



LAC-EA-16-03

ENVIRONMENTAL ASSESSMENT APPROVAL

Activity Location: Guatemala

Activity Title: Development Objective Two: Improved Levels of Economic Growth and Social Development in the Western Highlands; IR 2.1: Broad Based Economic Growth and Food Security Improved

Activity Number: DO2, IR2.1

Life-of-Activity Funding: \$87.026 million

Life-of-Activity: FY 2012 – September 30, 2016

EA Prepared By: Sun Mountain International, in collaboration with AGEXPORT Cooperative Agreement AID-520-A-12-00003 & ANACAFE Cooperative Agreement AID-520-A-12-00004, on behalf of USAID/Guatemala

Reference ETD and Scoping Statement: LAC-IEE-12-55, LAC-SS-15-03

Comments:

The Bureau Environmental Officer approves the attached Environmental Assessment (EA) for the Rural Value Chains Program (RVCP). Environmental Threshold Decision (ETD) LAC-IEE-12-55 resulted in a Categorical Exclusion, a Negative Determination with Conditions, a Positive Determination, and a Deferral for Program activities. A condition of the ETD was after one year of implementation, USAID/Guatemala would conduct an environmental compliance audit of Program activities and audit recommendations would be incorporated into implementation partner work plans. As a result of the audit, conducted in July 2014, the Bureau Environmental Officer reaffirmed his decision that the RVCP must complete an EA.

Conditions of this approval include:

1. The program and implementing partner(s) budget(s) must incorporate the cost of implementing, monitoring, and evaluating the EA's Environmental Mitigation and Monitoring Plans (EMMP); reference Annex D of the EA.
2. Compliance with the USAID/Guatemala Pesticide Use Report and Safe Use Action Plan (PERSUAP) and its attendant Integrated Pest Management Plan. The PERSUAP is not part of the attached EA, but is a linked analysis.
3. The Mission and/or its Monitoring and Evaluation Program team to conduct a final evaluation of the EA's EMMPs and their effectiveness. Information from the final evaluation, in combination of the recommendations in Section 12 of the EA, to be utilized by the Mission in the design of the follow-on program.
4. Responsibility for compliance with mitigation measures must be stipulated in contracts and/or agreements, including a status report on compliance at the end of each fiscal year (which should be completed in conjunction with regular reporting requirements) and at the end of the activity.
5. The Regional Environmental Advisor for Central America and/or responsible Mission Environmental Officer for USAID/Guatemala will review the status of the implementation of the mitigation and monitoring plan at least once each fiscal year, to ensure that it is in compliance with applicable USAID policies and regulations.
6. Each activity manager or Contracting or Agreement Officer Representative (COR or AOR) is responsible for making sure environmental conditions are met (ADS 204.3.4). In addition, CORs and AORs are responsible for ensuring that appropriate environmental guidelines are followed, mitigation measures in the EA are funded and implemented, and that adequate monitoring and evaluation protocols are in place to ensure implementation of mitigation measures.
7. It is the responsibility of the Development Objective (DO) Team to ensure that environmental compliance language from the ETD is added to procurement and obligating documents, such as activity-related Development Objective Grant Agreements (DOAGs) and Activity Approval Documents (AADs).

Amendments

- Amendments to Initial Environmental Examinations (IEE) and Environmental Assessments (EAs) shall be submitted for LAC Bureau Environmental Officer (BEO) for approval for any activities not specifically covered in the IEE or EA, which include:
 - Funding level increase beyond life-of-activity amount,
 - Time period extension beyond life-of-activity dates (even for no cost extension), or

- A change in the scope of work, such as the use of pesticides or activities subject to Foreign Assistance Act sections 118 and 119 (e.g. procurement of logging equipment), among others.



Jessica Rosen

Date 2/22/2016

Bureau Environmental Officer
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Attachments:

- LAC-IEE-12-55
- Environmental Assessment

File: P:\LAC.RSD.PUB\ENV\Reg 216\EAs & Scoping Statements\Guatemala - RVCP
Env Compliance Audit\Guate - RVCP EA\LAC-EA-16-18 ETD (GU Rural Value Chains
Program_ Amend LAC-IEE-12-55, LAC-SS-15-03).docx



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LAC-IEE-12-55

ENVIRONMENTAL THRESHOLD DECISION

Activity Location: Guatemala

Activity Title: Development Objective Two: Improved Levels of Economic Growth and Social Development in the Western Highlands, IR 2.1: Broad Based Economic Growth and Food Security Improved

Activity Number: TBD

Life-of-Activity-Funding: \$87.026 million

Life-of-Activity: FY 2012 – FY 2016

IEE Prepared by: Liliana Gil, USAID/Guatemala

Reference Environmental Threshold Decisions (ETD): LAC-IEE-12-11

Recommended Threshold Decision: Categorical Exclusion
Negative Determination with Conditions
Positive Determination (for the use of pesticides)
Deferral

Bureau Threshold Decision: Categorical Exclusion
Negative Determination with Conditions
Positive Determination (for the Rural Value Chains Project)
Deferral

Comments:

A **Categorical Exclusion** is issued to the DO2, IR 2.1: Broad Based Economic Growth and Food Security Improved activities listed under Section 1.3 in the attached IEE involving education, technical assistance, preparation of business plans, and municipal strengthening, pursuant to 22CFR216.2(c)(2)

- (i) Education, technical assistance, or training programs except to the extent such programs include activities directly affecting the environment (**such as construction of facilities, etc.**);
- (iii) Analyses, studies, academic or research workshops and meetings
- (v) Document and information transfers;
- (xiv) Studies, projects or programs intended to develop the capability of recipient countries to engage in development planning, except to the extent designed to result in activities directly affecting the environment (**such as construction of facilities, etc.**); and

A **Negative Determination with Conditions** is issued to the DO2, Rural Value Chains Project (RVCP) horticulture, coffee, and handicrafts activities, pursuant to 22 CFR 216.3 (a) (2) (iii). Conditions include:

- The Recipient shall follow USAID's "Environmental Guidelines for Development of Activities in Latin America and the Caribbean", especially Chapter 8 regarding agriculture and watershed management, to identify mitigation measures. This document is available at the following website:
 - http://transition.usaid.gov/locations/latin_america_caribbean/environment/docs/epiq/chap8/lac-guidelines-8-ag-and-watershed.pdf
- Upon identification of new sites and site-specific actions, the recipient shall develop an Environmental Mitigation Plan (EMP) to be submitted to the Agreement Officer Representative (AOR) for approval by the Mission Environmental Officer (MEO) and Regional Environmental Advisor (REA) prior to implementation (See the following links for guidance on EMP development and implementation):
 - http://transition.usaid.gov/gt/docs/emp_format.pdf (English version)
 - http://transition.usaid.gov/gt/espanol/docs/emp_format_spanish.pdf (Spanish version).
- For existing sites the RVCP will follow the attached Annex 1, Evaluation of potential environmental impacts of RVCP activities and proposed mitigation measures as approved on December 16th 2011, on Environmental Mitigation Plans for Coffee and Horticulture for AGEXPORT and ANACAFE RVCP implementing partners.

- All Coffee and horticultural small-scale producers supported under the Rural Value Chains program will be trained and will implement good agricultural practices to comply with international market standards and will be prepared to access international certifications such as GlobalGAP or similar standards.
- RVCP will develop standards for water discharge of wet coffee processing, and appropriate technology and design guidelines (such as oxygenation ponds) will be developed to effectively treat discharge water.
- The REA and/or BEO will undertake an environmental review of project activities once implementation starts to assess current mitigation practices and make any necessary changes to ensure that there is no environmental and human damage.
- After one year of implementation (o/a November 2013, in accordance with Cooperative Agreements signing dates) USAID/Guatemala will conduct an environmental compliance audit of RVCP activities. The SOW will be developed in consultation with the MEO and the REA. Audit recommendations will be incorporated into subsequent implementing partners' work plans.
- Coffee producers supported by implementation partners of RVCP will continue to follow the certification processes and requirements for:
 - Rainforest Alliance – Sustainable Agriculture Network certification: <http://www.sanstandards.org/userfiles/SAN-S-1-1%20SAN%20Sustainable%20Agriculture%20Standard%20July%202010%20v2.pdf>
 - Fair trade certification: http://www.fairtrade.net/fileadmin/user_upload/content/2009/standards/documents/2012-07-11_SPO_EN.pdf
 - http://www.fairtrade.net/fileadmin/user_upload/content/2009/standards/documents/2012-04-01_EN_SPO_Coffee.pdf
 - UTZ Certified: [http://www.utzcertified-trainingcenter.com/home/images/documentos/coffeeIndividualMultisite/ENU_TZ2009CodeofConduct\(January2010\).pdf](http://www.utzcertified-trainingcenter.com/home/images/documentos/coffeeIndividualMultisite/ENU_TZ2009CodeofConduct(January2010).pdf)
 - Starbucks CAFÉ Practices: http://www.scs-certified.com/retail/docs/CAFE_GUI_EvaluationGuidelines_V2.0_093009.pdf
 - USDA Organic: <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=51149456cbd04f648d27ad97dfb8209a&rgn=div6&view=text&node=7:3.1.1.9.32.3&idno=7>
- Horticulture producers supported by implementation partners of DO2 I.R.2/RVCP will continue to follow the Good Agriculture Practices, such as conserving and

improving soils, maintaining the safety and quality of their crops, and protecting the health of the producers and their natural environment, that are detailed described in the attached PDF document (Annex 3) and additionally some of them will be using also the Tesco Nurture Certification that includes additional environmental considerations, more information available at:

- Tesco Nurture certification:
 - <http://ebookbrowse.com/gdoc.php?id=139183178&url=866df38783b35f981e7ba3abb807262e>
- Global GAP certification:
 - http://www.globalgap.org/cms/upload/The_Standard/IFA/Version_4.0-1_Feb2012/English/CPCC/120206_gg_ifa_cpcc_fv_eng_v4_0-1.pdf
 - http://www.globalgap.org/cms/upload/The_Standard/IFA/Version_4.0-1_Feb2012/English/GR/120926_gg_ifa_intro_and_specific_rules_eng_v4_0-2.pdf
 - http://www.globalgap.org/cms/upload/The_Standard/IFA/Version_4.0-1_Feb2012/English/GR/120206_gg_gr_part_i_eng_v4_0-1.pdf
- Both coffee and horticulture producers will follow the specific measures and conditions established for each crop, including Integrated Pest Management measures, that are detailed on the Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP) that was approved by the BEO in ETD LAC-IEE-12-41 on August 15th 2012, with a negative determination with conditions for the use of pesticides with any of the Mission's agricultural activities (e.g., the Rural Value Chains Project), pursuant to 22 CFR 216.3(b). These are attached as Annex 2.

A **Negative Determination with Conditions** is issued to the DO2, IR2.1 activities involving small-scale infrastructure such as mini-irrigation systems (<100 ha), cold storage, and small processing facilities related to improved agricultural productivity.

- The Recipient shall follow USAID's "Environmental Guidelines for Development of Activities in Latin America and the Caribbean", especially Chapter 2 regarding small-scale infrastructure, to identify mitigation measures. This document is available at the following website in both English and Spanish:
 - http://transition.usaid.gov/locations/latin_america_caribbean/environment/docs/epiq/epiq.html
- Upon identification of site-specific actions, the recipient shall develop an Environmental Mitigation Plan (EMP) to be submitted to the Agreement Officer Representative (AOR) for approval by the Mission Environmental Officer (MEO) and

Regional Environmental Advisor (REA) prior to implementation (See attached and the following link for guidance on EMP development and implementation):

- http://transition.usaid.gov/gt/docs/emp_format.pdf (English version)
- http://transition.usaid.gov/gt/espanol/docs/emp_format_spanish.pdf (Spanish version).

A **Deferral** is issued to the activity entitled “**Improved Access to water for irrigation and sustainable watershed management in the Cuchumatanes Highlands of Guatemala**” until final negotiations are concluded with the applicant and the contract has been signed. An approved amended IEE is required before this activity can be implemented.

Conditions also include:

Responsibilities

- Each activity manager or **Contracting (or Agreement) Officer Representative (COR/AOR)** is responsible for making sure environmental conditions are met (ADS 204.3.4). In addition, COR/AORs are responsible for ensuring that appropriate environmental guidelines are followed, mitigation measures in the IEE are funded and implemented, and that adequate monitoring and evaluation protocols are in place to ensure implementation of mitigation measures.
- It is the responsibility of the **Development Objective (SO) Team** to ensure that environmental compliance language from the ETD is added to procurement and obligating documents, such as activity-related Development Objective Grant Agreements (DOAGs), program descriptions, and statements of work.
- The **Mission Environmental Officer** will conduct spot checks to ensure that conditions in the IEE and this ETD are met. These evaluations will review whether guidelines are properly used to implement activities under this ETD in an environmentally sound and sustainable manner according to USAID and applicable U.S. Government policies and regulations.
- The implementing **contractor or partner** will ensure that all activities conducted under this instrument comply with this ETD. Also, through its regular reporting requirements, a section on environmental compliance (e.g. mitigation monitoring results) will be included.

Amendments

- Amendments to Initial Environmental Examinations (IEE) shall be submitted for LAC Bureau Environmental Officer (BEO) approval for any activities not specifically covered in the IEE, which include:
 - Funding level increase beyond ETD amount,
 - Time period extension beyond ETD dates (even for no cost extension), or
 - A change in the scope of work, such as the use of pesticides or activities subject to Foreign Assistance Act sections 118 and 119 (e.g. procurement of logging equipment), among others.


