance.

In Bolivia, woodland deforestation occurs particularly in the lowlands. Although deforestation figures vary according to the information source, it is known that this practice is increasing exponentially. Nevertheless, compared to the deforestation rates of neighboring countries, Bolivia shows a low index.

#### **B.1.f Permanent crops**

Single-crop farming is a widely generalized practice in Bolivian valleys. It increases the risk of disease spread, genetic erosion and excessive extraction of the same type of nutrients from soil. Moreover, permanent crops result in environmental simplification, i.e., a decrease in the biological diversity which is considered important to regulate the way ecosystems respond to the increase of carbon dioxide in the atmosphere. The most radical standpoints against permanent crops state that there cannot be sustainability where single-crop farming exists.

### **B.2 ALTIPLANO**

#### **B.2.a Erosion**

According to the quarterly periodical “*Bolivia Ecológica*” (No. 13), 2% of the Bolivian altiplano has been classified as very eroded (2,855km<sup>2</sup>). These lands are located principally in the Intermediate Desaguadero basin.

The erosion process has been accelerated by agrosilvopastoral and mining activities, which many times are carried out

in an excessive manner or without any sort of planning. Additionally, natural agents such as rain, drought, and wind, affecting bare soils, accelerate the erosion process in the region. Eroded soils generate a large quantity of sediment that ends up at water sources, being responsible to a large degree for filling up in rivers and overflows.

Studies in the region do not differentiate between erosion of anthropogenic and geologic origins; it is maintained that this differentiation would be too superficial given the various millenniums of agropastoral practices that have nearly left the total area deprived of natural vegetation.

### **B.2.b Land overexploitation**

There is a serious incongruence between the actual use of land and land use capacity in the Bolivian altiplano. Studies in the region mention that at least 46,455 km<sup>2</sup> is overexploited, representing a third of the land in the region (35.2%).

This overexploitation occurs in lands that are marginal and not suitable for cultivation, with scarce tree or shrub vegetation. The rest of the lands are suitable for cultivation and/or grazing, non-arable lands suitable for permanent crops and extensive grazing, rock outcrops, sands, rocky ground, and salty lands.

Overexploitation is the result of low soil productivity, obligating farmers to expand their cultivation areas in order to increase yield. One of the factors causing low productivity is the use of rudimentary technology to exploit the land and cultivate various agricultural products. If an increase in production on the same area, although reduced in size, could be achieved, levels of land overexploitation would decrease significantly.

### **B.2.c Salination**

Salty lands cover 3,449km<sup>2</sup> of Bolivian territory (2.4% of the total surface area of the Bolivian altiplano). These areas are located primarily in the Poopo – Salares and Desaguadero basins, with some in the Titicaca basin.

The salinity of water in the rivers varies from 1 to 2 g/l (Joya) to 100 g/l in the case of Poopo Lake.

The use of water from the Desaguadero River for irrigation has serious limitations due to its salinity. This situation limits agricultural practices, and it is important to evaluate not only the scarcity of water but also its tendency towards high salt concentrations.

In addition, the groundwater in the region has high salt concentrations. However, residents of the region generally know of traditional methods for locating underground springs having low salt content.

### **B.2.d Soil compaction**

Despite the fact that there are no studies in this regard, continuous overgrazing of livestock (principally bovine) not only destroys surface vegetation but also compacts surface soil, impeding the growth of vegetation. This compaction diminishes water infiltration capacity and oxygenation, and therefore, considerably reduces crop yield. Among the animals that graze in the altiplano, camelids are considered animals that do not have a large impact on soil compaction, due to their lower body weight and soft, small hooves, in contrast to cows, sheep, and goats.

### **B.2.e Low fertility**

Low soil fertility occurs when the nutrient extraction rate is greater than its replacement rate. Part of the soil nutrients is lost through crops and used pastures. Moreover, the cold climate conditions of the area do not allow for the rapid decomposition of organic materials, obliging the farmer to leave soils to fallow for long periods.

Organic and chemical fertilizers can be used to increase fertility. However, the incorporation of nutrients in lands of

the Bolivian altiplano is not methodical, and in many cases the application of agrochemicals or the preparation of fertilizers requires extra effort or finances that the farmer is not able to cover, this being the situation principally in poorer or micro-farm zones. Add to this the farmer mentality which generally focuses on quick results.

In order to achieve high-yield annual production, it is necessary to apply rapid decomposition organic manure (such as poultry, porcine, etc.), to apply chemical fertilizers, and to engage in crop rotation. However, the application of agrochemicals generally has negative consequences, as will be seen in the following sub-section.

#### **B.2.f Inappropriate application of agrochemicals**

Agrochemicals are applied (mostly nitrogenated and phosphorated compounds, nitrites, phosphates, urea, pesticides and herbicides) in order to maintain or increase production, usually of products with market demand. Farmers generally give a higher priority to these purchases than manure and fertilizers, with focus on immediate results that is only aimed at pest control and not management. Applications do not follow an appropriate calendar schedule, and information regarding agrochemical types and dosages is not disseminated among farmers.

This situation is worsened by the use of unauthorized agrochemicals with toxic and even carcinogenic effects, which are acquired at a low cost from contraband and/or adulterated sources.

Likewise, the use of agrochemicals can contaminate nearby sources of water used by inhabitants in various manners.

Furthermore, the use of appropriate safety equipment is almost non-existent in the region, both for economic reasons and the fact that farmers are not accustomed to use it and/or lack knowledge about harmful health effects.

#### **B.2.g Droughts and floods**

There are records of numerous droughts generally affecting the entire Bolivian altiplano. Farming, ranching, and fishing are the sectors most affected by water scarcity. The drought of 1989-1990 caused an agricultural loss estimated at US\$ 88.5 million.

With respect to floods, two types can be distinguished: slow developing and relatively quickly developing, the former causing the most damage in the past. Losses due to floods are estimated at US\$ 34 million annually (in years when floods occur).

Although they are natural events, droughts and floods are being influenced by massive deforestation, overgrazing, erosion, sedimentation of river beds, inappropriate location of infrastructure and productive activities, and a lack of high level prediction models in lakes (in the case of floods).

#### **B.2.h Organic, bacterial, and physical/chemical contamination**

This contamination is produced by dumping sewage in Bolivian altiplano river basins. Since there are no treatment plants, wastewater has high concentrations of organic materials and coliform bacteria. This situation accelerates the eutrophication process with the growth of duckweed (*Lemna* sp). The most contaminated sources of water are the following:

- The lower course of the Coata River (due to dumping wastewater from Juliaca);
- Uru Uru Lake (due to dumping wastewater and trash from the Department of Oruro);
- The interior Bay of Puno (though two treatment plants were installed here that lowered contamination indexes significantly).

Furthermore, dumping industrial wastewater from mines and urban populations lowers the quantity of dissolved oxygen (in the Uru Uru and Poopo Lakes) and increases sulphate concentrations (Desaguadero River, mostly the Japones and Chuquiña bridges) and silica (Desaguadero River, Mauri tributary).

## **C. CONSERVATION TECHNOLOGY RESOURCE**

The following activities that could be promoted by MAPA 2 are provided as examples of the “conservation technology bank,” taking into consideration that in the valleys region the activities of the various projects will be implemented by technology providers supervised by FDTA - Valles, an institution to which MAPA 2 will provide technical assistance. The same is true for those projects to be financed and accompanied through technical assistance and training by MAPA 2 in the altiplano region through FDTA - Altiplano .

It must be emphasized that the indicators that this PEA will propose for MAPA 2 activities will not be developed by considering specific conservation technologies, but rather will propose the training and distribution of educational materials on these conservation technologies for technology providers (direct field operators). Likewise, indicators for MAPA 2 activities in this PEA will emphasize instruments and monitoring and evaluation procedures in order to ensure that the training of providers in conservation technologies be widespread and be applied by technology providers in their technical assistance activities with farmers.

### **C.1 FOR AGRICULTURAL PRODUCTION**

The conservation technologies to be used in both regions where MAPA 2 will implement activities through mechanisms for FDTA - Valles or for FDTA - Altiplano consist of in-farm technologies that have the goal of rapidly increasing agricultural production and therefore, the income of the poor in rural areas. It will not participate in conservation activities off-farm, such as management of basins, forests, and protected areas or reforestation, since these are not project objectives, nor is the budget sufficient for such. The actions and technology to be used in-farm should be environmentally feasible in order to prevent negative effects on the surrounding area or region. For example, a reduction in the use of pesticides will reduce pressure or contamination in the course of water or groundwater that, in addition to affecting the farm, affect the watershed in general. However, constant monitoring should occur to identify possible impacts off-farm resulting from promoted in-farm technologies in order to take mitigation measures in the case of negative impacts. These aspects will be incorporated into a guide for the identification and characterization of environmental impacts for each project to be sub-contracted and will be monitored through a follow-up and evaluation system.

MAPA 2 should promote conservation technologies systematically in the activities it finances (directly through FDTA - Altiplano) while at the same time increasing the net income of agricultural businesses and therefore, that of the poor in rural areas. A series of conservation technologies were identified that are supported for both regions. The majority of these have been identified and promoted by previous development projects. The challenge is, then, to understand and promote incentives on a significant scale in order to encourage the diffusion and adoption of conservation technologies in-farm on the basis of the financial interests of each farmer. It should be noted that this realistic perspective for the introduction of conservation technologies is effective only in consultation with farmers themselves.