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Attachment: Initial Environmental Examination Amendment

File: LAC.RSD.PUB\RSDPUB\EES\Reg216\IEE\IEE12\ LAC-IEE-12-55 ETD (GU - DO2 Economic Growth, Social Development, IR 2.1 BBEG, Food Security).doc



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ENVIRONMENTAL ASSESSMENT RURAL VALUE CHAINS PROGRAM, GUATEMALA



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ENVIRONMENTAL ASSESSMENT

RURAL VALUE CHAINS PROGRAM, GUATEMALA

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The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development, AGEXPORT, ANACAFE, or the United States Government

ACRONYMS AND ABBREVIATIONS

ANACAFE	<i>Asociación Nacional del Café</i> (National Coffee Association)
AGEXPORT	<i>Asociación Guatemalteca de Exportadores</i> (Guatemalan Association of Exporters)
AOR	Agreement Officer Representative
BOD	Biological Oxygen Demand
CBO	Community-based organizations
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CFR	Code of Federal Regulations
CNCG	Climate, Nature and Communities Guatemala (USAID-funded project)
COCODE	Community Development Advisory Councils
CONAP	National Council for Protected Areas
<i>cuerda</i>	Unit of land equivalent to 437 m ²
BEO	Bureau Environmental Officer
CERCAFE	<i>Centro Rural de Café</i> (Rural Coffee Center)
EA	Environmental Assessment
EMMP	Environmental Mitigation and Monitoring Plan
EMPR	Environmental Mitigation Plan Report
ENCOVI	Encuesta Nacional de Condiciones de Vida
ETD	Environmental Threshold Decision
FTF	Feed the Future
GEF	Global Environment Facility
Ha	Hectare
IARNA	Instituto de Agricultura, Recursos Naturales y Ambiente (Institute of Agriculture, Natural Resources and Environment)
IGSS	Instituto Guatemalteco de Seguridad Social (<i>Guatemalan Institute of Social Welfare</i>)
INAB	Instituto Nacional de Bosques (<i>National Forest Institute</i>)
INCAP	Instituto de Nutrición de Centroamérica y Panamá (Institute of Nutrition of Central America and Panama)
INTECAP	Instituto Técnico de Capacitación y Productividad (Technical Institute for Training and Productivity)
IPM	Integrated Pest Management
m ²	Meters squared
m ³	Meter cubed
masl	Meters Above Sea Level
MEO	Mission Environmental Officer
MINEDUC	Ministry of Education
PERSUAP	Pesticide Evaluation Report and Safer Use Action Plan
PINPEP	Forest Economic Incentives Program for Small Land Holders
PINFOR	Forest Economic Incentives Program
Q	Quetzal (Guatemala monetary unit)
qq	Quintal
RVCP	Rural Value Chains Project
REA	Regional Environmental Advisor
SESAN	<i>Secretaria de Seguridad Alimentaria y Nutricional</i> (Secretary for Food Safety and Nutrition)
SIGAP	<i>Sistema Guatemalteco de Areas Protegidas</i>

TNC
UNDP
USAID
USDA

(Guatemalan System of Protected Areas)
The Nature Conservancy
United Nations Development Program
United States Agency for International Development
The United States Department of Agriculture

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EXECUTIVE SUMMARY

The USAID-funded Rural Value Chains Project (RVCP) was awarded in 2012 to develop market-led growth in rural areas of the Western Highlands of Guatemala as a means of sustainably reducing rural poverty and chronic malnutrition. A Feed the Future Initiative, the RVCP works in five departments of the Western Highlands (Huehuetenango, Quiché, San Marcos, Quetzaltenango, and Totonicapán.) Implementing partners, AGEXPORT and ANACAFE (and associated sub-implementing partners) are expanding the participation of poor rural households in coffee, cardamom, horticulture, and fruit orchards and handicraft value chains, improving connections with local, regional and international markets and improving food security and nutrition. Together, they work with 222 producer groups with the cumulative membership of 18,911 producers farming 11,925 hectares of land.

In September 2012, an Initial Environmental Examination (LAC-IEE-12-55) was conducted of the RVCP coffee, horticulture and handicraft activities. The resulting Environmental Threshold Decision (ETD) was a Negative Determination with Conditions. A requirement of the ETD was after one year of implementation, USAID/Guatemala would conduct an environmental compliance audit of RVCP activities and the audit recommendations will be incorporated into subsequent implementing partners' work plans. As a result of the audit, which was conducted in July 2014, the Bureau Environmental Officer (BEO) required that the RVCP perform a complete Environmental Assessment concurrently with the implementation of RVCP's activities, pursuant to section 216.3 (a) (2) on Threshold Decisions and 216.3 (a) (8) of USAID Environmental Procedures on Monitoring.

Taking place mid-project, the Environmental Assessment of the Rural Value Chains Project identifies environmental effects of the project – effects that have been observed and potential effects that continue to need to be prevented or minimized by nature of project activities - after two years of implementation. It provides an opportunity to analyze alternatives to project activities making improvements to project design and implementation to prevent, minimize or rectify any direct, indirect or cumulative adverse effect on the environment. The result is a document that outlines how the project can improve its environmental management, recommending alternative actions that improve environmental design, and in the Environmental Mitigation and Monitoring Plan (Annex D) the measures to be taken to mitigate any adverse effects of the project. A summary of the EMMP mitigation measure outcomes and EA selected alternative implementation outcomes shall be documented in the Project Final Report within an Environmental Compliance Section.

Three alternatives are developed and assessed - No Action, the Proposed Action and Alternative C actions for their environmental consequences and effect on the 14 issues identified by the members of the EA Team and during scoping with stakeholders. The Recommended Alternative does not deviate from the project's purpose and need, has the greatest positive effect on the significant issues, is not an irreversible commitment of resources, and goes the furthest to avoid or minimize adverse effects (observed and potential; direct and indirect) of RVCP activities. The following table summarizes the Recommended Alternative: the actions related to the issues identified in the environmental assessment, including connected actions, and the measures that mitigate the impacts (potential and observed) of the actions of the Recommended Alternative. *Italicized actions and mitigation measures are those that carry over from the Proposed Action and are further described in Section 4.0 and in Annex D, the EMMP.*

Recommended Alternative	
Recommended Alternative Actions	Recommended Alternative Mitigation Measures
<p><i>Issue 1- Forest degradation: forest habitats and associated biodiversity can be negatively impacted by the consumption of fuel wood for drying cardamom. Fuel wood purchased for cardamom drying may be illegally and unsustainably harvested</i></p>	
<p>Recommended Alternative Actions</p> <ul style="list-style-type: none"> • <i>Proposed action: Technical assistance and training in production topics to increase cardamom quality and yields to 805 producers working 1,050 ha.</i> • <i>Proposed action: Improved technologies in post-harvest management, such as more efficient cardamom drying technologies and practices including preventative maintenance and repair of existing dryers to increase their efficiency.</i> • <i>Proposed action: Incorporation of fuel wood and multi-use agroforestry species to provide shade in 324 Ha of existing Cardamom plantations.</i> • <i>Proposed action: establish cardamom and tree nurseries.</i> • <i>Proposed action: Introduce practices that mitigate effects of and support producers to adapt to climate change (e.g. soil conservation practices, cardamom plants selected for their resilience to climate change, pest and disease, cardamom agroforestry systems, etc.)</i> • Sustainable fuel wood management planning will assess current and future legal supplies and demand of firewood for cardamom drying in RVCP participating organizations and identify actions to be taken to meet fuel wood demand. • Small-scale fuel wood plantations are one action to be taken immediately to fill firewood demand into the future. • Assess efficiency of the cardamom-drying technologies and methods. Modifications in the current dryers will be assessed to evaluate 	<p>Recommended Alternative Mitigation Measures</p> <ul style="list-style-type: none"> • Promote only native trees to be used for reforestation and in cardamom agroforestry systems. • Select and plant shade trees based on the altitude, aspect and soils of a given site. • Locate nurseries on flat ground or construct terraces and erosion control devices when on steep slopes. • Establish solid waste collection receptacles or correct waste burial practices at nurseries. • Train farmers with fuelwood plantations in plantation management and reduced impact firewood harvesting practices¹. • Fuelwood plantations will be planted only in abandoned agricultural or pasture land. (Not in established forest.) • Fuelwood plantations will not be planted in riparian zones or in wetlands.

¹ Reduced impact practices can be found in the USAID Sector Environmental Guidelines on Forestry, p. 23 and guidance on reforestation and plantation management on p. 27.
http://www.usaidgems.org/Documents/SectorGuidelines/SectorEnvironmentalGuidelines_Forestry_2015.pdf

Recommended Alternative	
Recommended Alternative Actions	Recommended Alternative Mitigation Measures
<p>the efficiency and the reduction on firewood use. It will be done at pilot sites, comparing efficiency of the current cardamom dryers with the efficiency of the new proposed dryer design.</p>	
<p><i>Issue 2- Diversity of native species in agroforestry systems: the Proposed Action's selection of shade tree species, and that of non-native or invasive species, to be used in project agroforestry systems has the potential to affect biodiversity on farms.</i></p>	
<p>Recommended Alternative Actions In coffee agroforestry systems:</p> <ul style="list-style-type: none"> • <i>Proposed action: Promotion of and technical assistance in shade tree management on 9,866.71 ha.</i> • <i>Proposed action: Identification and diversification of native and non-native shade species for coffee crops (majority Ingas and Gravilea).</i> • <i>Diversification with Native Species: promotes native trees and fruit trees not only to help coffee with shade but also for domestic consumption. Also leguminous species to fix nitrogen.</i> • <i>Non-native species, Gravilea, will be planted in coffee fields and around them as windbreaks where agro-climatic conditions permit.</i> <p>In cardamom agroforestry systems:</p> <ul style="list-style-type: none"> • <i>Proposed action: locally collected seeds of native shade tree species will be cultivated in RVCP nurseries and use for reforestation (small scale plantations) and enrichment of 324 ha of agroforestry systems.</i> 	<p>Recommended Alternative Mitigation Measures In coffee agroforestry systems:</p> <ul style="list-style-type: none"> • <i>Coffee growers will be trained to diversify native species in coffee agroforestry systems²</i> • <i>Select and plant shade trees based on the altitude, aspect and soils of a given site.</i> • <i>Connected nursery-related mitigation measures as described in Issue 1.</i> <p>In cardamom agroforestry systems:</p> <ul style="list-style-type: none"> • <i>Promote only native trees to be used for reforestation and in cardamom agroforestry systems.</i> • <i>Select and plant shade trees based on the altitude, aspect and soils of a given site.</i> • <i>Connected nursery-related mitigation measures as described in Issue 1.</i>
<p><i>Issue 3 - Soil erosion: coffee field renovation and establishment can create conditions for soil erosion if soil management and conservation measures are not applied properly.</i></p>	

² While shade grown coffee agroforestry systems are necessarily designed according to site-based characteristics (aspect, soils, climate, etc.) here are some common standards: AGEXPORT (2014b) recommends shade grown coffee systems have a minimum of 10 species of trees and a minimum density of 70 trees per hectare. July 2014 Rainforest Alliance standards (12 native species per hectare including fruit trees, at least 40% shade and at least two canopy strata) and in Bird Friendly standards which include 40% shade cover, a diversity of at least 10 woody species, and three stratum of structural diversity.

http://nationalzoo.si.edu/scbi/migratorybirds/coffee/quick_reference_guide.cfm

Recommended Alternative	
Recommended Alternative Actions	Recommended Alternative Mitigation Measures
<p>Recommended Alternative Actions</p> <ul style="list-style-type: none"> • <i>Proposed action: Renewal of plantations with rust resistant plants that meet international market standards, establishment of agro forestry systems.</i> • <i>Proposed action: Drip irrigation and management for coffee and shade tree nurseries.</i> • <i>Proposed action: Technical assistance to promote improved technologies or practices: shade management, soil conservation measures such as live barriers, individual terraces, etc.</i> • Plant nitrogen fixing, multi-use grasses (for mulch and livestock forage) and green manures during renovation, as well as native fuel wood/shade trees or fruit trees to protect soils from erosion and improve fertility. 	<p>Recommended Alternative Mitigation Measures</p> <ul style="list-style-type: none"> • <i>Rotate renovation of coffee groves (in blocks) to stagger periods of non-productivity of new coffee plants.</i> • <i>Protect existing multi-use shade trees during renovation.</i> • <i>Train para-technicians and producers in the design and implementation of soil conservation standards and practices (e.g. the correct soil conservation measures and spacing between them for soil type, depth and slope³ of the site).</i> • <i>The use of herbicides will not be recommended but manual weeding will be promoted and the use of “chapeados” that leave some 10 cm of the plants in their place instead of eliminating them, in order to decrease erosion and favor the infiltration of rainwater.</i> • <i>All mitigation measures in Issue 2 as applicable to connected diversification and nursery actions.</i>
<p><i>Issue 4- Water management and conservation: Water is being used for irrigation in some horticulture crops and for coffee processing without sufficient measurement and monitoring of water use, supply and demand.</i></p>	
<p>Recommended Alternative Actions</p> <ul style="list-style-type: none"> • <i>Proposed action: Conversion of sprinkler irrigation systems to drip irrigation systems.</i> • <i>Proposed action: Improve in post-harvest management and processing including new and remodeled wet milling and artisanal processing.</i> • <i>Proposed action: Establishment of home gardens (and school gardens for two departments): micro-drip irrigation systems of 50 m² or less, establishment of raised fields for planting</i> • Irrigation Management Planning and Implementation: Conversion of established irrigation systems (as being done by 	<p>Recommended Alternative Mitigation Measures</p> <p>In coffee processing:</p> <ul style="list-style-type: none"> • <i>Promote the re-conditioning (re-design) of “honey water” (coffee wastewater) treatment filter pits to avoid over-flows by generated wastewater or rainwater. Re-conditioning of filter pits is based on volumes of wastewater generated and site-based conditions (e.g. soils, location).</i> <p>In horticulture and food security and nutrition:</p> <ul style="list-style-type: none"> • <i>Train farmers in best management practices for water conservation in irrigation, such as best timing of irrigation (e.g. in early morning or late afternoon), to identify and immediately repair leaks, to identify signs of</i>

³ Based on Sheng’s 1989 Soil Conservation for Small Farmers in the Humid Tropics as cited on p. 11 of the USAID (2014) Environmental Guidelines for Agriculture.

Recommended Alternative	
Recommended Alternative Actions	Recommended Alternative Mitigation Measures
<p>Agexport) should include an overall diagnosis and plan of the system, as well as measurement of water supply and demand of the system. An irrigation management plan includes not only maintenance and operation, but also the management of water and the irrigation system as a whole, including water measurement and monitoring (of the water supply) and how to change the operation when drought or other problems and needs arise.</p> <ul style="list-style-type: none"> • Compare volume of water used (per cuerda or square meter per crop) by the two systems – sprinkler systems and RVCP-installed drip irrigation systems with management (including soil conservation practices) in demonstration sites. • Water Management and Conservation in coffee wet milling processes: train farmers in measurement and monitoring of water use and practices that support its conservation, and climate change adaptation measures. • Demonstrate techniques for harvesting rainwater for home gardens in master farms. • Apply organic mulch to home gardens to conserve soil moisture. 	<p><i>over or under watering, and soil conservation methods to apply in the irrigated parcel that help retain soil humidity (mulch, green manures, incorporation of organic matter, etc.).</i></p> <ul style="list-style-type: none"> • Strengthen (via training) irrigation management committee or form a new one when one doesn't exist. (In associations that have converted to the project-promoted drip irrigation systems.) • <i>Teach soil conservation measures in home gardens including minimal to no till techniques and incorporation of compost to improve soil humidity.</i> • Educate beneficiaries that rainwater storage containers should be screened to keep out debris, mosquitos and other insects. • Train families to collect rainwater off metal roofs that are not rusting and without overhanging branches.

Issue 5 – Water pollution: a) Existing coffee waste water disposal systems using filter pits have the potential to overflow (such as in wet coffee processing at the Asociación Chajulense in Quiche and as identified in the July 2014 Audit, p. 24) and can cause surface and ground water contamination when water is not treated or filter pits not designed correctly, and b) Agriculture production actions such as pesticide application, fertilizer use, and composting can deteriorate water quality due to inappropriate location of the activities, lack of buffer zones, and when best management practices are not followed.

Recommended Alternative Actions	Recommended Alternative Mitigation Measures
<ul style="list-style-type: none"> • <i>Proposed action: Improvement in post-harvest management and processing, including new and remodeled artisanal processing, improved technologies⁴ such as</i> 	<ul style="list-style-type: none"> • <i>Train farmers to reuse wet milling waste, such as pulp, by incorporating into compost and making fertilizers</i> • <i>Locate compost piles at least 20m from</i>

⁴ Such as pulping manual machines (brand Servicios Integrados Industriales with 20qq capacity), and modules of semi-integrated coffee pulping machines (brand Jota Gallo)

Recommended Alternative	
Recommended Alternative Actions	Recommended Alternative Mitigation Measures
<p><i>eco-friendly coffee mills that use significantly less water, and treatment of coffee wastewater.</i></p> <ul style="list-style-type: none"> • <i>Proposed action: Technical assistance and implementation of Good Agricultural Practices (e.g. soil conservation practices such as contour planting, mulching, live and dead barriers, crop rotation, cover crops, utilization of organic fertilizers and terracing or bunds; training in the safe use and management of pesticides, per USAID PERSUAP, the management of pesticide waste containers, and the monitoring of best management practices to meet certification.).</i> • Promote re-conditioning of “honey water” (coffee wastewater) treatment filter pits to avoid over-flows based on water volumes and site-based features and conditions as part of the technical assistance/training provided to farmers and associations. • Alternative Action: Development of instructional materials that give general recommendations to farmers, para-technicians and technicians on how to design a filter pit based on local conditions and volume of coffee wastewater generated. • Exchange of Experiences/Field Trips with Master Farmers, Producer Groups, Promoters and Project Technicians, promoting successful models and best management practices across implementers and producer groups, such as Pesticide. 	<p>bodies of water and ensure they are protected from rain and strong winds, are not located in floodplains, nor will run-off contaminate crops or irrigation water.</p> <ul style="list-style-type: none"> • <i>Incorporate organic waste into worm and regular compost systems.</i> Worm bins must have solid, enclosed sides and bottoms. Farmers must be trained to manage worms, being vigilant of their proper enclosure and not letting them escape into the environment. • <i>Train farmers to establish native vegetation barriers (such as with multi-use grasses, trees or shrubs) where they do not exist between coffee crops and the edges of streams and other bodies of water (of at least 18m as farm space permits⁵) to capture run-off of chemicals and nutrients.</i> • <i>Locate latrines at least 30m from water bodies or sources of drinking water⁶. Ensure they are constructed above the water table. Ensure latrine construction and location meet USAID ENCAP standards⁷.</i>

Issue 6 – Pest and disease management: Coffee rust, thrips, and other pests/diseases are impacting coffee, cardamom, and fruit tree production, as well as horticulture production. Pesticide use is seen as a solution to minimizing pest and disease in crop production but can negatively impact health and water quality, especially in areas under organic production such as on organic coffee farms

⁵ Fleming and Henkel. (2001). <http://www.fao.org/forestry/12659-05d509078d5cbe3908cd6e891e808490d.pdf>

⁶ USAID ENCAP Visual Field Guides: Toilets/Latrines, December 2009. http://www.usaidgems.org/Documents/VisualFieldGuides/ENCAPVslFldGuide--Sanitation_1Dec09.pdf

⁷ USAID ENCAP Visual Field Guides: Toilets/Latrines, December 2009. http://www.usaidgems.org/Documents/VisualFieldGuides/ENCAPVslFldGuide--Sanitation_1Dec09.pdf

Recommended Alternative	
Recommended Alternative Actions	Recommended Alternative Mitigation Measures

in the Zona Reina, at the headwaters of the Chixoy River Basin.

The sub-issues are:

- 1) *Variations in pesticide use and safe use standards⁸ and practices.*
- 2) *The appropriate coffee-rust resistant varieties to plant per local conditions and international markets.*
- 3) *The lack of standardized IPM practices in project value chains that can be applied in conventional and organic systems*

Recommended Alternative Actions	Recommended Alternative Mitigation Measures
<p>Across all three value chains:</p> <ul style="list-style-type: none"> • Exchange of Experiences/Field Trips with Master Farmers, Producer Groups, Promoters and Project Technicians, promoting the adoption of best practices such as the Pesticide Brigades in other producer groups. <p>Coffee value chain:</p> <ul style="list-style-type: none"> • <i>Proposed action: Technical assistance and training in production issues for organic, conventional and mixed coffee crops.</i> • <i>Proposed action: Purchase, training in use and maintenance of motorized sprayers with a two-stroke engine, and handling and storing of petroleum products.</i> • <i>Proposed action: Analysis of the effect of coffee rust in coffee cultivation and management design for the small farmer (according to the guidance provided in the LAC Coffee PERSUAP and Guatemala PERSUAP amendment for coffee).</i> • <i>Proposed action: Train project technicians,</i> 	<p>Coffee, horticulture/fruit orchard and cardamom value chains:</p> <ul style="list-style-type: none"> • Update training materials to ensure the 2015 approved pesticides and safe use practices are being applied. • <i>Provide farmers/associations lists of approved pesticides identified in the PERSUAP (per their crop⁹).</i> • <i>Train farmers in the correct and complete construction and use of pesticide, mixing zones and bio-beds (Biodeps).</i> • <i>Train farmers to practice cleaning and dispose of empty pesticide containers according to Guatemalan norms COGUANOR NGO 44 086:98, Triple lavado</i> • <i>Train farmers to use Personal Protection Equipment (PPE) while using pesticides.</i> <p>Coffee value chain:</p> <ul style="list-style-type: none"> • Update all pesticide and IPM training and technical assistance to adhere to the findings of the January 2015 Programmatic PERSUAP for LAC (LAC-IEE-15-05)¹⁰

⁸ The July 2014 Audit cites various inconsistencies with pesticides being used by RVCP participants and the project PERSUAP. “Based on observations in the field and interviews with producers, the environmental audit results indicate that participants in the RVCP are not compliant with the PERSUAP. Based on active ingredients in commonly used pesticides such as Duett, the first active ingredient in epoxiconazole + carbendazim is listed as a fungicide not to be used on USAID projects. In addition, copper oxide and tea tree oil (*Melaleuca alternifolia*) are utilized by producers, but not included in the approved PERSUAP list” (Cadmus 2014, p.30).
⁹ coffee - January 2015 Programmatic PERSUAP for LAC (LAC-IEE-15-05)⁹; horticulture – the RVCP PERSUAP and as amended to include new crops, and for cardamom.

¹⁰ <http://gemini.info.usaid.gov/egat/envcomp/repository/pdf/42611.pdf>

Recommended Alternative	
Recommended Alternative Actions	Recommended Alternative Mitigation Measures
<p><i>para-technicians and farmers in the Integrated Pest Management practices of the Programmatic Pesticide Evaluation Report and Safe Use Action Plan (PERSUAP) for Coffee, with Emphasis on Coffee Rust, approved January 2015.</i></p> <p>Horticulture & fruit orchards value chains:</p> <ul style="list-style-type: none"> • <i>Proposed action: Producer adoption of production systems under controlled conditions: macrotunnels.</i> • <i>Proposed action: Technical assistance and training in production topics to increase horticultural production quality and yields, such as fertilization planning, and management, composting, pesticide use and management, and technologies and sanitary practices to improve quality and meet certification requirements: field-based latrines, hand-washing stations and bio-beds.</i> • Training of project technicians, para-technicians and farmers in the PERSUAP as amended by the USAID to include crops and pesticides not reviewed such as apples, peaches, green peppers and jalapeño peppers. <p>Cardamom value chain:</p> <p><i>Proposed action: Technical assistance and training in production topics to increase cardamom quality and yields, such as crop sanitation and management, shade management and pest and disease management</i></p> <ul style="list-style-type: none"> • Promote Organic Standards to 	<ul style="list-style-type: none"> • Ensure that purchased motorized backpack sprayers meet FAO standards¹¹ and incorporate practices¹² that protect human health and the environment into training in the use and maintenance of motorized pesticide sprayers. • <i>The use of herbicides will not be recommended but manual weeding will be promoted and the use of “chapeados” that leave some 10 cm of the plants in their place instead of eliminating them, in order to decrease erosion and favor the infiltration of rainwater.</i> <p>Horticulture and fruit orchards value chains:</p> <ul style="list-style-type: none"> • <i>Locate macro-tunnels where they won't be damaged by high winds or intense rains and on slopes less than 12%.</i> • Apply USAID Visual Field Guide: Construction¹³ at all RVCP constructed small-scale infrastructure: macro-tunnels, greenhouses, <i>centros de acopio</i> and demonstration centers to ensure they are not generating impacts. Take corrective actions when impacts identified. • During training of farmers in the RVCP PERSUAP and as amended for new crops (apple, pear, peach, green and jalapeño peppers) special emphasis needs to be placed on IPM and the identification of which pesticides are allowed and for which plants. <p>Cardamom value chain:</p> <ul style="list-style-type: none"> • Update all pesticide and IPM training and

¹¹ <http://www.fao.org/docrep/006/Y2752S/Y2752S00.htm>

¹² Practices include: calibration of equipment, determining the proper application rate, pressure and speed of movement, determining the amount of chemicals to use and the safe application of pesticides. Information on these practices can be found in the Environmental Guidelines for Small-scale Agriculture in Africa, Chapter 13, p. 34 – 40 <http://www.encapafrika.org/sectors/saferpesticides.htm> and the APHIS USDA Job Hazard Analysis,

https://www.aphis.usda.gov/emergency_response/downloads/health/JHA%2020%20Application%20of%20pesticide_s-herbicides%20by%20Hand%20apparatu.pdf

¹³ http://www.usaidgems.org/Documents/VisualFieldGuides/ENCAP_VsIFldGuide--Construction_22Dec2011.pdf

Recommended Alternative	
Recommended Alternative Actions	Recommended Alternative Mitigation Measures
<p>Cardamom Producers in Zona Reina.</p> <ul style="list-style-type: none"> • Train project technicians, para-technicians and farmers in the findings of the PERSUAP for cardamom production (as developed by the USAID) in the Zona Reina. 	<p>technical assistance to adhere to the findings of the Pesticide Evaluation and Safe Use Action Plan for cardamom.</p> <p>Component 5, SAN:</p> <ul style="list-style-type: none"> • <i>Train families in organic pesticides and integrated pest management practices to control pests in home gardens, per the project PERSUAP.</i>
<p><i>Issue 7 - Litter and solid waste management: improper solid waste management in agricultural production and processing, handicraft production and in plant nurseries can contribute to the community-wide problem with inorganic litter and waste, a problem experienced throughout Guatemala.</i></p>	
<p>Recommended Alternative Actions</p> <p>Horticulture, fruit, coffee, cardamom and handicraft value chains and nurseries:</p> <ul style="list-style-type: none"> • Training in Solid Waste Management: Horticulture, fruit, coffee, cardamom and handicraft technicians, para-technicians and organizations will be trained to identify and manage inorganic and organic solid waste. <p><i>The following are the carried over proposed actions that can generate inorganic solid waste: Coffee value chain (e.g. seedling bags):</i></p> <ul style="list-style-type: none"> • <i>Proposed action: Renewal of plantations: establishment of coffee rust and other disease resistant coffee seedlings, nursery establishment, irrigation and management for nurseries.</i> <p><i>Cardamom value chain (e.g. seedling bags):</i></p> <ul style="list-style-type: none"> • <i>Proposed action: Establish cardamom and tree nurseries</i> <p><i>Horticulture value chain (such as plastics in macrotunnels and irrigation systems.):</i></p> <ul style="list-style-type: none"> • <i>Proposed action: Conversion of sprinklers to drip irrigation systems with plastic tubing.</i> • <i>Proposed action: Production systems under controlled conditions, such as macro-tunnels and plastic sheets.</i> <p><i>Handicraft value chain (such as textile clippings):</i></p>	<p>Recommended Alternative Mitigation Measures</p> <ul style="list-style-type: none"> • <i>Develop solid waste management practices with producers or producer groups. Such as, coordinate container collection and disposal services (e.g. Agrequima collection where they service) or establish properly designed solid waste (inorganic) disposal/burial pits on farms. (Do not burn waste.)</i> • <i>At nurseries, establish solid waste collection receptacles (for collection and transport to another appropriate waste management site) or waste burial practices (e.g. trash burial pits) at nurseries.</i> • <i>Train farmers to practice cleaning and dispose of empty pesticide containers according to Guatemalan norms NGO 44 086-98, Plaguicidas. Envases. Triple lavado and COGUANOR NGO 44 086.</i>

Recommended Alternative	
Recommended Alternative Actions	Recommended Alternative Mitigation Measures
<ul style="list-style-type: none"> • <i>Proposed action: Development of market- based new products.</i> • <i>Proposed action: Improved technologies or production practices.</i> 	
<p><i>Issue 8 - If handicraft raw materials are bought from unsafe and unsustainable sources, they could impact human health, place indirect pressures on a natural resource, and negatively impact handicraft production.</i></p>	
<p>Recommended Alternative Actions</p> <ul style="list-style-type: none"> • Source verification and planning: implies training handicraft organizations to verify if raw materials meet market requirements, are legal and non-toxic. • Identify other providers of non-toxic thread in Guatemala or regionally to meet export market requirements: Identify other companies that will or can provide non-toxic thread and meet wastewater treatment standards. 	<p>Recommended Alternative Mitigation Measures</p> <ul style="list-style-type: none"> • Train artisans in occupational health and safety practices as identified in plans.
<p><i>Issue 9 - Inadequate occupational health and safety conditions impact air quality in the work environment, damage infrastructure and can pollute local soils and water.</i></p>	
<p>Across all value chains:</p> <ul style="list-style-type: none"> • Promote a culture of occupational health and safety. Develop organizational capacity to develop and monitor the implementation of occupational health and safety plans. Create alliances with local public and private organizations dedicated to occupational health and safety, emergency response and related practices. <p><i>Coffee value chain:</i></p> <ul style="list-style-type: none"> • <i>Proposed action: Improvement in post-harvest management and processing, training in occupational health and safety measures.</i> <p><i>Horticulture and fruit value chain:</i></p> <ul style="list-style-type: none"> • <i>Proposed action Intermediate or final post-harvest processing: e.g. selection, quality control, and packing in re-used plastic boxes to avoid damage during shipment.</i> <p><i>Cardamom value chain:</i></p> <ul style="list-style-type: none"> • <i>Proposed action Improved technologies in post-harvest management, such as more efficient cardamom drying technologies</i> 	<p>Recommended Alternative Mitigation Measures</p> <p>All value chains:</p> <ul style="list-style-type: none"> • Train producers in industrial safety and occupational health practices. <p>Cardamom value chain:</p> <ul style="list-style-type: none"> • Train farmers with fuel wood plantations in safe and reduced impact harvesting practices to minimize risks of to human health and bodily harm.