The potential in-farm conservation and environmental protection technologies that MAPA 2 should promote fall into four large categories that affect soil, water, flora and fauna, respectively.

### **C.1.a Soil**

This category involves the maintenance of and increase in organic material in soils, fertility, and the in-farm soil erosion. These technologies include crop rotation, creation of compost with organic waste, incorporation of additional organic material, appropriate use of terraces, plowing techniques and equipment that minimize the risk of erosion due to water and wind, and the use of chemical fertilizers on a solid technological basis, as well as an increase in vegetation.

General policies should create economic incentives for soil conservation; solutions to actual soil conservation problems should be appropriate for the particular circumstances of each farm and farmer. It will be necessary, then, for MAPA 2 to contract technical service providers in order to identify problems in soil conservation and solutions for each farm as a systematic part of improving production technology.

### **C.1.b Water**

The management of irrigation water is essential, not only for the financial success of agricultural businesses in the short term, but also for the long-term productivity of irrigated soils used for agricultural production. The techniques that are used to irrigate crops have the potential of improving or degrading the land used for these activities. For example, the expansion of irrigation in a dry climate without sufficient drainage could cause the migration of soil salts towards the surface and salinization of the surface soil. The correct application of irrigation could also contribute to the accumulation of organic material by creating necessary moisture conditions, thus improving soil fertility and structure for the plant growth, as well as reducing the risk of water or wind erosion.

### **C.1.c Flora**

The in-farm management of vegetation plays an important role in its conservation. Agricultural crops produce residue such as trunks or leaves that can be used as organic additives for the soil. Trees around the borders or in the crop fields can benefit agricultural productivity through their positive effect on micro-climate conditions by providing shade and reducing wind velocity.

Some trees and other types of vegetation add nutrients to the nearby soil, particularly nitrogen, through their leaves and roots. Alder trees (*Alnus alcuminata*) in the valleys of Corani and Tablas Monte of the Department of Cochabamba, for example, produce nitrogen in a symbiotic relationship with bacteria; alder leaves also produce a fertile layer of humus on the soil surface where they fall. The residue from crops, trees, and shrubs could provide fodder for farm animals whose manure increases soil fertility and improves its structure, creating better conditions for agricultural production. Trees and bushes on farms provide fuel for families, reducing imported fuel costs and increasing the net income of their businesses.

An increase in vegetation should be promoted, since it is known that a vegetation belt between cultivated fields and water bodies, if sufficiently wide and dense, can filter a great percentage of agricultural chemicals or animal waste that could contaminate water through its roots. Therefore, this vegetation helps maintain a sufficient level of water quality for human and animal consumption, as well as preserve aquatic organisms.

The maintenance of native vegetation in the farm certainly would not preserve the whole range of original plants and animal diversity associated with the vegetation; however it could contribute to the conservation of some biodiversity and provide fauna habitat.

In-farm vegetation, cultivated or otherwise, could be managed to contribute to the reduction of attacks by insects and

diseases on crops. For example, crop rotation could break the cycle of certain insects and diseases that attack crops, thus reducing crop damage and increasing production and quality and, therefore, net farm income.

Some insects and diseases reproduce and spread less quickly if the farm land is divided into different vegetation sections. Natural vegetation can also provide a natural source for attracting prey insects, thereby reducing the need for commercial pesticides and supply costs and increasing farm income.

#### **C.1.d Fauna**

The attractiveness of the farm for fauna can be employed through conservation technologies that are based upon different vegetation species and structures, the creation of suitable habitats, and the creation of protection for water bodies. Fauna can be useful or destructive for farm production.

#### **C.1.e Insects and diseases**

Fumigating with pesticides is one way to control insects and diseases that attack crops. However, pesticides generally reduce insect and disease levels only temporarily, and they must be applied repeatedly. Furthermore, if they are not applied technically, the repeated application of pesticides almost invariably favors the reproduction of resistant specimens of insects and diseases. After a certain period, the population of resistant insects and diseases, which could have been very small when a given pesticide was first used, begins to grow in relation to the non-resistant population. Resistant organisms become the dominant genotype in the insect or disease population. In this case, pesticides become less effective or completely ineffective. This resistance requires more and more frequent pesticide applications or a change to other pesticides that are generally more expensive.

In fact, farmers have stated that pesticides have become ineffective against the insects and diseases that attack some of their most important crops, such as onion and tomato. The effect of this resistance will be seen in greater production costs, lower productivity, and poor quality. This situation can generally apply to a large portion of farmers that experience problems of pesticide resistance due to their constant use.

The indiscriminate use of pesticides can also cause spread of pests through animals within an ecological system and affect their relative abundance, although data has not been obtained to evaluate this risk quantitatively.

For this reason, Project MAPA 2 should promote IPM in projects both in the valleys and in the altiplano.

## **C.2 FOR THE MANUFACTURING OF AGRICULTURAL PRODUCTS**

Technologies proposed must be designed according to the requirements of environmental norms. GMPs and GHPs should be promoted, as well as necessary industrial safety measures in all transformation processes.

A table is included in Appendix 4 with a bank of mitigation measures and conservation technologies of GAPs and GMPs that complement those mentioned above

# ANALYSIS OF ENVIRONMENTAL CONSEQUENCES

## A. BACKGROUND

This section of the PEA analyzes environmental topics and classifies them as follows:

- Not Significant and Not Considered
- Significant and Considered

The **Not Significant** and **Not Considered** topics, environmentally speaking, are those that have been eliminated from subsequent consideration given that it has been found that:

1. They have no relation to proposed activities.
2. They can cause a very slight negative impact.
3. They can cause only positive substantial environmental impact.
4. They are already considered and resolved in the proposed alternative.
5. They are beyond the possibility of resolution within the scope of proposed actions.

The **Significant** and **Considered** topics are those that the PEA has identified that:

1. Can cause significant environmental impact due to their permanence, large scale and intensity, or because they affect a particularly important aspect of the functions or biodiversity of the ecological system.
2. Have not been resolved in the proposed alternative.
3. Can be resolved through proposed actions.

## B. NOT SIGNIFICANT AND NOT CONSIDERED ENVIRONMENTAL TOPICS

### B.1 ANIMAL BREEDING

#### B.1.a Description of the topic

Project activities can increase domestic grazing within the project area and, therefore, contribute to a greater degradation of grazing lands and forests, as well as to the contamination of water bodies.

### **B.1.b Source of the topic**

Documents of FDTA - Altiplano mention animal breeding as a possible intervention activity (camelids).

### **B.1.c Justification for its elimination**

Although FDTA - Altiplano has plans for supporting animal breeding (specifically camelids), MAPA 2 has no plans to provide any type of assistance for animal breeding.

## **B.2 DEVELOPMENT OF IMPROVEMENTS IN MARKET INFRASTRUCTURE**

### **B.2.a Description of the topic**

The construction or rehabilitation of market infrastructure (roads, markets, etc.) produces direct negative effects on the environment (soil or vegetation problems and the production of contaminating wastes) and negative indirect effects (deforestation).

### **B.2.b Source of the topic**

This topic emerged from discussions of MAPA 2 activities for promoting market access.

### **B.2.c Justification for its elimination**

Project MAPA will not provide any assistance for the improvement of market infrastructure (roads, construction of markets).

## **B.3 ENDANGERED AND ENDEMIC SPECIES**

### **B.3.a Description of the topic**

The activities promoted by the MAPA 2 Project, both in the valleys region as well as in the altiplano, could cause indirect impact through the destruction of the endangered species habitat.

### **B.3.b Source of the topic**

This topic emerged in conversations and discussions regarding locations for project interventions and implementation. However, locations with previous agricultural activities have been determined for deciding upon intervention and implementation sites.

### **B.3.c Justification for its elimination**

The actions to be implemented by both Foundations with the support of MAPA 2 are focused on areas that have had agricultural intervention for many years and that do not influence protected areas or conservation sites for endangered and endemic species. However, this will be a point to consider in possible expansion activities that will require the application of a specific Environmental Assessment.

## **C. SIGNIFICANT AND CONSIDERED TOPICS**

### **C.1 USE OF PESTICIDES**

#### **C.1.a Description of the topic**

The greater demand for agricultural products that are promoted by the marketing components of MAPA 2 could stimulate a greater use of pesticides, which would have a negative impact on the functions and biodiversity of the ecological system.

The support of MAPA 2 in agricultural commodity chains, at distinct levels in both FDTAs, could require the use of greater quantities of agricultural chemicals and cause a greater deterioration rate in water and soil quality within project intervention areas.

### **C.1.b Background**

The uncontrolled, indiscriminate use of pesticides is one of the greatest environmental problems in Bolivia. The indiscriminate use of pesticides, without a technical basis, has already created the resistance of many diseases and insects to common, low-cost pesticides. This resistance creates the need for stronger pesticides. Sometimes pesticides destroy beneficial micro-fauna, reducing natural pest control ability. The continuous use of pesticides and greater resistance to pests can eventually lead to the introduction of pesticides into the alimentary chain that have a negative impact on animal species. Pesticides can also negatively affect the quality of groundwater that is used for human consumption and soil that is used for agricultural production.

The environmental regulations of USAID require the preparation of a PERSUAP when a project finances the purchase of pesticides, provides technical assistance or training that might make recommendations regarding the use of pesticides, or stimulates the additional use of pesticides in any way. The PERSUAP is an Annex to this document.

## **C.2 POST-HARVEST TECHNOLOGY**

### **C.2.a Description of the topic**

The promotion and introduction of new post-harvest and processing technologies directed at improving financial returns to the farmer could generate a greater need for water and energy, thus creating the risk of greater negative environmental impacts on water and air quality.