Recommended Alternative	
Recommended Alternative Actions	Recommended Alternative Mitigation Measures
<p><i>and practices and maintenance and repair of existing dryers to increase their efficiency.</i></p> <p><i>Handicraft value chain:</i></p> <ul style="list-style-type: none"> • <i>Proposed action: Improved technologies or production practices such as back-strap looms and inputs and modern looms tailored to the artisans, implementation of looms for bracelets, equipping workshops with treadle looms for weaving wool, carding machinery and machinery for thread spinning; sewing machines.</i> 	
<p><i>Issue 10: Conservation of local agrobiodiversity: Crops promoted in home gardens do not reflect the full range of medicinal and other vegetables that participants like to eat or use, potentially limiting the benefits of local agrobiodiversity, that has traditionally been conserved in home gardens, and their benefits to food security and nutrition.</i></p>	
Recommended Alternative Actions	Recommended Alternative Mitigation Measures
<ul style="list-style-type: none"> • <i>Proposed action: establishment of home gardens, and provision of vegetable seeds for home gardens.</i> • <i>Proposed action: training in nutritionally balanced recipes</i> • Exchange of Experiences between AGEXPORT and ANACAFE/FUNCAFE to learn successful approaches to food sovereignty and utilization of native herbs and plants of participating families. 	<p>Measures</p> <ul style="list-style-type: none"> • Mitigation measures as identified in other issues as related to establishment of home gardens.
<p><i>Issue 11 - Differing and competing agricultural practices between RVCP participating members and non- members can indirectly limit the effectiveness, replication and sustainability of the agricultural and environmental best management practices and technologies promoted by the project.</i></p>	
Recommended Alternative Actions	Recommended Alternative Mitigation Measures
<ul style="list-style-type: none"> • <i>Proposed action: exclusively works with the members of the producer associations, cooperatives and organizations attended by the AGEXPORT and ANACAFE implementing partners.</i> • <i>Proposed action: coffee, cardamom and tree seedlings raised in nurseries at member farms. Some farmers selling to producers in their community.</i> • <i>Proposed action: Agrequima pesticide waste receptacles available for everyone in the</i> 	<p>Measures</p> <ul style="list-style-type: none"> • Ensure model farms (master farmers and farms) reflect the complete and correct application of the mitigation measures and best practices promoted by the project.

Recommended Alternative	
Recommended Alternative Actions	Recommended Alternative Mitigation Measures
<p><i>community to use.</i></p> <ul style="list-style-type: none"> • <i>Proposed action: RVCP master farmers can share practices and experiences with members and non-members alike.</i> • <i>Proposed action: “Mesa de Concertación de Café” in Ixil provides opportunity for coffee producers throughout the area to come together and organize. (Members and non-members.)</i> • Exchange of Experiences/Field Trips with Producers and Project Technicians: to learn successful approaches such as exemplified by the Mesa de Concertación de Café in Ixil that brings together coffee producers in a particular geographic area to address specific issues together. 	
<p><i>Issue 12 - Land use monitoring: project baseline data (that of the RVCP or MEP) was not designed to collect, map or monitor land use information of participating farms in a way that facilitates the monitoring of land use change.¹⁴</i></p>	
<p>Recommended Alternative Actions</p> <ul style="list-style-type: none"> • <i>Proposed action: Support quality certifications where the market requires them.</i> • Land Use Monitoring and Evaluation: aims to identify (by taking GPS points) on a GIS map the locations of the productive units of RVCP farmers. This information will contribute to the MEP project mapping, monitoring and evaluation.¹⁵ 	<p>Recommended Alternative Mitigation Measures</p> <ul style="list-style-type: none"> • Develop a standardized RVCP land use data collection form per agricultural value chain, and coordinate it with component 5 to be applied to a sample of RVCP farms/participants.
<p><i>Issue 13 - Technical assistance and training is not having the expected results (fully addressing environmental management needs) and may be limited by language and literacy barriers</i></p>	
<p>Recommended Alternative Actions</p> <p>All RVCP value chains and component 5:</p> <ul style="list-style-type: none"> • <i>Proposed action: training and technical assistance from 132 technicians, 178 promoters and 33 master farmers (and growing) is being given by local staff, who speak the local languages.</i> 	<p>Recommended Alternative Mitigation Measures</p> <ul style="list-style-type: none"> • Ensure model farms (master farmers and farms) reflect the complete and correct application of the mitigation measures and best practices promoted by the project. • Update all pesticide and IPM training and technical assistance to adhere to the

¹⁴ The project’s objective is to improve production in parcels already under agricultural use. Also, the EA team confirmed in the field that RVCP activities are not directly converting forest to agricultural use.

¹⁵ It requires an agreement between MEP and RVCP

Recommended Alternative	
Recommended Alternative Actions	Recommended Alternative Mitigation Measures
<ul style="list-style-type: none"> • Exchange of Experiences/Field Trips with Producers and Project Technicians: includes workshops, field trips/exchanges, or co-implementation of field activities to cross-fertilize experience and knowledge between technical assistance staff of ANACAFE and AGEXPORT, producer groups and master farmers. Master farmers continue to share experiences with non-member farmers on their farms or on the master farm. • Extension materials published in pictographs to reach illiterate producers, and available on master farms. 	<p>findings of the January 2015 Programmatic PERSUAP for LAC (LAC-IEE-15-05)</p> <ul style="list-style-type: none"> • Train farmers in the RVCP PERSUAP and as amended for new crops (apple, pear, peach, green and jalapeño peppers).
<p><i>Issue 14 - Sustainability of environmental best management practices - economic and socio-cultural factors: 1) Will associations be profitable enough to afford and encourage their members (producers) to adopt practices such as the macro tunnels, latrines and hand washing stations, or metal fencing? (The July 2014 Audit points to existing challenges with investing in equipment such as the Personal Protective Equipment used during pesticide spraying) and 2) limited youth involvement in activities and decision-making, experienced during scoping, including that of young women, can limit the capacity of new generations to carry forward best management practices.</i></p>	
<p>Recommended Alternative Actions</p> <ul style="list-style-type: none"> • <i>Proposed action: Technical assistance and training in production topics to increase horticultural production quality and yields, such as technologies and sanitary practices to improve quality and meet certification requirements: field-based latrines, hand-washing stations and bio-beds.</i> • <i>Proposed action: Producer adoption of production systems under controlled conditions: macrotunnels.</i> • <i>Proposed action: Support quality certifications where the market requires them. This can result in a more secure market/buyer and the addition of a small premium on price.</i> 	<p>Recommended Alternative Mitigation Measures</p> <ul style="list-style-type: none"> • Train farmers to use Personal Protection Equipment (PPE) while using pesticides. (When an official PPE suit is not available, identify with farmers ways to adaptation common items as PPE, including plastic sheets to cover the torso and plastic beverage bottles to protect the eyes.) • Locate macro-tunnels where they won't be damaged by high winds or intense rains. Locate macro-tunnels and greenhouses on level ground, with slopes less than 12%. • Recruit/develop male and female master farmers from a range of age groups (e.g. youth, middle-age, elder)

I INTRODUCTION AND BACKGROUND

The USAID-funded Rural Value Chains Project (RVCP) was awarded in 2012 to develop market-led growth in rural areas of the Western Highlands of Guatemala as a means of sustainably reducing rural poverty and chronic malnutrition. A Feed the Future Initiative, the RVCP works in five departments of the Western Highlands (Huehuetenango, Quiché, San Marcos, Quetzaltenango, and Totonicapán). Implementing partners, AGEXPORT and ANACAFE (and associated sub-implementing partners¹⁶), are expanding the participation of poor rural households in coffee, horticulture and handicraft value chains, improving connections with local, regional and international markets and improving food security and nutrition. AGEXPORT works with 2,705 households and 142 producer groups in Quiché, Quetzaltenango and Totonicapán. ANACAFE works with 8,452 households and 155 producer groups in Huehuetenango and San Marcos (USAID/ANACAFE work plan FY 2016). Overall, the agricultural production activities are taking place with 18,911 producers on 11,925 hectares of land in 30 municipalities.

In September 2012, an Initial Environmental Examination (LAC-IEE-12-55) was conducted of the RVCP coffee, horticulture and handicraft activities. The resulting Environmental Threshold Decision was a Negative Determination with Conditions. In summary, implementation of coffee, horticulture and handicraft activities, including small-scale infrastructure development was given 12 conditions. The LAC-IEE-12-55 also required that after one year of implementation, USAID/Guatemala would conduct an environmental compliance audit of RVCP activities and that audit recommendations will be incorporated into subsequent implementing partners' work plans.

In July 2014, an Environmental Compliance Audit was carried out of the RVCP and found:

...the environmental considerations included in project design are generally consistent with the ETD, but that mitigation measures are not being fully implemented in all cases and that monitoring documentation needs to be strengthened (p.viii).

As indicated in the *Statement Of Work For The Scoping Statement And Environmental Assessment Of The Rural Value Chains Project In Guatemala, (2015) Activity*, the July 2014 Audit revealed weaknesses with water, pesticide and solid waste management, and that “adverse environmental impacts related to the EMPRs were observed. One of the most significant adverse environmental impacts observed was the potential risk of land use change.”

As a result of the audit conducted, the Bureau Environmental Officer (BEO) required that the RVCP perform a complete Environmental Assessment concurrently with the implementation of RVCP's

¹⁶ AGEXPORT consortium members include: Save the Children (SCF) working in horticulture, *Instituto de Nutrición de Centroamérica y Panamá (INCAP)* working in food security and nutrition, and the *Comisión de Artesanías (COMART)*. ANACAFE consortium members include: *Federación de Cooperativas Agrícolas de Guatemala (FEDECOAG)* working in horticulture, *Federación de Cooperativas Agrícolas de Productores de Café de Guatemala (FEDECOCAGUA)* working in coffee, *Federación Integral de Cooperativas de Producción Artesanal, (ARTEXCO)* working in handicrafts and the *Fundación de la Caficultura para el Desarrollo Rural, (FUNCAFE)*

activities, pursuant to section 216.3 (a) (2) on Threshold Decisions and 216.3 (a) (8) of USAID Environmental Procedures on Monitoring.

I.1 ENVIRONMENTAL ASSESSMENT OBJECTIVE

According to 22 CFR 216.6(a) the general purpose of the Environmental Assessment “is to provide Agency and host country decision-makers with a full discussion of significant environmental effects of a proposed action. It includes alternatives which would avoid or minimize adverse effects or enhance the quality of the environment so that the expected benefits of development objectives can be weighed against any adverse impacts upon the human environment or any irreversible or irretrievable commitment of resources.”

Taking place mid-project, the Environmental Assessment of the Rural Value Chains Project in Guatemala identifies environmental effects of the project – effects that have been observed and effects that continue to need to be prevented or minimized by nature of project activities - after two years of implementation. It provides an opportunity to analyze alternatives to project activities making improvements to project design and implementation to prevent, minimize or rectify any direct, indirect or cumulative adverse effect on the environment.

The result is a document that outlines how the project can improve its environmental management, recommending alternative actions that improve environmental design, and in the Environmental Mitigation and Monitoring Plan (Annex D) the measures to be taken to mitigate any adverse effects of the project.

In February and March 2015, the environmental assessment began with identification of significant issues related to the Proposed Action and the scope of topics to include in the environmental analysis, per 22 CFR 216.3 (a) (4). The Scoping Statement was submitted to USAID and approved by the Bureau Environmental Officer on June 10, 2015. Scoping findings are described in Section 5 and provide a basis for the proposed alternatives and mitigation measures of this environmental analysis.

This environmental assessment also supports the review of existing RVCP EMPRs and development of a project Environmental Monitoring and Mitigation Plan (EMMP) for the coffee, horticulture, fruit orchard, cardamom and handicraft value chains, as well as the food security and nutrition activities.

2 DESCRIPTION OF EXISTING CONDITIONS

This section on Existing Conditions presents general context in which the project is operating as well as project-specific conditions. It was informed by the following sources: 1) the Scoping Team’s visits to project sites, 2) their professional experience with the Western Highlands, 3) the findings of the 2014 RVCP Environmental Compliance Audit carried out by Cadmus, 4) non-RVCP secondary data, and 5) RVCP annual reports, PERSUAPS and other studies. It is important to recognize that AGEXPORT and ANACAFE do not measure nor uniformly present their activities in annual reports, which made it difficult to

describe project-specific existing conditions across both implementers and all departments in the same way. Therefore, descriptions of conditions based on RVCP activities, at times, reflect data from the dominant RVCP implementer per value chain (e.g. ANACAFE data for coffee in San Marcos and Huehuetenango, and AGEXPORT for horticulture, fruit orchards and cardamom in Quiché, Quetzaltenango and Totonicapán).

2.1 CLIMATE, GEOGRAPHY AND LAND USE

RVCP activities take place in 30 municipalities within five departments of the Western Highlands – Huehuetenango, San Marcos, Quiché, Quetzaltenango and Totonicapán. The Western Highlands have a territorial extension of 22,584 km². The topography being highly variable, project activities can be carried out on farms at elevations as low as 500 hundred meters above sea level, such as in the Zona Reina, to 3,000 masl in Huehuetenango. It is characterized by great bioclimatic variation with rainfall from 400 mm to 3,000 mm annually. Average annual minimum temperatures in the Western Highlands can reach eight degrees Celsius, although absolute minimums can reach -10 Celsius at high altitudes. Average annual maximum temperature can reach 33 degrees Celsius in the lowlands of San Marcos, with absolute maximums over 40 degrees Celsius. Its dense fog or night clouds generate horizontal rain, which promotes an abundance of mosses, algae, bromeliads and ferns. On the other hand, the areas of Guatemala (Annex A) experiences high rates of evapotranspiration and low rainfall during the rainy season (De La Cruz 1982). [The 2014 climate change vulnerability study by TNC/CNCG, identifies 66 municipalities in the five RVCP departments with conditions for high water scarcity (see section below on climate change vulnerability)]. The southern mountains of the Western Highlands have a range of active and inactive volcanoes, such as Tacaná in San Marcos, and Santa María in Quetzaltenango.