### **C.2.b Background**

Improvements in post-harvest processes could cause greater water and air pollution. For example, they could create the production of solid organic waste. This waste, if not eliminated properly, could create a favorable environment for the development of insects and bacteria, could remain contaminated with vegetal diseases or retain traces of pesticides that could contaminate the soil, groundwater, surface water, markets and housing.

## **C.3 INDIRECT IMPACTS ON THE CONVERSION OF NATURAL AREAS TO AGRICULTURAL LANDS**

### **C.3.a Description of the topic**

Greater demand and improved prices for some agricultural products could increase their profitability and stimulate a growth in production areas and, thereby, the conversion of areas with natural coverings to agricultural areas.

### **C.3.b Background**

Experiences with successful agricultural projects have indicated expansion to forested lands and protected areas. It has been seen, for example, that promising results in yield increases have led farmers to modify forested areas for the cultivation of crops with which they had positive experiences.

## **C.4 NEW CROPS / NEW VARIETIES**

### **C.4.a Description of the topic**

The introduction of new crops implies the risk of the uncontrolled propagation of exotic species in natural and agricultural environments, with the danger of producing a negative impact on agricultural production and on the

biodiversity and functions of the ecological system.

#### **C.4.b Background**

Intervention in the altiplano region and in the New Opportunities Program of FDTA - Valles will focus on the investigation of promising crops such as cut flowers, snow peas, and others. An investigation program that includes the introduction of vegetal material but does not comply with required norms or quarantine procedures and strictly control investigation areas could lead to the introduction of pests with the crop, their uncontrolled growth, and their invasion of zones, causing ecological dysfunction in intervention areas.

### **C.5 VULNERABILITY OF IRRIGATION SYSTEMS**

#### **C.5.a Description of the topic**

Irrigation systems in the valleys are vulnerable to destruction due to sedimentation and landslides caused by deforestation and poor land use practices in basins providing water.

#### **C.5.b Background**

The proper management of irrigation water could create potentially degrading actions on the land dedicated to such. For example, the use of irrigation in a dry climate without sufficient drainage could cause the migration of salts to the surface and the salination of the soil surface. The incorrect use of irrigation water could “wash” organic material contents, destroying soil fertility and structure needed for plant growth, as well as create erosion risks from water and wind.

## CHAPTER 4

# ALTERNATIVES

### **A. BACKGROUND**

This chapter presents the possible alternatives to achieve MAPA 2 goals. Some of the alternatives of further consideration are eliminated because neither the time nor the available funds will allow the achievement of the proposed activity.

Three alternatives are described:

- A. The proposed alternative - MAPA 2;
- B. A reasonable alternative - MAPA 2 with mitigation actions for negative environmental impacts; and
- C. No-Action alternative.

Criteria used for the selection of alternatives center on environmental issues, i.e., the analysis criteria consider potential environmental impacts resulting from MAPA 2 in its original form, without including mitigation measures for negative impacts. They also consider which environmental impacts and mitigation measures should be incorporated into MAPA 2 design to make it environmentally feasible.

### **B. ELIMINATED ALTERNATIVES**

#### **B.1 MARKETING WITHOUT POST-HARVEST AND/OR PRODUCTION SUPPORT**

##### **B.1.a Brief Description**

FDTAs, supported by MAPA 2, would focus exclusively on finding and identifying markets for agricultural products cultivated in poor rural areas of the valleys and altiplano. This implies to be involved in project financing adopting the market as the only force driving the production processes.

##### **B.1.b Justification of its elimination**

The development of stable and profitable markets for agricultural commodities requires a reliable supply, both in quality and in quantity. If both Foundations concentrate their activities exclusively on establishing and enhancing agricultural commodity markets, they would risk not being able to supply these products in adequate quantity and quality to developed markets. Focusing on markets would not involve support of appropriate production procedures,

or farmers would be forced to produce using a quantity approach without taking into account the environmental protection issue. Probably, marketing work would not yield expected results. Hence, this alternative would not achieve the goal of rapidly increasing the income in poor rural areas.

## **B.2 PRODUCTION AND POST-HARVEST WITHOUT MARKETING ACCOMPANIMENT**

### **B.2.a Brief Description**

FDTAs, supported by MAPA 2, would focus exclusively on providing assistance to farmers in the valleys and Altiplano to increase the reliability, quality and diversity of their agricultural production.

### **B.2.b Justification of its elimination**

Farmers already have to deal with very low prices for all current agricultural crops; this indicates that market demand may not grow rapidly. Moreover, markets for new crops usually are comparatively small and uncertain, at least during the introduction phase. Therefore, an approach based exclusively on agricultural production would pose a risk of flooding the agricultural commodity markets, thereby reducing the price of products. Consequently, this option would not achieve the goal of increasing incomes of farmers in valley and Altiplano rural regions in the short term.

## **B.3 ENVIRONMENTAL MANAGEMENT WITHOUT PRODUCTION, POST-HARVEST OR MARKETING ASSISTANCE**

### **B.3.a Brief Description**

FDTAs, supported by MAPA 2, would focus exclusively on providing assistance to farmers so that they may preserve their natural resources and improve environmental conditions on and off the farm.

### **B.3.b Justification of its elimination**

A Project based only on the preservation of environmental resources and improvement of environmental conditions in-farm in the short term would make it difficult to relate conservation improvements to the increase of farmer net income. This option would not achieve the goal of increasing the income of a significant number of poor families living in the Bolivian valleys and Altiplano regions in the short term. This alternative should be considered and incorporated transversal and complementarily to the project for the achievement of sustainability in the design of MAPA 2 and not as an isolated and unique option.

## **C. DETAILED CONSIDERED ALTERNATIVES**

### **C.1 ALTERNATIVE A: PROPOSED ALTERNATIVE - MAPA 2 PROJECT**

Alternative A is MAPA 2 project in its actual design which has been described in detail elsewhere herein.

### **C.2 ALTERNATIVE B: REASONABLE ALTERNATIVE – MAPA 2 PROJECT WITH MITIGATION MEASURES FOR NEGATIVE ENVIRONMENTAL IMPACTS**

Alternative B would add explicit environmental protection elements to components already existing in MAPA 2.

**Strengthen and consolidate FDTA - Valles and the agricultural production chains selected in Bolivian valleys.** MAPA 2 would involve the actions proposed above, selection processes and studies on the prioritized agricultural production chain that transversely internalize acceptable environmental issues.

- Include project selection criteria based on potential environmental impacts in FCI and FDTA - Valles mechanisms.
- Provide accompaniment and technical assistance to develop technological packages and terms of reference embodying conservation measures and technologies for post-harvest and marketing agricultural activities.
- Develop and execute follow up and evaluation systems in the framework of environmental policies such that service providers (or field operators) ensure the performance of actions proposed in the technological packages, terms of reference and proposals.
- Promote cross-training processes in environmental issues for service providers who, in turn, should promote these processes to farmers.

Ensuring compliance with animal and food safety regulations, including any necessary certifications, will facilitate national and international market access for products supported by the project.

Market mechanisms that orient production processes toward conservation technologies and environmental mitigation measures will facilitate an efficient access to those markets.

**Develop activities in the Bolivian altiplano.** MAPA 2 would involve the actions proposed above, selection processes and studies on the prioritized agricultural production chain that transversely internalize acceptable environmental issues.

- Include project selection criteria based on potential environmental impacts in FCI and FDTA - Altiplano mechanisms.
- Provide accompaniment and technical assistance to develop technological packages and terms of reference embodying conservation measures and technologies for post-harvest and marketing agricultural activities.
- Develop and implement follow up and evaluation systems in the framework of environmental policies such that service providers (or field operators) ensure the performance of actions proposed in the technological packages, terms of reference and proposals.
- Promote cross-training processes in environmental issues for service providers who, in turn, should promote these processes to farmers.

Ensuring compliance with animal and food safety regulations, including any necessary certifications, will facilitate national and international market access for products supported by the project.

Market mechanisms that orient production processes toward conservation technologies and environmental mitigation will facilitate efficient access to those markets.

Furthermore, MAPA 2 would promote the development of organic production technological packages and organic certification of products developed.

Specifically for the altiplano region where MAPA 2 project will intervene with donation funds directly and through the Trust Fund, the project will:

- Encourage participation of farmers in non-traditional agricultural chains whose introduction, validation and dissemination processes comply with the financing agency and Bolivian environmental regulations in force.

- Improve farmer income as a result of using new technologies for traditional agricultural production chains in the altiplano by developing technological packages and terms of reference that include conservation measures and technologies for agricultural post-harvest and marketing activities.
- Consider and apply mitigation measures for negative environmental impacts in business plans to be prepared and international export plans.
- Adapt transformation enterprises supported by MAPA 2 in the altiplano to the regulations in Law 1333 and apply actions defined therein.

### **C.3 ALTERNATIVE C: NO ACTION – MAPA 2 PROJECT IS NOT DEVELOPED**

Alternative C implies no action. The current condition of rural poverty due to low agricultural production, inappropriate post-harvest practices and weak links with the market would continue in the valleys and altiplano regions, excepting the improved results generated by FDTAs' actions alone without any financial support from USAID. Eventually, other donors such as the IADB would provide financial support to the FDTAs.

## **D. PREFERRED ALTERNATIVE RECOMMENDED**

### **D.1 COMPARISON OF ENVIRONMENTAL IMPACTS FROM ALTERNATIVES**

Alternative A (current MAPA 2 design) would generate both positive and negative effects. The positive impact would result in higher net income for poor people in the valleys and altiplano rural areas. To demonstrate quantitatively the link between the increase in net income for the poor and the positive environmental impact exceeds the scope of this PEA. However, such increase could reduce the migration of poor people from the valleys and altiplano rural areas to other places in Bolivia (rural and urban). Therefore, it would reduce the environmental degradation and contamination in areas that receive rural migrants. As an example, fewer immigrants to the cities could reduce air and water contamination in urban areas. Likewise, a reduced migration to the tropical forest in the lowlands could decrease deforestation and biodiversity loss and degradation of ecological system functions.

However, Alternative A does not include certain activities that would promote sustainable agricultural production, post-harvest processing and marketing.

Environmental impacts of Alternative A related to significant and considered environmental issues are as follows:

**Use of pesticides:** The increase in net income of the poor in rural areas could be achieved in the short term through a greater use of pesticides. However, without the adequate technical conditions for application, it is almost certain the pesticide effectiveness will decrease due to pest resistance. A higher pesticide application could also pose both short- and long-term risks to human health. A greater use of chemical fertilizers, for example, could increase net income, but if there is not a permanent improvement in the fertility and structure of farm soils, this improved production would be only short term and become increasingly more expensive.

**Post-Harvest Technology:** The introduction of post-harvest technologies considers such positive effects as: harvesting at the peak time to maximize the storage time and consumption quality; minimizing the use of post-harvest chemicals (waxes, fungicides, preservatives, etc.); searching for alternative techniques that help reduce chemical use, such as controlling atmosphere and temperatures. However, the promotion of post-harvest

technologies, particularly in the agro-industrial area, without performing adequate mitigation measures and using inappropriate sites, among other reasons, could eventually result in surface water and even groundwater pollution, air/noise contamination and soil contamination.

**Conversion of natural areas into agricultural lands:** Without the proper training and preventive measures, the promotion of profitable agricultural crops can generate expansion of the agricultural frontier to lands not suitable for that purpose.

**New crops/new varieties:** New varieties being introduced without the necessary importation, quarantine and other measures may generate vulnerability to pests and diseases in native plants and the uncontrolled spread of the introduced plant material that threatens natural flora habitat.

**Irrigation systems vulnerability:** The promotion of irrigation systems to increase yield increase in those crops being promoted can lead to the inappropriate use of surface and ground water, and salination of soils resulting from use of water sources with saline load, among other effects.

Like Alternative A, Alternative B would increase income of the poor in the valleys and altiplano rural areas. This would generate environmental benefits by decreasing deforestation rates and urban contamination.

However, Alternative B would add environmental components to the current design of MAPA 2. These components would enhance agricultural production, post-harvest and marketing.

- **Environmental mitigation measures.** FDTA action would promote aspects regarding conservation technologies proposed in this PEA.
- **Pesticides.** Using the PERSUAP included herein (Appendix 5), MAPA 2 would design and promote a training program for pesticides and integrated pest management. MAPA 2 would design this program not to interfere with competitive financing mechanisms, so that operations could be started as soon as possible.
- **Follow-up and evaluation.** MAPA 2 would promote the implementation of Follow-up and Evaluation tools and mechanisms so FDTAs take into consideration environmental issues, ensuring that technology operators or providers reach the farmer with the proposed conservation technologies. This process will not interfere with competitive financing mechanism.

Environmental impacts of Alternative B regarding significant and considered environmental issues are as follows:

**Use of pesticides:** Implementation of PERSUAP according to the concepts expressed above and in the document annexed to this PEA:

**Post-Harvest Technology:** The introduction of post-harvest technologies considers positive effects such as harvesting at peak times to maximize storage time and consumption quality; minimizing the use of post-harvest chemicals (waxes, fungicides, preservatives, etc.); searching for alternative techniques to help lower the use of chemicals, for example, controlled atmosphere and temperatures. The promotion of cleaner production technologies, particularly in the agro-industrial area, the development of adequate mitigation measures, location of suitable sites, preparation and implementation of good manufacturing and hygiene practice standards will be also sought.

**Conversion of natural areas into agricultural lands:** Technological packages for the crops to be developed will be promoted in order to contribute to sustainable development by increasing yields in surface lands previously used for

agricultural activities (productivity increase).

**New crops/new varieties:** Research and validation programs will be promoted for new crops and varieties that involve technical and human aspects such as importation, quarantine, validation and other measures that could prevent vulnerability to pests and diseases in native plants and the uncontrolled spread of the introduced plant material that threaten natural flora habitat.

**Irrigation systems vulnerability:** The encouragement of irrigation systems to benefit increased yield of crops being promoted will take into consideration training and technical assistance programs regarding the proper water use.

Alternative C would not generate benefits, the intensification of agricultural production or in-farm conservation technology. Even though it will not cause any additional environmental impact, neither would it generate any action to stop or reverse the trends of severe natural resource and environmental degradation that currently affects the valleys and altiplano regions.

**Alternative B is recommended since it involves significant aspects that this PEA approaches in an environmentally appropriate manner.**

## CHAPTER 5

# MITIGATION MEASURES AND PROPOSED ENVIRONMENTAL PROGRAM FOR MAPA 2

### **A. ENVIRONMENTAL POLICY PROPOSAL**

The MAPA 2 project global policy is to improve the farmers' quality of life by increasing production and product quality, primarily by promoting adoption of new technologies through the FDTAs. On the basis of this global policy and MAPA experience, the MAPA 2 Environmental Policy will seek to propose new technologies based on sustainable and rational natural resources use, both in-farm and in manufacturing processes, thereby encouraging agriculture that is competitive in the market and that meets national and international legal environmental requirements, all within the framework of both Foundations and respecting their intervention levels.

This Environmental Policy must establish guidelines for determining the environmental performance criteria that MAPA 2 should consider when defining its environmental guidelines. In this sense, it should be taken into account that the Project will adopt the market as the driving force for productive processes that will determine the promotion of organic agriculture and/or IPM.

General policies must create economic incentives for soil conservation; solutions to real soil conservation problems should be suited to the particular circumstances of each farm and farmer. It will be necessary, therefore, for MAPA 2 to contract technical service providers in order to identify soil conservation problems and solutions for each farm as a systematic component in improving production technology.

Another environmental performance criterion defined for MAPA 2 should be the legal framework. These criteria will differ according to the region where MAPA 2 will intervene. However, the financing agencies or the legal framework will determine legislation guidelines. Programs to be implemented in the valleys and the altiplano will be subject to USAID Procedures (22 CFR 216) and Bolivian environmental regulations (Law 1333).

### **B. ANALYSIS OF INSTITUTIONAL CAPACITY FOR IMPLEMENTING THE PEA**

Environmental management generally is implemented gradually as impact and preventive, mitigation and/or corrective measures are identified. However, in order to implement and operate an environmental management process, it is important to develop instruments and abilities first, seeking efficiency and effectiveness in the project.

MAPA 2 has established the following instruments for this:

- Technical assistance
- Training (technicians and/or farmers)
- Financial support

The following elements, integrated into a system, are fundamental for implementing and operating quality environmental management:

**MAPA 2 human, physical and financial resource capacity:** MAPA 2 has one full-time professional for implementing environmental management processes for MAPA 2 and the FDTAs. Likewise, consultants could possibly be summoned from Chemonic’s worldwide data base in order to carry out specific actions that require specialists in pertinent areas. Furthermore, the central office of Chemonics in Washington has a permanent staff of professionals in the environmental field whose support is permanently available as needed in specific aspects of environmental management.

**Integration and compatibility of the environment with other aspects of the Project:** Responsibility for environmental management will not fall specifically on one person but rather will be shared by responsible parties of each program at each FDTA.

MAPA 2 will contract specialists (consultants) in environmental topics for technical and/or strategic work to be implemented within environmental management.

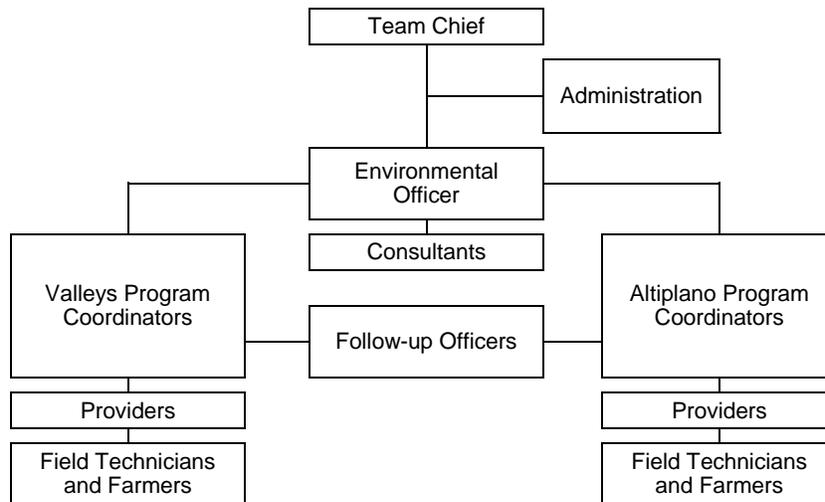
Since the environment is a theme transversal to MAPA 2 Policy, it is integrated into all other activities through the follow-up and evaluation system. The environmental component will be one of those used for this system with specific criteria for evaluating the effects of the projects on the environment.