The following table summarizes geographic and demographic characteristics of the RVCP departments (UNDP 2011):

Table 1: Geographic and Demographic Characteristics

Department	Area (km ²)	Meters above sea level (dep. capital)	Population (2010)	Rural population (%)	Women (%)	Indigenous (%)
Huehuetenango	7,403	1,902	1, 100,000	75	51	58
Quetzaltenango	1,951	2,222	771,700	42	51	43
Quiché	8,378	2,021	921,400	72	51	90
San Marcos	3,791	2,398	995,700	79	51	36
Totonicapán	1,061	2,495	461,000	56	52	97

The following Human Development Index data underscores the poverty and infrastructure conditions of the five RVCP departments.

Table 2: Human Development Characteristics of the RVCP Departments

Department	Education (average % literacy rate)	Electricity (%)	Extreme Poverty (%)	Poverty (%)	No Poverty (%)
Huehuetenango	72.7	85.5	9.54	50.91	39.50
Quetzaltenango	82.4	93.1	10.44	43.28	46.27
Quiché	64.6	70	16.83	55.02	28.15
San Marcos	79.7	86.2	15.19	53.35	31.46
Totonicapán	78.2	90	20.99	52.30	26.71

Sources: Education: Human Development Numbers, UNDP, 2010; Electricity: Electric Coverage Rate 2010; Extreme, non-extreme poverty and no poverty: ENCOVI, 2011.

RVCP organizations and participating farmers were selected for their location within areas of high malnutrition within the Western Highlands, as indicated in Table 3.

Table 3: Malnutrition rates per Department

RVCP intervention department	Malnutrition rate (%)
Quiché	63.9
Quetzaltenango	46
Totonicapán	69.4
San Marcos	55.5
Huehuetenango	62.8

Source: SESAN/MINEDUC, 2009.

RVCP families are mostly living in conditions of poverty and extreme poverty. According to RVCP baseline studies conducted by IARNA, (2013) which used ENCOVI 2011 criteria (thresholds of Q/year); the following table outlines the poverty data of RVCP families, and non-beneficiaries of the project.

Table 4: RVCP Poverty and Per Capita Income (Q8.00 = US\$1.00)

Department/ Beneficiary	Per-capita income	Extreme Poverty ($< Q4,800$ per year)	Poverty ($Q4,800 - Q8,282.90$ per year)	Total Poverty ($< Q8,282.90$ per year)
San Marcos & Huehuetenango (ANACAFE)				
Beneficiary	\$3.96	2.07%	44.71%	46.81%
No Beneficiary	\$3.28	3.04%	52.71%	55.75%
Quiché, Quetzaltenango, Totonicapán (AGEXPORT)				
Beneficiary	\$2.28	17.37%	64.58%	81.95%
No Beneficiary	\$2.22	19.91%	61.15%	81.06%
Total RVCP				
Beneficiary	\$2.86	12.13%	57.78%	69.91%
No Beneficiary	\$2.82	10.28%	56.33%	66.60%

Source: IARNA, 2013

ANACAFE and AGEXPORT report to be working with the following number of families in Food Security and Nutrition (SAN) activities, as well as with handicraft organizations, which are dominated by women.

Table 5: RVCP Handicraft and SAN participants

Department	Handicraft Organizations (#)	Handicraft Producers (#)	Food Security and Nutrition Families (#)
Huehuetenango	17	1,011	2,564
San Marcos	3	100	1,240
Quetzaltenango	1	31	334
Quiché	16	1,047	2,234
Totonicapán	1	52	137
Total	38	2,241	6,509

Source: Quetzaltenango, Quiché and Totonicapán, AGEXPORT, June 2015; Huehuetenango and San Marcos, ANACAFE, June 2015.

RVCP has also been working with the following number of coffee, horticulture, and cardamom producers since project commencement; through June 2015 in Quiché, Quetzaltenango and Totonicapán, and through March 2015 in Huehuetenango and San Marcos. AGEXPORT activities started in the field in January 2013, while ANACAFE activities began in October 2012 (coffee), May 2013 (horticulture) and July 2013 (handicrafts). Cardamom and fruit orchards have recently been added to the project.

Table 6: Area and Number of RVCP Coffee, Horticulture and Cardamom Producers

Department	Coffee Organizations (#)	Coffee Producers (#)	Area in Coffee (Ha)	Hort. & Fruit Orchard Orgs (#)	Hort. & Fruit Orchard Producers (#)	Area in Hort. & Fruit Orchards (Ha)	Cardamom Organizations (#)	Cardamom Producers (#)	Area in Cardamom (Ha)
Huehuetenango	50	4,257	5,832.82	12	1,410	145.57	0	0	0
San Marcos	31	1,841	1,918.89	7	477	59.65	0	0	0
Quetzaltenango	1	68	204.00	20	1,011	132.00	0	0	0
Quiché	7	2,080	1,911.00	Hort - 40 Fruit- 4	Hort – 4194 Fruit – 123	Hort - 545.22 Fruit – 70.00	5	805	1,050
Totonicapán	0	0	0	7	404	56.00	0	0	0
Total	89	8,246	9, 866.71	90	7,619	1,008.44	5	805	1,050

The majority of RVCP farmers (85%) own their land, another 32% rent (INCAP, 2013). According to the INCAP (2013) baseline report¹⁷ of the RVCP (based on survey data from RVCP farmers in Quiché, Quetzaltenango, Totonicapán and Sololá):

- In half of RVCP families, only one person works in agriculture.
- The average size of land worked by RVCP families is 24.5 *cuerdas*¹⁸,
- Almost one third of RVCP families have access to less than 10 *cuerdas*, and
- One quarter of RVCP families have access to more than 31 *cuerdas* of land to produce on.
- 37% of RVCP families produce 2-3 crops: one-third produces five or more crops.

Land Use in the Western Highlands

The five departments of the Western Highlands share similar patterns of land use. The most important perennial crops are coffee and cardamom. Annual crops such corn and beans are the basic staples of the food security system in the region, and horticulture crops contribute to the region's food security as well as economic development.

Coffee production in Guatemala represents around 10% of the export sector and is one of the top three export products in Guatemala shared with sugar and clothing production (Banco de

¹⁷ The sample taken for the INCAP (2013) *Linea de Base del Proyecto Cadenas de Valor* does not include farmers in San Marcos and Huehuetenango, which are dominated by coffee production. The survey sample includes families in Quiché, Quetzaltenango, Totonicapán and Sololá. Sololá has been excluded from the RVCP. The INCAP baseline report is the only source of crop-specific, RVCP farmer land-use data available at this time.

¹⁸ equivalent to 625 square *cuerdas*, or 441m²

Guatemala 2013). The Western Highlands is the region with the greatest number of small coffee farmers in the country. The department of San Marcos boasts the most area planted in coffee (80,506.92 ha), followed by Huehuetenango with 74,960.11 ha, Quetzaltenango with 37,678.02 ha, and Quiché with 9,156.37 ha. Because of climate conditions, Totonicapán has almost no coffee production - 1,061 hectares. According to ANACAFE (in USAID/Guatemala 2012) data, 60% of Guatemala's coffee fields need to be renewed or renovated because of the age of the coffee plants in them – 15 years or older. “The problem is gravest in the departments of Huehuetenango and Quiché, which are part of the geographic zone of the Feed the Future initiative” (p. 16).

Table 7 outlines coffee production in the five departments and the percentage of each department's coffee producing areas participating in the RVCP. RVCP works with 8,246 small coffee producers in Huehuetenango, San Marcos, Quiché and Quetzaltenango. More than two-thirds of the farmers produce in San Marcos and Quiché. Still, RVCP coffee farms make up only 0.5% - 8% of the coffee producing areas in the five departments. Based on the data presented in Table 7, RVCP-participating coffee farms are on average 1.2 ha. [According to the INCAP (2013) baseline study, 14.36 *cuerdas* (0.62 hectares) are planted in conventional coffee and 21.24 *cuerdas* (0.92 hectares)¹⁹ in organic coffee]. On average, they produce 0.8 qq (conventional) and 0.6 qq (organic) coffee per *cuerda* per year (INCAP 2013).

Table 7: RVCP Coffee Production per Department

Department	Area (km ²)	Area in planted with coffee (km ²)	Planted w/coffee (%)	Total Area w/coffee under RVCP (km ²)	RVCP coffee area/total dept area (%)	RVCP coffee area/total coffee area in department (%)
Huehuetenango	7,403	750 (75,000 ha)	10	58 (5,800 ha.)	0.78	8
San Marcos	3,791	805 (80,500 ha)	21	19 (1,900 ha)	0.5	2
Quetzaltenango	1,951	377 (37,700 ha)	19	2 (200 ha)	0.1	0.5
Quiché	8,378	92 (9,200 ha)	1	1.7 (170 ha)	0.02%	1.8%
Totonicapán	1,061	Not significant	Not significant	0	0	0
Total	22,584	2024 (202,400 ha)	51	80.7 (8,070 ha)	1.4	12.3

Source: ANACAFE

¹⁹ 1 hectare= 23 cuerdas and 1 cuerda= 21x21 meters

In terms of **annual crops** (corn and beans), Quiché is the most important annual crop-producing region reaching a planted area of 122,729.81 ha followed by Huehuetenango with 79,685.50 ha, San Marcos with 73,125.92 ha, Quetzaltenango with 40,134 ha, and the one with the smallest area, Totonicapán, with only 26,756.59 ha.

According to INCAP (2013) baseline data of RVCP families (in Quiché, Quetzaltenango, Totonicapán and Sololá), 78% percent produce yellow corn on an average 7.3 – 8.1 *cuerdas* of land and 71.1% are growing white corn on an average 6.9 *cuerdas*. 74.3% of farmers have dedicated an average 5.5 *cuerdas* to black beans in a mixed crop system with corn. While these are principally subsistence crops, about 3-4% of RVCP families also sell their production (INCAP 2013). Along with black (blue) corn, these crops have helped to sustain the food security and subsistence systems in the region and make up.

Horticulture production represents small areas at department level. For instance, Quiché has 2,897.37 ha, Quetzaltenango 1,903.14 ha, Huehuetenango 1,265.72 ha and the rest of departments have less than 600 ha. Horticulture crops have been established to generate additional on-farm income and according to the data in Table 8, RVCP producers have dedicated 0.13 hectares to production of these cash crops. The most popular horticulture crop is the green bean. Almost 30% of RVCP farmers have dedicated an average of 3.5 *cuerdas* of land to their production and the grand majority of green beans are grown as a monoculture (INCAP, 2013). The second two most planted export horticulture crops planted by RVCP farmers are sweet peas (15.7%) and peas in grain (16.9%) form (INCAP 2013).

RVCP works with 1,410 horticulture producers in Huehuetenango, 477 in San Marcos, 4,194 in Quiché, 404 in Totonicapán and 1,011 producers in Quetzaltenango; between 0.04% - 18% of the area is dedicated to horticulture production, as identified in the table below.

Table 8: RVCP Horticulture Production per Department

Department	Area (km ²)	Area with horticulture (km ²)	Area in department with horticulture (%)	Total Area w/hort under RVCP (km ²)	RVCP hort/total area of dept (%)	RVCP hort area/total hort area in dept (%)
Quiché	8,378	29 (2,900 ha)	0.35	5.2 (520 ha)	0.06	18
Huehuetenango	7,403	13 (1,300 ha)	0.17	1.46 (146 ha)	0.02	11
Totonicapán	1,061	Under 6 (< 600 ha)	Under 0.56	0.75 (75 ha)	Under 0.7	Under 0.13
Quetzaltenango	1,951	19 (1,900 ha)	0.97	0.74 (74 ha)	0.04	3.89
San Marcos	3,791	Under 6 (< 600 ha)	Under 0.16	0.59 (59 ha)	0.016	Under 10

Total	22,584	73 (7,300 ha)	No more than 2.21	8.74 (874 ha)	No more than 0.98	No more than 43
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Forty-seven RVCP coffee and horticulture organizations are certified organic or under standards such as Fair Trade, Rainforest Alliance or Starbucks, facilitating the adoption and implementation of new good agriculture practices per market requirements and improving organization agricultural and environmental management capacities.

Table 9: RVCP Coffee and Horticulture Certified Organizations

Department	Certified Coffee Organizations (#) <i>Organic (USDA), Rainforest Alliance, C.A.F.E (Starbucks), Fair Trade, Utz</i>	Area Certified Coffee (Ha)	Certified Horticulture Organizations (#) <i>Global Gap, Tesco</i>	Area Certified Horticulture (Ha)
Huehuetenango	19	5,032.30	1	2.23
San Marcos	14	1,062.90	0	0
Quetzaltenango	1 (Organic & Fair Trade)	204.00	0	0
Quiché	6 (6 organic, 3 with Fair Trade)	1,761.00	6	63.00
Totonicapán	0	0	0	0
Total	40	8,060.20	7	65.33

Sources: Quetzaltenango, Quiché and Totonicapán, AGEXPORT, June 2015. Huehuetenango, San Marcos, ANACAFE, June 2015.

Cardamom is an important export crop to Guatemala with an extension of 69,510 hectares (USAID 2014). There are 7,693.10 ha of cardamom in the Western Highlands. Some cardamom plantations are combined with coffee plantations; however, in the RVCP project area – *Zona Reina* - this is not the practice. Because of the plant's drainage requirements and intolerance to waterlogged soils, cardamom is mainly grown on steep terrains. In the Department of Quiché, 2,042 cardamom farms were reported in 2009 covering an area of 3,976.70 ha (De Paz 2009). (San Marcos and Huehuetenango also produce cardamom 56.45 ha and 1.5 ha, respectively.) An estimated 26.4% of Quiché's cardamom production is located in the *Zona Reina* (Municipality of Uspantán) and is one of the most important economic drivers in the region.

Zona Reina has an estimated area of 33,451.74 hectares. The landscape is characterized by four (4) types of land use: forest (51.7% of land cover), 2) cardamom crops (31.0% of land cover), basic grains crops (7.5% of land cover) and 4) *guamiles* or secondary growth and brush (9.7%). Forest is the predominant vegetation with 17,293.68 hectares or the 51.7% of the landscape (CATIE 2013). AGEXPORT started working with 805 cardamom producers in the *Zona Reina* in January 2015. It is estimated these producers work 1,050 ha, or an average of 1.3 ha per farmer.