Environmental responsibility will be demonstrated in activities implemented by area officers in collaboration with each FDTA program coordinator (that have different levels of knowledge and training with respect to the environment and carry out environmental actions as part of their duties). In this aspect, training and internalization of environmental management activities will be developed in each technical team (see proposed results).

Environmental work is coordinated between the MAPA area officer and each Program coordinator in both FDTAs. The following chart presents the communication structure:

Graphic 4

**COMMUNICATION NETWORK FOR ENVIRONMENTAL TOPICS**



FDTAs implement an ex-ante, during, and ex-post internal control system for projects. The ex-ante control is applied in the processes of determining demand, bids, appraisal, negotiation, and final consensus, processes in which aspects will be incorporated in the environmental order proposed in this document.

Management tools are important for implementing integrated environmental management in the project and continually optimizing efficiency and effectiveness. Crucial management tools are the following:

- Communication
- Documentation
- Operational controls

Communication is fluid among various actors, with the person responsible for communication being the key operator in this process. Communication among program coordinators regarding environmental topics should be strengthened with planned feedback.

Documenting processes and operative procedures of the project is the basis for monitoring and evaluation. In this respect, MAPA 2 should use this instrument to the greatest extent, both in general processes and in specific ones within each program. The goal should be to organize documentation according to two variables: subcontracts and chronological advances.

Operational controls are related to documentation. MAPA 2 will implement strict control mechanisms among the different actors and their duties. In the case of environmental management, control will begin with the environmental specialist.

**Measurement and evaluation of corrective measures.** Includes activities to measure, monitor, and evaluate processes implemented and to determine if they comply with the environmental program and environmental policy of the project.

**Continuous revision and improvements.** These procedures continually evaluate environmental behavior with respect to policies, objectives, and goals. Therefore, areas of opportunity, causes of problems and/or deficiencies should be identified in order to improve the environmental behavior of actors within their fields of activity. The results serve for determining corrective and preventive actions.

**Procedure for the additional analysis of crops or regions to be worked in:** A guide has been developed for identifying, categorizing, and proposing mitigation measures based on identification of negative environmental impacts in each of the subcontracts to be financed by MAPA 2. This document can be found in Appendix 6.

The PERSUAP for the MAPA 2 project has been prepared and presented specifically for the topic of pesticides, defining procedures to be followed in this aspect.

### **C. ENVIRONMENTAL OBJECTIVES**

The environmental objectives or proposed mitigation measures are focused on the application of tools to optimize the environmental management of MAPA 2 Project with regards to Alternative B proposed:

1. Define and incorporate guidelines to identify and propose mitigation measures for those negative impacts in the chain studies. MAPA 2 and the FDTAs will require studies of the specific chain for projects to be financed. The studies will ensure incorporation of the approach described in Alternative B selected herein. On the basis of the chain studies, agricultural and market interventions will be designed that should integrate relevant mitigation measures.
2. Design and disseminate technological packages for each chain that will incorporate suitable actions and proposals in the PEA “conservation technology bank.”
3. Incorporate aspects related to environmental impact identification and mitigation measures proposals and integrate them into Operation Regulations of the *Fondo Competitivo de Innovación Tecnológica* (FCI - Competitive Fund for Technological Innovation) and Trust Funds. Train technology providers or operators to incorporate environmental guidelines for proposal submission and implementation, as necessary.
4. Integrate environmental follow-up and assessment aspects into the FDTA - Valles and FDTA - Altiplano systems in order to ensure implementation of environmental mitigation tools proposed by the different projects (terms of reference and technical proposals) financed by the Foundations. Moreover, specific evaluation procedures will be defined for the PEA approaches.
5. Prepare and disseminate printed technical material: Technical handbooks on Integrated Pest Management (IPM), Good Agricultural Practices (GAP) and Safe Pesticide Use (SPU) for technicians and farmers, as well as SPU-related posters.
6. Implement a training program in SPU, IPM and GAPs for technicians and farmers, respecting the project execution procedures from FDTAS.
7. Promote and implement joint actions with the *Centro de Promoción de Tecnologías Sostenibles* (CPTS, Sustainable Technology Promotion Center) associated with interventions in agro-industry and/or post-harvest and manufacturing process.

8. Promote the setup and implementation of environmental management tools proposed by Law 1333, as well as follow-up and assessment processes (Environmental Briefs and Manifests, Environmental Regulation of the Manufacturing and Industrial Sector – RASIM)
9. Promote and implement organic agriculture procedures in the valley and altiplano regions in accordance with market conditions, and obtain organic certifications of farms and products for those market-driven crops being promoted.
10. Integrate and observe environmental regulations and procedures during the introduction and validation of small, new research areas, as well as during the business dissemination process, if necessary.
11. Strengthen the *Servicio Nacional de Sanidad Agropecuaria e Inocuidad Alimentaria* (SENASAG, National Service of Agricultural Health and Food Safety) in order to improve vegetal material imports while promoting exports.

## **D. RESULTS BY PROPOSED ENVIRONMENTAL OBJECTIVE**

The environmental objectives, results, and indicators proposed are considered to be the mitigation measures that the MAPA 2 project will implement.

### **D.1 INTERMEDIATE OBJECTIVE 1**

Define and incorporate the identification of environmental impacts and the proposal of mitigation measures for negative impacts in studies of commodity chains.

In these studies, the incorporation of the approach described in the alternative B selected in this document will be ensured. From these chain studies, agricultural and market interventions will be designed that must include pertinent mitigation measures.

Results of Intermediate Objective 1

- All of the chains prioritized by FDTA-Valles have studies that include environmental considerations from the environmental policy of MAPA 2 and this PEA in their design.
- New chains studied, with defined interventions and incorporating environmental guidelines appropriate for this PEA in the altiplano region.

### **D.2 INTERMEDIATE OBJECTIVE 2**

Design and distribute technology packages for conventional production crops that incorporate appropriate actions and proposals in the PEA “conservation technology bank”.

Results of Intermediate Objective 2

- All of the chains of FDTA-Valles Programs have technology packages for crop management that incorporate appropriate conservation technology in order to promote their sustainability.
- Through the intervention of service contractors (operators), 16,000 farmers in the valleys region know about and adopt technological packages that incorporate conservation technology proposed for each item.

- Traditional production chains of FDTA - Altiplano have technological packages available for crop management that incorporate appropriate conservation technology in order to promote their sustainability.
- Non-traditional production chains in the altiplano have crop management technology packages available that incorporate appropriate conservation technology in order to promote their sustainability.
- Through the intervention of service providers (providers), 4,400 farmers in the altiplano region adopt technological packages for crop management that incorporate proposed conservation technology.

### **D.3 INTERMEDIATE OBJECTIVE 3**

Incorporate and disseminate aspects for the identification of environmental impacts and the proposal of mitigation measures into the Operative Regulations of the Competitive Fund for Innovation (FCI) and the Trust Fund Operation Regulations to be implemented.

- In addition, FCI Regulations incorporate criteria for project selection based on pertinent conservation and environmental aspects.
- Trust Fund Regulations also incorporate criteria for projects selection based on pertinent conservation and environmental aspects.
- The two FDTAs are familiar with and apply the above-mentioned Regulations.
- Two disclosure workshops appropriate for 30 service providers or field operators have been implemented for explaining the Operative Regulations.

### **D.4 INTERMEDIATE OBJECTIVE 4**

Design and incorporate environmental follow-up and evaluation guidelines into the FDTA - Valles and FDTA- Altiplano systems, with the objective of ensuring implementation of environmental mitigation instruments proposed in the various projects (terms of reference and technical proposals) financed by the Foundations, in addition to determining specific evaluation procedures for the proposals of this PEA.

- One environmental review has been completed by the middle of the MAPA 2 project in order to evaluate advances in terms of the environmental management of the project.
- One final evaluation in order to assess the environmental management that the MAPA 2 project has implemented by the conclusion of the project.
- The follow-up and evaluation system described in this PEA (follow-up and evaluation procedures) has been fully implemented during the MAPA 2 project.

All of the evaluations proposed will be carried out by contracting consultants from Chemonics, as the implementing entity of the MAPA 2 Project, and will be submitted to USAID/Bolivia.

### **D.5 INTERMEDIATE OBJECTIVE 5**

To prepare and distribute technical manuals in IPM, GAP and the safe use of pesticides (SUP) to technicians and

farmers.

- Prepare a manual and distribute 1,000 copies.
- Distribute 3,000 copies of a poster on the safe use of pesticides.

#### **D.6 INTERMEDIATE OBJECTIVE 6**

Implement a training program in SUP, IPM, and GAPs for technicians and farmers, respecting the project procedures of the FDTAs.

- Train 200 service contractor technicians in SUP, IMP and GAPs, who in turn train 16,000 farmers in the valleys region and 4,400 in the altiplano in the various projects to be implemented by the Foundations.

#### **D.7 INTERMEDIATE OBJECTIVE 7**

Promote and implement joint actions with the CPTS for interventions in agroindustry and/or post-harvest and transformation processes.

- Information has been spread about CPTS to all the agroindustries working with FDTA - Valles.
- All of the agroindustrial business in the altiplano and valleys that receive financing from MAPA 2 are served by CPTS and incorporate cleaner production processes.

#### **D.8 INTERMEDIATE OBJECTIVE 8**

In addition to processes of follow-up and evaluation, promote the preparation and implementation of environmental management instruments proposed by Law 1333 (Environmental Briefs and Manifests, RASIM) in agroindustrial businesses.

- Information has been distributed regarding environmental procedures and regulations among all agroindustries working with FDTA - Valles.
- All agroindustrial businesses in the altiplano that receive financing from MAPA 2 have pertinent documents available according to their development guidelines (Licenses, Declarations, Environmental Dispensations and/or Industrial Environmental Registry).

#### **D.9 INTERMEDIATE OBJECTIVE 9**

Promote and implement organic agriculture in the valleys and altiplano, in accord with market requirements, and obtain farm and product organic certification for those market-driven crops being developed.

- Forty percent of production supported by MAPA 2 in both FDTAs is produced organically.

#### **D.10 INTERMEDIATE OBJECTIVE 10**

Incorporate and respect environmental norms and procedures during the introduction and validation of new crops in small investigation areas and, if necessary, in the process of commercial disclosure.

- Six validations (at least two successful), respecting the framework for categorical exclusion of USAID Norm 216 and importation, quarantine, and validation norms of SENASAG in the Bolivian altiplano.
- Two thousand households in the altiplano are informed of the results of the validations.
- Two hundred fifty households in the altiplano make use of improved technologies for validated crops.

#### D.11 INTERMEDIATE OBJECTIVE 11

Develop activities that strengthen SENASAG in order to improve the admission of plant material promoting exportation, in addition to facilitating farmer access to RAU and RITEX.

- Three procedures modified by SENASAG that facilitate exports by incorporating appropriate food safety and security along with environmental considerations.
- One informative system operating for SENASAG incorporating appropriate food safety and security along with environmental considerations.
- Twenty-seven SENASAG officers trained in appropriate food safety and security along with environmental considerations.

### E. RELATION OF THE OBJECTIVES, RESULTS AND INDICATORS TO THE OBJECTIVES OF MAPA 2 AND THE PEA

The following table shows the relation among the various paragraphs of this document:

Table 3

#### OBJECTIVES, RESULTS, AND INDICATORS AND THEIR RELATION TO THE PEA

Objectives of the environmental program for MAPA 2	Relation to the objectives of MAPA 2*	Relation to aspects defined as significant **
1	1, 2	1, 2, 3, 4, 5
2	1, 2	1, 2, 3, 4
3	1, 2	1, 2, 3, 4, 5
4	1, 2, 3	1, 2, 3, 4, 5
5	1, 2, 3	2
6	1, 2	1, 2, 3, 4
7	1, 2	1, 2, 3, 4
8	1, 2	3
9	1, 2	3
10	1, 2	1, 2, 3, 4
11	1, 2	5

\* 1 In relation to the valleys region and FDTA - Valles; 2 In relation to interventions in the altiplano and FDTA - Altiplano ; and 3 In relation to the norms and policies of SENASAG, RITEX and RAU.

\*\* 1 In relation to technological improvements in production; 2 Pesticides; 3 Post-harvest technology; 4 Conversion to non-agricultural lands; and 5 Introduction and validation of new crops.

## F. BUDGET

A large part of the activities for achieving the objectives and results presented in this PEA do not require an additional budget or one separate from the budget established for MAPA 2 in its entirety (following table) since they are activities transverse to the planning base of the project.

On the other hand, the programs prioritized by both Foundations are also financed by other entities (IADB, for example); therefore the MAPA 2 project will provide assistance and support for the majority of such program development instead of directly intervening with financing.

Of the US\$ 22,000 (twenty-two thousand US dollars) additional budget in MAPA 2 for unplanned mitigation measures, US\$ 12,000.00 would be set aside for environmental assessments and US\$ 10,000 for technical assistance.

The total Budget for MAPA 2 is presented in the following table:

Table 4

### PROJECT MAPA BUDGET

(in US\$)

	Total Contract Amount
Increased access to technology and markets by agro-entrepreneurs	3,138,910
Strengthened farmer organizations	2,922,148
Strengthened policy dialogue - SENASAG	1,513,528
Grant Agreements	1,854,860
Total	9,429,446
Life of the Project (in months)	60

## G. PROCEDURE FOR FOLLOW-UP AND EVALUATION

MAPA 2 will implement instruments to identify and carry out follow-up of the activities proposed in this PEA as well as activities that the service providers contracted by the FDTAs will carry out in field.

Consequently, the following instruments will be utilized as a transverse complement to the environmental objectives and programming for this PEA and proposed Alternative B:

An **Impact Identification Matrix** and an **Environmental Impact Characterization Record** (Appendix 6). These should provide a clear idea of environmental impacts caused by each activity and their magnitude. They are the basis for identifying prevention, mitigation and/or correction measures applicable in the field for intervention implementation and operations, avoiding negative environmental effects. They will be implemented by the service providers when they carry out their proposals (a Terms of Reference form will be incorporated).

**Report of Follow-up and Evaluation of Completion by Milestone** (Appendix 7). The instrument is used for follow-up and evaluation of how environmental aspects have been incorporated in the field. These should be clear and include quantification of advances, including training activities in the IPM, GAPS, BPMs and PERSUAP as well as adoption by the farmers.

**Quarterly Reports** (example in Appendix 8). Environmental aspects should be incorporated separately. They should

analyze limiting factors in the field for Program and Project implementation. Remarks should be pertinent and persuasive.

The environmental issue should be evaluated separately as a basis for application of the IPM, GAPs and PERSUAP, and adoption of technology packages, with the main objective of improving yields and incomes for small farmers.

**Semi-annual Reports and Final Reports.** Environmental guidelines incorporated should follow the same philosophy as the quarterly reports, but they should summarize six months work. Analysis and recommendations expressed in these reports should be pertinent and focus on optimizing environmental administration.

Final reports shall be done once the project is completed. Each environmental guideline should be explained clearly, with the appropriate events in chronological order, mentioning the progress of the environmental component according to the qualitative and quantitative indicators established at the beginning. This report is very useful to verify compliance with the proposal and to evaluate how the environmental guidelines were gradually incorporated in implementing the Programs and their Projects.

**Follow-up and Evaluation Planning Information System** (Appendix 8). Responding to the Coordination Unit for the Agricultural Services Program (UCPSA, *Unidad de Coordinación del Programa de Servicios Agropecuarios*), a department of the Ministry of Agriculture, the FDTAs carry out planning and assessment procedures through a standardized computer system. This instrument collects information regarding physical and budget progress for compliance with the proposals (including qualitative and quantitative indicators) for each program and its progress.

Under specific objective number 4, the computerized follow-up and assessment instrument should incorporate an environmental component that allows collection of information in the field on the environmental impacts generated and mitigation measures applied, which is uploaded into a database.

MAPA 2 should develop the environmental record for each project that receives its support. This record should contain all environmental information related to the project to be financed. Before beginning each project or sub-contract, an environmental baseline should be developed, that is, a detailed description of the resource situation before the project begins, in order to have a parameter base to implement the follow-up and assessment procedures and to measure the proposed mitigation measures. This baseline does not refer to the MAPA 2 Project overall, but to each specific sub-contract.

## H. PUBLIC PARTICIPATION IN THE PROJECTS

The following table summarizes the steps beginning with identification of a project and its execution, highlighting in each step how applicants or beneficiaries are involved.

Table 5

### STEPS FOR IDENTIFICATION AND EXECUTION OF A PROJECT

	Stage of Process	Remarks
1	Demand	Every project will be originated in a real need of actors in each link of the commodity chain. With the support of MAPA 2, the FDTAs should ensure that the process incorporates environmental aspects stemming from the applicants or beneficiaries. Pertains to intermediate objectives 1 and 2.
2	Call for Public Bidding	Pertains to intermediate objectives 3 and 4.

3	Proposal	Based on documentation generated in intermediate objectives 1, 2, 3, 4 and 5, the service providers will prepare proposals for final design in close cooperation with the applicants or beneficiaries who prepared the application.
4	Evaluation of the Proposal	Objective 1, 2, 3
5	Negotiation	FDTA - Valles representatives participate with representatives of service providers and beneficiaries to improve the original technical proposal.
6	Milestone Plan	Work plan for project execution. Should incorporate clear objectives and results in environmental terms. Result of participatory negotiation process.
7	Follow-up and Evaluation	Each report submitted by the service providers should contain a memorandum of approval by the beneficiaries that incorporates all components, including environmental components. Semi-annual and final evaluations will be participatory and will incorporate all inherent components of the project evaluated.



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# ANNEXES

- Annex 1 Initial Environmental Examination, Environmental Threshold Decision
- Annex 2 Terms of Reference
- Annex 3 Visits and People Interviewed
- Annex 4 Some Mitigation Measures
- Annex 5 PERSUAP
- Annex 6 Environmental Impact Identification and Characterization Handbook and Proposal or Mitigation Measures
- Annex 7 Environmental Follow-up Field Spreadsheet
- Annex 8 Model of Quarterly Environmental Report and Data Base
- Annex 9 Maps



**ANNEX 1**  
**INITIAL ENVIRONMENTAL EXAMINATION, ENVIRONMENTAL THRESHOLD DECISION**

(The document was submitted in advance to USAID/Bolivia and forms integral part of this document)



## ANNEX 2 TERMS OF REFERENCE

MAPA Project  
Contract N°  
Task Order N°

### Terms of Reference

#### MAPA 2 Project PEA (Programmatic Environmental Assessment) Preparation

##### Purpose

A professional with at least 10 years of broad experience in environmental management should fill this position in direct support for an Environmental Management Specialist for the MAPA Project in activities related to preparing the PEA for MAPA 2 Project in the FDTA - Valles and FDTA - Altiplano of Bolivia.