Coffee and Cardamom Pest and Disease in the Western Highlands - Coffee rust and Thrips According to a report from the USDA Foreign Agricultural Service 2014, it is estimated that 30% of the cardamom crop in Guatemala is affected by Thrips (*Sciothrips cardamomi*), which is an exotic pest for Guatemala. In the *Zona Reina*, where cardamom is de facto produced organically, the advance of the Thrips from neighboring Cobán's cardamom plantations is a serious threat to their production systems and the environmental and human health of a still relatively chemical-free region of Guatemala.

Association leaders and AGEXPORT technicians expressed concerns over the growing pressure from national organizations and companies to use pesticides to control Thrips, (some of them not approved per U.S. Government standards but which are, however, being promoted in other internationally-funded projects.)

Coffee rust –scientific name *hemileiavastatrix* or ‘la roya’ in Spanish –is a fungus that develops on the leaves of the coffee bush. If not identified and treated, the fungus spreads, blocks photosynthesis and promotes defoliation within a couple of weeks. Coffee rust appeared in Central America in the 1970s, but over the last five years the fungus has achieved epidemic proportions and farmers have struggled to combat the infestation. Concurrently, climate conditions, such as temperature rise, more intense rainfall and higher levels of humidity have encouraged the spread of coffee rust to new areas and to the cooler, higher altitudes that were previously spared. Rust used to be found only below 1,750 meters; it is now found at altitudes above 2,100 meters (USAID 2015).

According to ANACAFE (2015), coffee rust in the Western Highlands shows different levels of severity. San Marcos and Quetzaltenango present levels of severity below 25% damage to the coffee plant and moderate levels of defoliation. In the case of Huehuetenango and Quiché, coffee rust infestation had been limited due to their geographic remoteness. However, today the average severity of the coffee rust in these departments is 30% - 40%. In Quiché, coffee plantations show intense levels of defoliation while Huehuetenango moderate to low levels of defoliation are seen.

Guatemala has established agronomic interventions to cope with coffee rust. Its approach is to replace coffee plants with younger, healthier and more fungus-resistant varieties (e.g. CR95, Sarchimor, Lempira y Parainema) and protect them as they grow. These practices are expected to be implemented at altitudes below 1200 masl. For higher altitudes, the national strategy is to use systemic pesticides combined with agronomics practices such as shade management, fertilizer management and weed free plantations (AGEXPORT 2014a, p. 25-26).

USAID recently approved (in January 2015) the Latin America and Caribbean Regional Coffee Rust Programmatic Pesticide Evaluation Report and Safe Use Action Plan (PERSUAP). A prior PERSUAP amendment with emphasis on coffee rust (October 2013) had been developed and guided RVCP intervention for its first two years. The amendment includes new fungicides for coffee rust treatment and the implementation of coffee management techniques. Both PERSUAPS guide RVCP coffee producers and implementing partners to use USAID authorized pesticides as well as to assure that the use of pesticides are part of an integrated pest management (IPM) system (See Table 10), and under the principles of safe pesticide use. Better agricultural management practices are also included in the PERSUAP to enhance coffee farm management.

Table 10: Integrated Pest Management (IPM) practices for Coffee Leaf Rust

	IPM practices for Coffee Leaf Rust –La Roya- (<i>Hemileia vastatrix</i>)	Pesticides to integrate into IPM
Crop: Coffee	<ul style="list-style-type: none"> Increase shade of coffee plants (plant trees) to increase biodiversity; this promotes growth of 	<ul style="list-style-type: none"> Implement preventive chemical control by using copper-containing fungicides like Bordeaux mixture,

	IPM practices for Coffee Leaf Rust –La Roya- (Hemileia vastatrix)	Pesticides to integrate into IPM
	<p><i>Verticillium/Lecanicillium lecanii</i> “white halo” fungus and other species that attack and control rust.</p> <ul style="list-style-type: none"> • Use certified varietal and disease-free planting material. • Do crop and plant monitoring to quickly locate and deal with disease symptoms. <p>Plant new certified varieties (like Catimor, Sarchimor) with resistance to coffee leaf rust.</p> <ul style="list-style-type: none"> • Do hand-weeding/chopping of weeds, especially with new young plantings. • Conduct proper pruning of coffee plants to reduce woody growth and strengthen the overall plant. • Cut or renovate old plantations (i.e., plants older than 30 years) with new and/or resistant seedlings. • Manage soil and plant fertility for coffee by conducting soil and leaf analyses to determine macro and micronutrient requirements, and fertilize accordingly. • Use organic mulch to cover soil and help decompose dropped leaves. • Control abandoned coffee farms that serve as a source of rust inoculum for all plantations around them. 	<p>copper hydroxide, cuprous oxide, copper oxychloride or tribasic copper sulfate.</p> <ul style="list-style-type: none"> • Implement preventive chemical control by using fungicides containing ferbam, mancozeb, maneb or ziram. <p>Implement curative chemical control by using fungicides containing any of the following active ingredients:</p> <ul style="list-style-type: none"> - azoxystrobin, - captan, - cyproconazole, - flutriafol, - fosetyl aluminum, myclobutanil, - oxycarboxyn, - propiconazole, pyraclostrobin, - tebuconazole, - triadimefon, - triadimenol.

Source: USAID (2013, 2015)

In the first two years, RVCP has trained more than 7,000 coffee producers and almost 4,000 producers in the horticulture value chains in pesticide management, safe use and IPM practices.

2.2 SOILS OF THE WESTERN HIGHLANDS

A limiting factor to production in the Western Highlands is soil capability: fertility, susceptibility to erosion and degradation. Site-specific characteristics vary greatly across the farms of the more than 8,600 RVCP farmers, and the 2014 Audit recommends that soil conservation and enrichment practices be better designed to farm conditions. The following descriptions (based on Simmons et. al. 1959) characterize the soils of RVCP farmers in the Western Highlands.

The soils of San Marcos are Patzité and Suchitéquez. Patzité soils are influenced by high precipitation, and erosion is its greatest threat. The Suchitepéquez soil series is white volcanic ash presenting within steep to smooth relief; the soil texture is clay loam and brittle in the dry season despite its depth (40-60 centimeters). Still, natural fertility is high and erosion low because of soil depth and vegetative cover.

Patzité soils are also found in Totonicapán. The parent soil material is composed of some volcanic ash predominantly dark in color and brittle throughout its soil profile depth. Topsoil texture is over 15-25 cm of sandy fine texture. Patzité soil is composed on steep relief and good for percolation during the rainy season; in dry season this characteristic can be an issue to the provision of water. Patzité soils have a natural fertility; hence they are useful for agricultural use. However, they may be susceptible to erosion from plowing.

The three soil series of Huehuetenango are: Jacaltenango, Quixtán and Toquitá and characteristics like poor drainage, steep topographic relief and high susceptibility to erosion make them unsuitable for agriculture. Limestone is the parent material of Jacaltenango soils, which convert to karst material when combined with rolling relief. Soil texture is a clay loam in the topsoil horizon and clay subsoil with good drainage, but karst material is highly erodible. The Quixtán soil series comes from a limestone conglomerate as parent material; it has bad drainage increasing vulnerability to flooding because it is on steep relief. Soil texture is clay loam with clay subsoil blended with limestone, which is highly erodible. Toquitá soil comes from a parental material that has the same limestone of the others and it is in a steep relief. Silt loam is the soil texture with a presence of expanded clay. They are susceptible to freezing when temperature is low and have low natural fertility. These soil conditions limit agricultural production and plowing.

Ostuncalco and Sinaché soils are found in Quetzaltenango. Ostuncalco contains white volcanic ash in a strong rolling to steep relief. The soil texture is loose sandy loam with fast drainage in a thin horizon and is highly erodible. Subsoil is volcanic ash with a low natural fertility. Sinaché soil includes volcanic ash as parent material in rolling relief with a clay loam soil texture with highly erodible propensity but with a moderate natural fertility.

The predominant soil series in Quiché is Calanté and Tzejá. Calanté contains volcanic ash as parent material in its topsoil on a landscape of sloping relief. Soil texture is silt loam texture with 30-centimeter depth; its subsoil is brittle and vulnerable to hydric erosion. Tzejá soils are composed of clay schist in a strong ripple relief; topsoil is a clay loam texture and brittle in the dry season. Soil depth of 2-5 cm limits agriculture.

Pivotal to the success of RVCP horticulture and coffee production activities are soil conservation and improvement methods promoted by the project. RVCP coffee producers are adopting and applying soil conservation practices such as contour planting and plowing, individual terraces, shallow pits, composting and live and dead barriers, as well as shade grown coffee practices and reforestation within their agroforestry plots. (Please see section below on agroforestry.) According to ANACAFE's 2013 – 2014 annual report, these practices have been applied to 62 hectares of coffee farms in San Marcos and Huehuetenango. As well, soil enrichment is taking place such as applying composted material or planting trees like the Inga whose fallen leaves provide enriching mulch. AGEXPORT has established live barriers on 200 hectares of coffee plantations and 40 hectares of individual terraces in Quiché, Quetzaltenango and Totonicapán.

Still, the 2014 RVCP Environmental Compliance Audit found that in coffee farms the “use of beneficial soil management techniques were not uniformly applied across coffee producers” (p. 16). During scoping, the Environmental Assessment team also observed that renovation and establishment of

new coffee plantations on steep slopes is exposing farmers to risks²⁰ even when farmers are undertaking soil management techniques.

In horticulture production, most RVCP producers are applying soil conservation techniques such as contour farming, live and dead fences, ditches to slow run-off, mulching and planting cover crops. According to the AGEXPORT 2013 – 2014 report, best agricultural practices are being applied to 200 hectares in Quiché, Quetzaltenango and Totonicapán. The specific practice of mulching is being applied to 50 hectares of land in their project area. Farmers are growing to understand the benefit of using these soil conservation practices and, for the most part, these practices are helping to avoid or control erosion on the predominately sloped lands on which they farm.

2.3 WATER RESOURCES

Estimates of total water availability in Guatemala are 90 Km³ (SEGEPLAN IDB 2006) to 97 Km³ (IARNA 2012); nationwide availability is more than 7,000 m³ of water per person annually. Despite its relative abundance, between 1970 and 2001 there was, on average, a 20-25% reduction in water flow in the country's rivers (World Bank 2006 in Tolisano & Lopez 2010) and the availability will be seriously compromised around the year 2025. Availability relies on the rainy season (from May to October) while the rest of the year precipitation is minimal. Different areas of the country have important water deficits in the months of March and April. According to the USAID/CNCG (2014) climate change vulnerability analysis, 17 RVCP municipalities have high indices of water scarcity. (USAID/CNCG, 2014; See also section 2.8, Vulnerability to Climate Change and Annex A: RVCP Municipalities and Indices of Water Scarcity.) About one-third of RVCP coffee and horticulture beneficiaries (5,206) are farming in these municipalities.²¹

Last year's prolonged "canicula" (drought) experienced throughout Guatemala severely impacted rain-fed crops, such as corn, and the capacity of families to feed themselves. An emergency was declared for affected municipalities (including in Quiché and those east of the Western Highlands) and in August the emergency was extended by a Government decree and the Ministry of Agriculture to other departments including Huehuetenango, Sololá and Totonicapán. The damages to crops were estimated at 450 million Quetzales for the whole area (Zavala 2014).

The majority of water used by RVCP agricultural production in the Western Highlands comes from community-managed springs, which are tapped first and foremost for domestic consumption. When and

²⁰ Biophysical events, such as heavy rainfall in short periods of time and storms can result in severe erosion of loose fertile soil in new coffee plantations and those being renovated, including landslides under the right conditions.

²¹ Data across implementing partners is not uniformly presented, however from data received 4,026.81 hectares are farmed in the ten high water scarcity municipalities of San Marcos and Huehuetenango. Some partial data provided includes: FEDECOCAGUA coffee producers are farming 2,411.19 hectares. In high water scarcity municipalities of Quetzaltenango, Quiche and Totonicapan, 289 AGEXPORT producers have converted to drip irrigation on 20.3 hectares because of the project.

where there is excess supply, producers are allowed to draw from the source water for irrigation. Some irrigation water is also sourced directly from streams and rivers, or specially designated springs. For example, INCAP (2013) baseline data reports that 40.2% of water for irrigation of household gardens comes from public systems, 19.8% comes from another water system “tube”, and 16.4% irrigate their gardens with water sourced directly from a river or spring. (22% depend on rainwater for home garden irrigation.)

Water management and scarcity were identified by stakeholders (during scoping) as an issue affecting RVCP participants and non-participants alike, especially for the majority of RVCP farmers who do not have access to privately-owned water sources. RVCP water conservation measures are being implemented, including drip irrigation systems and recycling of water in coffee processing. [However, the 2014 Audit reports that the filter pit process of filtering “aguas mieles”, the most common practice by RVCP participants for managing coffee effluent, does not allow for water recycling (Cadmus p. 24)].

AGEXPORT reports that 27 value chains in their project areas have access to new technologies such as drip irrigation and they expect to install 50 drip irrigation systems over the life of the project. By the end of 2014, 45 ha of horticulture farms had been converted from sprinkler systems to drip irrigation. And by the end of September of the same year, 1,950 families working with ANACAFE were equipped with drip irrigation systems.

AGEXPORT RVCP producers are mainly located in the Chixoy and Xacbal watersheds, in the Gulf of Mexico Basin, which is the basin with largest flows and at the same time the least used. Some producers are found in the Samala watershed in the Pacific Basin with more committed flows, and the rest are in the Motagua River watershed on the Atlantic Basin. (See Annex B). ANACAFE’s producers are, mostly, on the Gulf of Mexico Basin mainly at Ixcán River, Pojom, Nentón, Selegua and Cuilco watersheds, while the rest of the projects are in the Pacific Basin at Suchiate and Naranjo watersheds. In general, with the exception of the project in the *Zona Reina*, project sites are located in the upper parts of the watersheds.

In general, the Pacific Basin watersheds are affected by human action, not only from agriculture but also from urbanization. The Motagua watershed is highly intervened in its entire length and its water is polluted by many of the urban areas located in the highlands²². Other sources of pollution include excessive use of fertilizers and pesticides. Environmental impacts such as pollution from coffee processing, pesticides or fertilizers, as well as the inadequate disposition of plastics and containers will affect the lower zones of the watersheds in greater or lesser degree, as described next. The watersheds at the Gulf of Mexico Basin still have good forest cover, but there are maize crops steadily moving up the steep slopes.