##### Background

Bolivia is one of the poorest countries in Latin America. Its economic development has failed to increase average income, especially for the poor. In rural areas where agricultural activities are the principal source of income, poverty is a constant, mainly in regions known as valleys and altiplano. These regions have been economically integrated with the market economies with great difficulty. Weak links to local markets (*i.e.* consumer and agro-industrial markets), sparse highway infrastructure and virtually no access to international markets and technology have perpetuated the existence of a primitive sub-economy and negatively affected productivity. Links to the markets have been limited in large measure to local fairs where the same basic product is sold during the same time period of the harvest season. Those regions have traditionally produced items with a low market value using antiquated production technology in relatively hostile environments, including lack of irrigation infrastructure. Additionally, there are inefficiencies in sector policies, institutional support and financial intervention for poor rural areas.

USAID/Bolivia and the Bolivian government, by implementing the MAPA project during the last five years, have jointly managed to increase poor rural family income through a strategy based on improving farmers' access to markets and on stimulating new market demands in the valleys of Bolivia. The MAPA project also supported establishing and strengthening the *Fundación para el Desarrollo de Tecnología Agropecuaria – Valles* (FDTA - Valles, Foundation for Agricultural Technology Development - Valleys), a non-profit organization that is part of the *Sistema Boliviano de Tecnología Agropecuaria* (SIBTA, Bolivian Agricultural Technology System) whose goals are to contribute to the reduction in rural poverty, the increase in local farmer income, the increase in competitiveness in the agricultural sector, and promotion of the sustainable use of natural resources.

As mentioned, Market Access and Poverty Alleviation (MAPA) Project has increased poor family incomes in the valley and Los Yungas regions of Bolivia. In Los Yungas the project focused on three areas of intervention that represent significant opportunities for rapid impact and that show potential for long-term economic development. Areas of concentration have been coffee, tourism and tea.

In the valleys, the areas of concentration have been herbs (with an emphasis on oregano), onions (regular and sweet), berries (raspberries and blackberries), table grapes, peanuts, peppers (including *locoto*), tomatoes, peaches (and other stone fruits) and cut flowers (mainly bulbs).

The results achieved by the MAPA Project have made it possible for USAID/Bolivia and the Bolivian government to support implementation of a new five-year program, beginning in October 2005 and ending in September 2010.

This new phase does not include intervention in Los Yungas. Instead, it considers that the project should have a component of support for agri-business development activities in the Bolivian altiplano (the departments of La Paz, Oruro and Potosí) while maintaining support of the FDTA - Valles activities in the Bolivian valleys.

In this framework, an operative structure in the region of the altiplano has been determined that will be composed exclusively of the altiplano program coordinator and an Andean crop specialist. This structure will be directly related with the rest of the project technical team, which will also provide specialized support in the areas of marketing, agri-business, environment, machinery and equipment as required by the altiplano program.

### **Objective**

In coordination with the MAPA Project environmental management supervisor, prepare a Programmatic Environmental Analysis (PEA) for the MAPA 2 Project according to the goals established for the project and based on Bolivian and financing agency regulations in the framework of the central objective to develop sustainable development processes in the prioritized chains.

### **Scope**

- In coordination with the MAPA Project environmental management supervisor, prepare an analysis methodology for the environmental management processes according to criteria that respond to the specific needs and initial planning.
- Develop the document according to the specified considerations and content outlined below.

In preparing the document take into account:

- The ETD issued by USAID based on the Initial Environmental Examination (attached).
- Procedures of project identification, selection/qualification, allocation and follow-up in the SIBTA FCI framework and the MAPA Operative Regulation.
- Environmental aspects that result from activities or products, based on planning.
- Based on the first point and field observations, point the assessment toward design and implementation of prevention, mitigation and corrective measures in the technical assistance field of projects financed.
- Requirements of law and regulations applicable to the project.
- Mainly in the case of the valleys, the recommendations made in the MAPA I Project PEA (Programmatic Environmental Assessment) besides recommendations issued in the Environmental Review.
- The holistic framework of the prioritized chains' sustainable development process.

- The market, as long as the environmental variable may be important for the purchase.
- MAPA Project activities have centered on increasing incomes for beneficiary families, improving production processes, taking sustainability into account in this general scheme by incorporating environmental management procedures into the Project.
- Environmental variables in the MAPA and FDTA - Valles follow-up and evaluation system.

#### Document Contents:

- Objectives.
- Methodology.
- Background. Bolivian Agricultural Technology System. MAPA I and MAPA 2.
- General description of the environment affected. Valleys, altiplano. General environmental impacts in both regions.
- Applicable environmental rules and regulations.
- Criteria for environmental performance.
- Environmental objectives, goals and indicators.
- Environmental programming.
- Environmental follow-up procedures.
- Preventive mitigation measures to be implemented per planned activity.
- Budget.

#### **Location**

The person contracted will be based in Cochabamba and will travel to the capitals and rural areas of the departments of Santa Cruz, Tarija, Chuquisaca, Oruro and La Paz

#### **Duration**

The consultant work will last 10 work days, from Monday through Saturday.

#### **Requirements**

- Specialist in Environmental Management, environmental consulting or similar experience
- 10 years experience in activities related to the position to be filled
- Appropriate experience with computer packages
- Training in technical writing and fluent Spanish
- Availability to travel to the country

**Technical coordination**

The general coordinator for the person hired will be the MAPA Project Environmental Management Specialist

### ANNEX 3 VISITS AND PEOPLE INTERVIEWED

	City	Chain	Specific location	Institution	Interviewee	Position
1	Cochabamba	Berries	Sacaba	4 Estaciones Nursery	Engineer Osvaldo Urquidi	Coordinator
		Cut flowers	Sacaba	4 Estaciones Nursery	Engineer Lily Alvéstequi	Coordinator
					Mrs. Eliana de Moreno Mr. Esteban García	Provider Field Technician
Tomato	Valle Alto	BIOSIS	Engineer Osvaldo Urquidi Engineer Eloy Gálvez	Coordinator Provider		
2	Sucre	Herbs	Tomina	Agrocentral UNEC.	B.A. Mauricio Quintanilla Mr. Marcelino Mamani	Manager Field Technician
		Ajíes (type of hot pepper)	Padilla	PROINPA	Engineer Carlos Bejarano Mr. Constantino Nina	Coordinator Provider Farmer
		Peanut	Padilla	PROINPA	Engineer Crecencio Calle Mr. Constantino Nina	Provider Farmer
		Peach	Valle Central	AGROS	Engineer Daniel Zamora	Provider
3	Tarija	Onion	Uriondo Tarija	ECOVIDA	Engineer Marcelo Núñez	Provider
				PETROMAAS	Engineer Elio Rodrigues	Field Technician
		Berries		AFRUTAR	Engineer Osvaldo Urquidi	Coordinator
					Engineer Gonzalo Pinedo	Field Technician
					Engineer Ariel Ortega	Field Technician
Grapes		APECO	Engineer Mariam Berdeja	Provider		
			Engineer Vicenta Hoyos Mr. Rufino Márquez Mrs. Aide Ortega Mrs. Cenaida Poma	Field Technician Farmer Farmer Farmer		
Table Grapes		AGROSERVACH	Engineer Efraín Rivera Engineer Vicente Teodoro Mr. Milton Perea	Provider Field Technician Farmer		
4	Oruro			FDTA – Valles	Engineer Juan Arévalo	Coordinator onion
				FDTA - Altiplano	Engineer Marcelo Céspedes Engineer Javier Siliézar Engineer Claudia Sáinz Engineer Paul Meruvia	Coordinator onion Coordinator Altiplano Consultant Coordinator



## ANNEX 4 SOME MITIGATION MEASURES

### Some mitigation measures taking into account good agricultural, manufacturing and health practices

Technical Aspect	Environmental Considerations
Varieties to Sow	Selecting appropriate varieties is important to obtain favorable results (susceptibility to pests and diseases) since a more productive variety is more susceptible, which will require greater use of chemical products. Take into account the final destination of the crop. As much as possible resistant varieties or varieties tolerant to pests and diseases should be sown to maintain an appropriate economic yield.
Fields to sow	Aspects to be considered in choosing the fields to sow: Communication lines, water sources, climate conditions, soil characteristics, previous presence of pests and/or diseases, crop rotation, soil fertility, etc.
Land preparation	Using plow and rake, the pest pupae or eggs remain well entrenched in a deep site that interferes with their emergence, or at a surface site that exposes them to the cold, desiccation or predators.
Sowing	Choosing an appropriate date to sow that will favor the crop if done in a period when the pest is absent or its degree of infestation is reduced.
Crop rotation	Different crops should be alternated in a field in order to alter, and in some cases break, the biological cycle of the pests and diseases that attack the crop.
Sowing densities	When there are high densities of sowing, microclimate conditions of high humidity, temperature and shade are generated that favor pests and diseases. An appropriate sowing density helps reduce the development of pests and diseases.
Fertilization	A properly fertilized plant is stronger and thus has greater tolerance for attacks from pests and diseases. Natural soil fertility should be maintained by choosing appropriate agricultural practices. Another option is utilizing leguminous coverage associated with the crop that favors nitrogen uptake by the soil and improves soil structure while reducing run-off erosion, especially on sloping lands.
Harvest waste destruction (stubble)	Stubble harbors initial insect populations for the next crop cycle. Destroying stubble and incorporating it into the soil or burning reduces a large percentage of pests and diseases.
Diseases and pests	In procedures to manage pests and diseases, natural methods, cultural practices and biologic control use are recommended. Integrated Pest Management (IPM) techniques should be implemented. These are some IPM practices that can be cited: <ul style="list-style-type: none"> <li>• Cultural control</li> <li>• Biological control</li> <li>• Physical control</li> <li>• Mechanical control</li> <li>• Phylogenetic control</li> <li>• Legal control</li> <li>• As a last resort, where no other option is available, chemical control.</li> </ul>
Use of agro-chemicals as a last resort	Use of agrochemicals should be a practice absolutely justified and necessary. Aspects should be taken into consideration in their use such as: use of agrochemicals appropriate for the specific pest, of low toxicity to natural enemies and wildlife, low persistence and safe for human health and the environment. For chemical control, the following basic rules should be adhered to: <ul style="list-style-type: none"> <li>• Appropriate time, based on thresholds, predictions, pest phase and incidence.</li> <li>• Appropriate and correct treatment according to label specifications, using chemicals specifically recommended and approved for the problem present, avoiding as much as possible wide spectrum products and complying with recommended periods. Appropriate technique, using correct equipment and appropriate calibration of equipment.</li> <li>• To ensure application and elimination of waste, personnel should be duly trained.</li> </ul>