Water pollution and specifically the impacts of upstream activities on downstream users is a natural resources problem that was mentioned in 16 of the stakeholder consultations during scoping. (See consultations with the Río Azul Cooperative, AFSCAFCA, ADAT, Asociación de Caficultores Miguelenses, among others, in Annex C.) While many RVCP participants referred to non-members as the polluters,

²² Taking into account that the majority of urban centers are in the highlands, it can be inferred they generate a high degree of water pollution. It is estimated that 10,000 million m³ of untreated sewage is discharged into bodies of water and soil (IARNA 2012).

coffee processing practices by RVCP producers are not fully meeting impact mitigation standards (e.g. overflow of filtration pits spilling coffee honey water into surrounding environment) and groundwater-polluting chemicals²³ are being used indicating their potential and cumulative contribution to a national water pollution issue (Cadmus 2014).

During scoping, stakeholders also expressed concern with deforestation of headwaters by private landowners and non-members (of the associations or cooperatives). Communities have been concerned about the protection of their source water for generations. In some communities, forests around source waters have been placed under protection by the grandparents and great-grandparents of RVCP participants. The Environmental Assessment team did not observe headwater deforestation in progress by RVCP participants; however, deforestation is a continuing threat. This coming year, the Guatemalan Natural Forest Institute (INAB) has chosen to prioritize provision of forest incentives, PINPEP and PINFOR, (see next section) to farms in headwaters.

Unfortunately, no framework water law exists in Guatemala and water rights are ill-defined and poorly managed by political and administrative divisions (Tolisano & Lopez 2010). Due to weak enforcement and compliance with existing environmental policies intended to control water pollutants, the water quality of the majority of RVCP watersheds is at high risk.

2.4 FORESTS AND FOREST COVER

Forests of the Western Highlands are composed of a pine-oak ecosystem dominated by *Pinus sp.* and *Quercus spp.* However, other species can be found such as sweet gum (*Liquidambar styraciflua*), alder (*Alnus sp.*), common cypress (*Cupressus lusitanica*), devil's hand tree (*Chiranthodendronpentadactylon*), madrone (*Arbutus xalapensis*), Guatemalan fir (*Abies guatemalensis*), which is in danger of extinction, and butterfly bush (*Buddleia sp.*). Also found, among others, is myrtle (*Baccharis vaccinioides*), lonspear lupine (*Lupinus montanus*), and epiphytes (such as *Tillandsia sp* which are endangered.) (www.alianzapinoencino.org; Municipalidad de San Marcos, 2005) Endangered and threatened species used in coffee and cardamom shade are listed in the agroforestry systems section below.

Table 11 shows forest cover in the Western Highlands indicating some negative rates of forest reduction. In some cases, such as Huehuetenango and Quiché forested area has increased. The reasons for this are: the promotion of reforestation through economic incentive programs, voluntary initiatives with local governments, projects funded by international cooperation working with local communities and natural regeneration.

Table 11: Forest Cover in the RVCP Departments of the Western Highlands

²³ Product Amistar contains the active ingredient azoxystrobin (Cadmus 2014. p 36)

Region	Department	Coverage 2006 (ha)	Coverage 2010 (ha)	Net change 2006 -2010 (ha)	Annual change (ha)	Annual rate of change (%)
Western Highland	Huehuetenango	243,523	263,470	19,947	6,346	2.61
	Quetzaltenango	56,061	55,730	-331	-81	-0.14
	Quiché	257,704	264,732	7,027	1,742	0.68
	San Marcos	87,246	86,673	-573	-141	-0.16
	Totonicapán	39,778	39,721	-57	-17	-0.04
	Total	684,312	710,326	26,013	7,849	

(UVG et. al., 2011)

The highest net change of forest cover is in Huehuetenango where 19,947 ha were added from 2006 to 2010, followed by Quiché with a positive forest cover net annual change of 1,742 ha. The rest of departments report negative but not significant forest net changes. The highest rate of deforestation is in San Marcos with -141 ha lost from 2006 - 2010.

Threats to Western Highland forests include forest fires generated by unsustainable agricultural practices (e.g., burning fields) and their conversion to agriculture (Cadmus 2014; Tolisano & Lopez 2010) and illegal logging for timber and firewood purposes. Although forest cover in the Western Highlands has shown an increase in some departments, the overall degradation and high-grading of forests for commercial species and from firewood harvesting is a principle threat to these ecosystems. Juan Carlos Godoy, External Affairs Associate Director for Central America of The Nature Conservancy (TNC), concurs that domestic and industrial demand for firewood is having a significant impact on forest composition and biodiversity throughout the Western Highlands.

RVCP activities are focused on production in existing fields, and promote methods that avoid slash and burn practices by improving soil fertility such as organic fertilizers and incorporating crop residue back into soils. Also, although some coffee processors use firewood, it is derived from the shade-grown coffee agroforestry system. However; firewood for cardamom processing – an activity the RVCP has just initiated - is more widely sourced. The majority of firewood used in cardamom drying is purchased, and the origin of the firewood - of legal, sustainably managed or illegal harvest - is not generally considered by the producer.

According to a USDA (2014) Global Agriculture Information Network report, 14% of Guatemala's cardamom is produced in Quiché (specific estimates of cardamom production in *Zona Reina* could not be identified.) A normal wood-fired cardamom dryer uses 5m³ of firewood per process.

Thus, for each metric ton of dried cardamom pods 13.514 m³ of wood is used. Taking into account that Guatemala produces an average of 30,000 MT annually of dried cardamom pods,

multiplying this amount by 13.514 m³, a product of 404,420 m³ of wood is used per harvest. Assuming that 75 percent of the drying process is done by wood-fired dryers, this equals 303,315 m³ yearly. According to the National Council of Protected Areas (CONAP), wood usable volume estimation in forests in the cardamom area is 95m³ per hectare. The impact to the forest coverage is: 303,315 m³/95m³/ha = 3,192.79 hectares lost due to deforestation on a yearly basis.”(USDA 2014 p. 3)

In contrast to USDA estimates, a RVCP diagnostic study determined that average firewood consumption per ton of dry cardamom in the *Zona Reina* is 8.8 m³ (Julio Domínguez, AGEXPORT, personal communication March 23, 2015.) Other sources identified during the scoping provided varying estimates of firewood consumption in the *Zona Reina*, as well.

As further discussed in Section 4.0, RVCP work with cardamom producers is a new activity. AGEXPORT plans to help improve the efficiency of cardamom dryers, and also support reforestation on farms. In Section 5.0, complementary alternative actions are proposed that improve fuel wood management, which includes calculating supply and demand for RVCP cardamom producers in the *Zona Reina*.

2.5 FOREST PROTECTION INCENTIVE PROGRAMS

In the face of threats of deforestation, the INAB has set up forest protection and management programs for large and small landholders known as PINFOR and PINPEP to reduce the deforestation rate, to enhance the permanence of forestry and agro-forestry systems, and to improve streams of revenues for local communities and private owners at the rural level.

PINFOR is a program that has been designed to support landowners who hold legal property right to their land by bestowing money for maintaining their forest under different regimes such as forest management for protection, forest management for production, reforestation activities, and regeneration of forests. The type of beneficiaries includes individuals, private companies, cooperatives/associations, municipalities and organizations.

The PINPEP program is aimed at small landholders without formal land titles. Beneficiaries include individuals, communities, associations and other organized groups. The types of projects that this program supports are: 1) agro-forestry projects, 2) forest plantations, 3) forest management for protection, and 4) forest management for production (INAB 2015). In the Western Highlands, Huehuetenango has the largest forest area supported by PINPEP with 3,406.10 ha, followed by Totonicapán and San Marcos with over 1,000 ha each. Quetzaltenango and Quiché show areas over 800 ha under the PINPEP incentive (INAB 2015). According to the INAB Director in Quiché, in the coming year INAB will be targeting PINFOR and PINPEP incentives in forests in recharge areas of watersheds.

2.6 AGROFORESTRY SYSTEMS

Agroforestry systems are helping to recover forest cover, protect water recharge areas, restore organic matter to soils, protect soil from erosion, and promote biological corridors for fauna and flora by interconnecting habitats and ecosystems. During scoping, the Environmental Assessment team found all of the RVCP coffee farms visited are growing coffee in agroforestry systems. The shade structure of coffee farms throughout Guatemala varies in complexity, from shade composed of several species of one genus (e.g. *Inga*), to more diverse systems that replicate the structure of a natural forest, incorporating fruit trees, hardwoods, and epiphytes like bromeliads and orchids.

More than 50% of shade trees found in coffee farms belong to the *Inga* genus. *Inga* is endemic to the region (Central America) and its benefits are associated with rapid growth, tolerance to a wide range of soils, and broad shade canopy. Also its leaves filter the right amount of sunlight, and its fruits contribute to wildlife and birds as sources of food. Within this 50%, 15 native species are commonly found. For instance, Chalum (*Inga micheliana*), Cushin (*Inga laurina*), Caspirol (*Inga fagifolia*), Cuje or Guama (*Inga vera*), and Pepeto de Rio (*Inga edulis*). In certain parts of the Western Highlands non-native *Gravilea* (*Grevillea robusta*) is also found. One of its benefits is that it tolerates frost and grows rapidly. In addition to *Inga* and *Gravilea*, around 55 species of trees have been identified throughout the country in coffee farms. Table 12 shows the Guatemalan coffee shade species (ANACAFE 2011).

Coffee Cooperative San José Obrero

More than 20 years ago Chalum and the non-native tree, *Gravilea*, were introduced to shade-grown coffee systems in Guatemala and today dominate the agroforestry systems of Cooperative San José Obrero. They have not experimented with incorporating more native species other than fruit trees such as banana, mango and orange. Still, San José Obrero holds four different certifications - Rainforest Alliance, Fair Trade, Utz and Starbucks. Because of these certifications, they understand their farms and shade grown agroforestry systems should be more diversified.

Table 12: Guatemalan coffee shade composition

Tree specie	Percentage in coffee agro forestry systems
Inga	69
Other	12
Gravilea	8
Fruit trees	4
Pine/Oak	2
Volador	2
Pito	1
Palo Blanco	1
Madrecacao	1

These agro forestry systems are planted at an average density of 100 trees per hectare. On three farms visited by the scoping team no more than six different species were planted; however, ANACAFE reports up to eleven species are planted on other farms. Guatemalan coffee is 98% shade-grown (ANACAFE 2011) and shade systems are widely recognized by coffee producers as beneficial to coffee

production. However, in some cases, farmers' response to the coffee rust fungus has been to reduce the amount of shade in their farm via pruning (Cadmus 2014), reversing those benefits.

Another important benefit of agroforestry systems is the fuel wood derived from pruning shade trees. According to the PERFOR report, which is an analysis of forest governance, 65% of the population uses firewood for cooking and heating their homes (in INAB, et al. 2012b.) Most of them are rural families in situations of poverty or extreme poverty who use per capita an average of 1m³ of firewood per year. The PERFOR report also indicates that most firewood is harvested illegally (INAB, et al. 2012b). However, in coffee production systems, the pruning of trees to regulate the amount of shade over the coffee is providing fuel wood to households thus minimizing the need to purchase or collect firewood from forested areas. In addition, RVCP is promoting the adoption of improved cook stoves. According to the ANACAFE annual report (2013-2014), 47 improved cook stoves have been introduced into schools and 539 to homes in Huehuetenango and San Marcos. (At this time, AGEXPORT is providing follow-up auditing of 960 improved cooks stoves that were implemented under the previously USAID-funded project *Diversificación Rural con Orientación a las Exportaciones*.)

Cardamom can also be a shade-grown crop and agroforestry system. AGEXPORT estimates 1,050 hectares are under cardamom production by RVCP producers. Regionally, and as presented under the land use section, 51.7% of Western Highland's cardamom is produced in Quiché and 0.75% in Huehuetenango and San Marcos. The cardamom agroforestry systems in *Zona Reina* are principally made up of the following native species of shade trees: 1) *Vismia sp.*, 2) *Terminalia amazonia*, 3) *Swietenia sp.*, 4) *Inga sp.*, 5) *Terminalia chiriquensis*, 6) *Nectandra reticulata*, 7) *Gliricidia sp.*, 8) *Tabebuia donnell-smithii*, 9) *Virola sp.*, 10) *Vochysia guatemalensis*, 11) *Dialium guianense*, and 12) *Pouteria sapota*. According to CONAP (2009), of these species the following are threatened and endangered: *Swietenia* and *Inga* (e.g. *Inga cookii* Pittier, *Inga cubvestita* Standl, *Inga donell smithii* Pittier, *Inga vera* L).

2.7 PROTECTED AREAS AND THREATENED AND ENDANGERED SPECIES

The Western Highlands have established more than 54 protected areas²⁴ covering an area of at least 125,000 ha based on different management categories such as regional municipal parks, biosphere

²⁴ Huehuetenango has nine regional municipal parks covering over 10,000 ha. Todos Santos Cuchumatán with 7,255.40 ha is the largest. Huehuetenango also has natural private reserves. San Marcos has eighteen protected areas covering 25,074.98 ha with different management categories such as municipal regional parks, private natural reserves and definitively closed season areas. The largest protected area in San Marcos is Tajumulco Volcano with 4,472 ha. Quetzaltenango, with 21 protected areas, is the department with the most protected areas covering 35,969.12 ha. Its main management categories are private natural reserves, municipal regional parks, national parks and definitively closed season areas. Quetzaltenango municipalities are managing a total area of 11,248.35 ha. Totonicapán has an area of 11,617 ha of protected areas, which are under two management categories - national park and municipal regionalpark (SIGAP-CONAP 2013.) Totonicapán shares with the departments of Chimaltenango, Quiché, Suchitepéquez, and Sololá one the largest protected areas in the Western Highlands

reserves, private natural reserves, national parks and definitively closed season areas²⁵. The Western Highlands possess 3.46 % out of 31.05% of the Guatemalan Protected Areas System (SIGAP) (SIGAP-CONAP 2013.) While the exact geo-positions of RVCP farms is not yet available, (however, it is in progress by the implementing partners) an initial geographic assessment locates the headquarters of 60 RVCP producer or handicraft groups within 5 kilometers of a protected area, as discussed next.

Per the Environmental Assessment team's geographic analysis based on USAID Monitoring and Evaluation Program (MEP) geo-referenced data, the organizational headquarters of 60 RVCP organizations (25 coffee, 21 horticulture including fruit production, and 14 handicraft organizations) are located five kilometers or closer to a protected area²⁶. (Please see Annex B, map 2 for location of RVCP organizations.) Some organizations are located within multi-use²⁷ protected areas (such as Lago Atitlán) or were there prior to protected area designation. Guatemala's protected areas are the principle mechanism through which *in situ* conservation of biodiversity is carried out (Toliano & Lopez 2010). They are often the refuges of endangered and threatened flora and fauna of the Western Highlands.