## Some mitigation measures taking into account good agricultural, manufacturing and health practices

Technical Aspect	Environmental Considerations
	<ul style="list-style-type: none"> <li>• A record should be kept of all applications.</li> <li>• Keep unused pesticide in the storage facility or a safe place.</li> <li>• Safe elimination of all pesticide waste.</li> <li>• Clean protective clothing and application equipment after product is applied.</li> <li>• Destroy empty containers, perforating them to make them impossible to use in the future and burying them in an appropriate location.</li> <li>• Use personal protection equipment (appropriate protective clothing, boots, masks, eye protection, gloves) leaving no part of the body exposed to the product being used.</li> <li>• Reduce the number of applications.</li> <li>• Use low-toxic agrochemicals (green or blue label products – in case of backpack fumigators, only green label).</li> <li>• Train farmer in safe use of agrochemicals (SPU).</li> </ul>
Harvest and post-harvest management	<p>Includes:</p> <ul style="list-style-type: none"> <li>• Harvest at the optimum time to maximize warehouse time and consumption quality.</li> <li>• At harvest time, harvesters should not collect any crop from the soil. This is one of the main sources of contamination that affect products going to processing plants or market places.</li> <li>• Minimize the use of post-harvest chemicals (waxes, fungicides, preservatives, etc.). If their use is essential, they should comply with laws and regulations currently in force. For crops intended for export, it should be verified whether the chemical products utilized are registered and their use permitted in the destination country.</li> <li>• Pre-selection in the field, so that neither trash nor contaminants are taken to the next processing site, warehouse or market.</li> <li>• Reduce the interval between harvest and arrival of the product at the processing plant.</li> <li>• Implement standards and procedures which imply that each activity will have a standard procedure that should be well-known and completed by plant operators.</li> <li>• Cleanliness at all stages of harvest and post-harvest.</li> <li>• Seek out alternate techniques that help reduce the need for use of chemicals, such as controlled atmosphere and temperatures.</li> </ul>
Waste and contamination	<ul style="list-style-type: none"> <li>• All operations should be done with an eye to generate the least amount of waste possible, whether organic or inorganic.</li> <li>• Reuse of inorganic materials includes: packaging materials, supply packaging, polyethylene, etc.</li> <li>• Materials that can not be reused should be taken to specialists, or design installations appropriate for such use. Water should be treated before being dumped into the streams.</li> <li>• Where possible, all organic waste should be reused. Organic wastes can be reused in compost, Bokashi or earthworm compost which are excellent quality organic fertilizers, or lastly, incorporated directly into the soil in the case of harvest waste, always when it does not compromise development of plants due to pest and disease contamination.</li> </ul>
Use of vehicles in project technical training, transfer and dissemination	<ul style="list-style-type: none"> <li>• Carry out periodic vehicle maintenance to guarantee they operate well to reduce losses and contamination from leaks and fuel economy.</li> <li>• Appropriate disposal of containers and lubricants.</li> <li>• A motor with greater cubic capacity will complete the same work as one of smaller cubic capacity, except in extreme cases, but fuel consumption will be much smaller and therefore operating costs and emission contamination will be reduced.</li> </ul>
Industrial procedures: Surface water and eventual groundwater pollution	<ul style="list-style-type: none"> <li>• Use of clean technologies where available and treatment of: 1) waste water, 2) solid waste, 3) atmospheric emissions.</li> <li>• Locate agro-industries in zones with waste water drainage and treatment plants.</li> </ul>

## Some mitigation measures taking into account good agricultural, manufacturing and health practices

Technical Aspect	Environmental Considerations
Soil pollution Air pollution Noise pollution	<ul style="list-style-type: none"> <li>Promotion of transformation processes based on biodegradable substances or mechanical practices.</li> <li>Acoustic protection measures at facilities that produce excessive noise.</li> </ul>
Packaging area	<ul style="list-style-type: none"> <li>The facility should have even walls and floors that can be easily washed and an adequate drainage.</li> <li>Light is an important factor since it should be sufficient to allow observation of the product to detect defects in quality, contamination and trash.</li> </ul>
Machinery and equipment	<ul style="list-style-type: none"> <li>Equipment and machinery should be tidy, clean and properly maintained.</li> <li>Maintenance record and schedule should be kept up to date.</li> <li>Work tables should have a smooth, washable surface that will not damage the product.</li> <li>Scales should be clean and calibrated.</li> </ul>
Product management and waste elimination	<ul style="list-style-type: none"> <li>Packaging material should never be left on the floor nor accumulated near the shipping area since it attracts pests and is a source of contamination for a safe product.</li> <li>Boxes should not be left uncovered.</li> </ul>
Signs in the shipping area	<ul style="list-style-type: none"> <li>Signs should be posted stating that there should be no eating, smoking or drinking in the shipping area.</li> <li>Other signs should be posted regarding hygiene practices, location of rodent traps, location of bathrooms, use of uniforms, etc.</li> </ul>
Packaging materials	<ul style="list-style-type: none"> <li>Should be stored in a dry place on platforms so they do not touch the ground.</li> </ul>
Sanitary facilities	<ul style="list-style-type: none"> <li>The number of restrooms is one for each sex/25 persons.</li> <li>Restrooms should always be kept clean. Disinfectant bars should be used in the toilet tanks, which should be cleaned at least twice a day.</li> <li>Toilet tissue should always be available in all restrooms.</li> <li>Men's and women's restrooms should be clearly identified with signs on the door.</li> <li>Sinks should have liquid soap and paper towels for washing and drying hands. Cloth towels are not recommended since they can become a source of contamination.</li> <li>Trashcans, lined with plastic bags for easy disposal, must be placed in every restroom.</li> </ul>
Personnel	<ul style="list-style-type: none"> <li>No smoking, eating or drinking is permitted within the packaging facilities.</li> <li>All personnel in contact with the product must use an apron, cap or hair covering.</li> <li>Hands should be washed before each shift, after breaks and visits to the restroom.</li> <li>Nails should be kept short and clean.</li> <li>In case of illness, the worker should immediately advise his/her supervisor, who should record the symptoms of the illness. The worker must present a medical certificate to return to work that, in the case of an infectious disease, indicates he/she is fit to return to work.</li> <li>Open wounds should be completely covered and reported to the supervisor so that the accident can be recorded.</li> </ul>
Pest control	<ul style="list-style-type: none"> <li>Packager should be enclosed with screens to prevent entrance of birds and insects.</li> <li>Entrance doors should be double, with at least two meters between them and a mechanism that keeps them closed.</li> </ul>
Warehouse	<ul style="list-style-type: none"> <li>Should be a well-ventilated, clean and low-moisture environment.</li> <li>Personnel entering the area should be restricted (authorized personnel).</li> </ul>
Pollution of the area due to solid waste accumulation and organic material decomposition	<ul style="list-style-type: none"> <li>Incorporate waste transformation procedures.</li> <li>Incorporate organic wastes into soils with poor organic material.</li> <li>Reduce solid waste using cleaner technologies and waste recycling.</li> <li>Treat and dispose of solid wastes.</li> </ul>

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**Some mitigation measures taking into account good agricultural, manufacturing and health practices**

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<b>Technical Aspect</b>	<b>Environmental Considerations</b>
Deficient hygiene practices : Contamination of processed food products.	<ul style="list-style-type: none"><li>• Strict hygiene standards.</li><li>• Product quality control.</li><li>• HACCP standards.</li><li>• EUREPGAP standards.</li></ul>
Excessive consumption of firewood and fossil fuels.	<ul style="list-style-type: none"><li>• Use alternative energy sources.</li></ul>

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## **ANNEX 5**

### **PERSUAP**

(The PERSUAP was submitted in advance to USAID/Bolivia and forms integral part of this document)



**ANNEX 6**  
**ENVIRONMENTAL IMPACT IDENTIFICATION AND CHARACTERIZATION HANDBOOK AND**  
**PROPOSAL OR MITIGATION MEASURES**



**ANNEX 7**  
**ENVIRONMENTAL FOLLOW-UP FIELD SPREADSHEET**



**ANNEX 8**  
**MODEL OF QUARTERLY ENVIRONMENTAL REPORT AND DATA BASE**



**ANNEX 9**  
**MAPS**