Endangered and threatened timber species are classified by the Red List of Trees of Guatemala (2012). The three most important endangered trees species are *Swietenia humilis* Zucc, *Balmeastormae* Mart., and *Abies guatemalensis* Rehder. The last two are Category I according to CITES nomination; *Swietenia humilis* Zucc is Category II. Also flora species such as *Annona* spp., *Amaranthus* sp., *Capsicum* spp., *Chamaedorea* sp, *Crotalaria* sp. and *Ipomea* sp. are threatened with extinction because of the reduction and modification of their natural habitats (USDA/CIAT/IPGRI/FAUSAC 2006.)

Also endangered, according to CONAP (2009), are coffee shade tree species *Inga Vera* L., and pines such as *Pinus strobes* var. *chiapensis* Martinez, *Pinus tecunumani* Eguliz & J.P. Perry, and various oaks such as *Quercus benthamii* D.C., *Quercus brachystachys* Benth., *Quercus bumelioides* Liebm., *Quercus cortesii* Liebm, *Quercus conspersa* Benth., *Quercus candicans* Nee., *Quercus crispifolia* Trel., *Quercus flagelifera* Trel., *Quercus elliptica* Nee., *Quercus insignis* M. Martens & Galeotti., *Quercus oleoides* Schlecht & Cham., *Quercus peduncularis* Nee., *Quercus pilicaulis* Trel., *Quercus polymorpha* Schltl & Cham., *Quercus sapotifolia* Liebm., *Quercus segoviensis* Liebm., *Quercus skinneri* Benth., *Quercus skutchii* Trel., *Quercus tristis* Liebm, and *Quercus vicentensis* Trel. Project diversification of shade grown coffee systems with native species can be especially important to the recovery of these species.

known as the Multiple Use Area of the Basin of Lake Atitlán, which is 122,900 ha. Finally, Quiché has five protected areas covering 47,265.08 ha. The largest protected area in Quiché is known as Visis Cabá Biosphere Reserve and it occupies 45,000 ha (CONAP 2015).

²⁵ It is a management category that protects Volcanos in Guatemala.

²⁶ Actual farmer landholdings have not been geo-referenced therefore at this time it is impossible to identify exact locations of RVCP agricultural production activities.

²⁷ According to CONAP (2006), multi-use protected areas have suffered alterations by human but still conserve a good sampling of the natural environment. Permitted activities in multi-use protected areas should be sustainable production decentralized and coordinated with government and civil society.

The following endangered and threatened wildlife are found in the Western Highlands: fresh water fish Mayan cichlid (*Cichlasoma spp.*), reptiles such as the Boa (*Boa constrictor*), birds such as Sparrow hawk (*Falco sparverius*), Orange-breasted hawk (*Falco deiroleucus*), Peregrine falcon (*Falco peregrinus*), Bat falcon (*Falco ruficularis*), Great curassow (*Crax rubra*), Horned guan (*Oreophasis debianus*), Crested guan (*Penelope purpurascens*), Quetzal (*Pharoma chrusmocinno*), Elegant trogon (*Trogon elegans*), Omas (*Myadestes obscurus*), Mountain thrush (*Turdus plebejus*), and mammals which include the Common opossum (*Didelphis marsupialis*), Virginia opossum (*Didelphis virginiana*), Water opossum (*Chironectes minimus*), armadillo (*Dasypus novemcinctus*), gopher (*Orthogeomys mysgrandis*), Hispid pocket gopher (*Orthogeomys myshispidus*), Forest cottontail (*Sylvilagus brasiliensis*), Eastern cottontail (*Sylvilagus floridanus*), coyote (*Canis latrans*), and raccoon (*Procyon lotor*) (CONAP 2009; INAB-CONAP 2003.)

It is also important to recognize that RVCP activities are taking place within bioregions of biological and agro-biological importance. Three bioregions in the Western Highlands have been proposed by CONAP based on essential ecosystems for biodiversity protection (life zones, biomes and eco-regions). Areas of significance to the RVCP are:

- The Western Cuchumatanes is an important bioregion due to its agrobiodiversity, which has traditionally been protected in home gardens. Crops' primitive cultivars can still be found there and wild relatives of maize; 47 types of cultivated maize have been found in Huehuetenango (Diaz & Azurdia 2001). Also found are cultivars of beans, avocado, chile, potato, tomato and other native crops of regional or local use. The highest diversity of cassava in Guatemala is found in this region (USDA, IPGRI, FAUSAC 2004.) The Western Cuchumatanes bioregion also coincides with protected areas and a high number of endemic flora and fauna. Also, the highest diversity of conifers, holm oak and oak are found here and it is the zone of the Guatemalan fir (*Abies guatemalensis*).
- The Western Volcanoes is also a bioregion recognized for the primitive cultivars and wild relatives of beans (*Phaseolus*) and maize (*Zea mays*²⁸) found there. This area has the greatest genetic diversity of major wild relatives of cultivated plants native to Guatemala, and a high number of endemic flora. For instance, this region is known as a center of diversity of peanut (*Arachis hypogaea*) where five varieties with at least 22 peanut races are cultivated (USDA, IPGRI, FAUSAC 2004.)

Generally speaking, the principle threats to the conservation of biodiversity in Guatemala include habitat loss, degradation and fragmentation from conversion of land to agriculture, forest fires, firewood extraction and the introduction of exotic or opportunistic species, as well as over-exploitation of natural resources, such as unregulated hunting and wildlife trafficking (Tolisano & Lopez 2010). Indirectly, declining quantities of water resources, habitat loss, degradation and fragmentation also pressure threatened and endangered species. The USAID 2010 Biodiversity and Tropical Forest Assessment points out "water scarcity is increasing and by 2025 availability of freshwater supplies suitable to meet habitat requirements for native species and human communities is expected to be seriously compromised by a combination of growing demand, unregulated direct and indirect liquid effluents, and solid waste disposal from both municipal and industrial sources, and the uncertain impacts from climate changes" (Tolisano & Lopez p. 46). Section 6.0 present environmental design actions the

²⁸ *Zea mays* subsp. *huehuetenanguensis*

project can take to minimize environmental consequences of the proposed action and improve on existing conditions.

2.8 VULNERABILITY TO CLIMATE CHANGE

The five departments of the Western Highlands where the RVCP will be working all share very high-to-high levels of food insecurity as well as overall high levels of extreme poverty ranging from 9.5% - 20.4%. These conditions, combined with weak governance, high levels of illiteracy especially among women, poor environmental health conditions, and job insecurity contribute to the Western Highlands' sensitivity and capacity to adapt to climate change and related adverse events such as landslides, flooding, drought, frosts, and forest fires.

At least 50% of the RVCP departments are currently very highly - highly vulnerable to climate change (USAID/CNCG 2014). Totonicapán is 100% vulnerable and the municipalities along the corridor of highlands of San Marcos and Quetzaltenango also exhibit very high and high vulnerability. Models of the future (2050), also based on the percentage of municipalities that are very highly or highly vulnerable to future climate change, indicate Totonicapán continues to be the most vulnerable (100% of its municipalities are very highly – highly vulnerable) followed by Quetzaltenango (54.1%), San Marcos (48.3%), Huehuetenango (40.7%), and Quiché (38.1%).

Quiché is also vulnerable to drought. (See Annex A.) Parts of Totonicapán and Quetzaltenango (ten municipalities between the two) are additionally highly vulnerable to drought, and the trend to drier conditions brought on by climate change will no doubt increase this threat exacerbating water scarcity issues. The USAID/CNCG (2014) climate change vulnerability analysis indicates sixty-six municipalities in the five RVCP departments have a high index of water scarcity (listed in Annex A), meaning “There exists a strong pressure over hydrological resources. It denotes maximum urgency to regulate supply and demand. In these cases, the low availability of water is a limiting factor in economic development.” (p. 51).

The threat of landslides affects more than a ¼ of the Western Highlands population, a threat influenced by the highly variable topography and highly erodible shale bedrock underlying the soils. San Marcos (34.5% of its municipalities, principally located in the north), Quiché (33.3% of its municipalities) and Totonicapán (25% of municipalities) are at high risk of landslides (USAID/CNCG 2014). At the same time, the threat of erosion in the Western Highlands is highest in the departments of Huehuetenango (46.9% of municipalities at very high risk), Quetzaltenango (20.8% of municipalities) and San Marcos (17.9% of municipalities).

Three of the five departments in the Western Highlands - San Marcos, Quetzaltenango and Totonicapán - have seen a net loss of forest cover between 17 and 141 hectares per year. A study undertaken by Biota and The Nature Conservancy (2014) projects the rates of forest loss for the year 2050 as follows: Quetzaltenango (-5.6%), San Marcos (-6.4%) and Totonicapán (-1.6%).

For Western Highland farmers and families, adaptation to these threats and vulnerabilities requires improvements in key variables such as food and nutrition insecurity, illiteracy, extreme poverty, job security and the health conditions in housing (USAID/CNCG 2014).

Likewise, it is important to moderate population growth through educational campaigns and other techniques, as well as maintain and improve the forest cover. With regard to water and agricultural production, it is important to maintain the water-forest link, reforesting water sources and the upper part of micro-watersheds. (USAID/CNCG 2014, p. 4)

Soil conservation measures, such as the construction of bench terraces on hillsides with crops and applying organic material to soils, are also key to adaptation, as well as irrigation, so farmers are not solely dependent on the rainy season.

The RVCP is addressing many of these factors. ANACAFE reports providing training to 3,280 coffee farmers and 856 vegetable farmers in the following types of climate change adaptation practices during the first two years of the project: soil conservation, use of coffee rust resistant varieties, composting and fertilization practices, production of trees for firewood, water reuse and recirculation and integrated pest management. AGEXPORT is carrying out similar farm-based practices, and in collaboration with TNC, has developed technical manuals, training materials and guides in agricultural practices and climate changes adaptation. They have also carried out climate change assessments in four municipalities (with RVCP associations) where they will develop demonstration sites and carry out trainings on climate change adaptation practices.

3 PURPOSE AND NEED

3.1 PURPOSE AND NEED OF THE RVCP

Communities in the Western Highlands, the focal region of the RVCP, suffer from high rates of poverty and extreme poverty, chronic malnutrition, infant mortality and low education levels. Host to a predominately rural, agricultural and indigenous society, it is accepted that the widespread poverty and malnutrition experienced in this country is the result of embedded structural problems of socioeconomic and political inequality and exclusion including the lack of access that poor families have to food as well as their food utilization and consumption decisions and feeding practices (USAID 2012a). Western Highland communities are in need of an economic development approach that will improve their access to income generating value chains, create jobs, strengthen food security, and improve nutrition.

The purpose of the Rural Value Chains Project is to improve broad-based economic growth and food security in the poorest of the Western Highlands communities. Specifically, its purpose is “to increase sustainable market-led growth in rural areas as a means of sustainably reducing rural poverty and chronic malnutrition” (USAID 2012b). It works with producers and their organizations in the five departments of the Western Highlands to expand agricultural productivity, rural employment, access to markets along value chains, and to increase resiliency of vulnerable communities and households. During the first two years of implementation, the project focused on three value chains – coffee, horticulture and handicraft. In 2015, two additional value chains - cardamom and fruit orchards (apples, peaches and pears) - were included in the program.

Since 2012, RVCP has been carrying out activities with 222²⁹ coffee, horticulture, cardamom, fruit and artisan groups in 30 municipalities to meet two main strategic objectives:

- Facilitate and support value chain activities that encourage agricultural growth, private investment, and expanded value chain participation by poor rural households, and
- Increase the productivity of food crops grown by poor households for their own consumption, and improve crop storage and food utilization practices to reduce beneficiary household levels of chronic child under-nutrition.

Specifically, RVCP implements an integrated set of economic growth, food security, and local governance interventions as part of the Feed the Future (FTF) Initiative to meet the following strategic results: 2.1.1) Agricultural productivity and rural employment expanded, 2.1.2) Access to markets expanded, and 2.1.3) Resiliency of vulnerable communities and households increased.

²⁹ However, RVCP started activities with cardamom and fruit orchard groups activities in 2014.

3.2 PURPOSE AND NEED OF THE ENVIRONMENTAL ASSESSMENT OF THE RVCP

The land and natural resources of the Western Highlands continue to be subject to agricultural practices that degrade soils, contaminate water resources, and unsustainably use water. Institutionally, it is an environment absent of land-use planning and management. Environmental contamination (poorly- managed liquid, solid, chemical and atmospheric wastes) and over-exploitation of natural resources (overharvesting of firewood and illegal logging) further threaten their natural resources, biodiversity and forests. These circumstances contribute to the degradation of the natural environment and the productive capacity of RVCP small producers exacerbating socio-economic conditions and creating a heightened vulnerability to the effects of climate change. The effects of poor land management practices disproportionately impact the livelihoods of impoverished Guatemalans.

“The involvement of local communities in healthy and functioning ecosystems... are vital to long term development. This is so because healthy, functional ecosystems reduce vulnerability to tropical storms; provide a steady supply of water for industry, energy, consumption and irrigation; and offer sustainable livelihoods for the rural poor through agriculture, forestry, tourism and fishing. In turn, sustainable livelihoods contribute to increased citizen security and public participation; reduce threats to biodiversity conservation and the influence of narco-traffickers in rural communities. (Gil Boiton 2012).”

The purpose of the Environmental Assessment of the RVCP is to help it meet the afore-mentioned value chain development and food security objectives in more environmentally sustainable ways. (As mandated in the Foreign Assistance Act of 1961, as amended, Section 117, environmental sustainability is a central consideration of all foreign assistance.) While RVCP activities are designed to introduce and train participating farmers in various soil and water conservation practices and technologies, Good Agricultural Practices (GAP) and adaptation to and mitigation of the effects of climate change, the 2014 Environmental Compliance Audit of the RVCP identified the following specific environmental sustainability needs of these farmers, based on the evaluation of its first year of activities.

- Improve site-specific soil conservation practices, increasing farmer knowledge of the characteristics and needs of the soils they produce on.
- Technical assistance and training in water management and conservation practices.
- Technologies in agricultural production and processing.
- Improved management of liquid and solid wastes in agricultural production and processing, including in coffee processing and composting.
- Safe and appropriate use of approved pesticides and agrochemicals.
- Greater knowledge and application of integrated pest management practices that will help producers minimize dependence on pesticides.
- Solid waste management planning with producers and artisans to either reuse or avoid improper disposal of inorganic materials generated by project activities, including textile scraps, irrigation tubes, macro tunnel structures and associated plastics.
- Improve production on existing farmland and in agroforestry systems to avoid conversion of forested land into agricultural or agroforestry use.

Improved land management and natural resources conservation practices are a central need of the Western Highlands in order to:

- Help protect the biodiversity and agro-biodiversity on which RVCP participant food security and health can depend,
- Diminish the pressures on Western Highlands forests generated by activities including firewood harvesting and consumption, and
- Support farmers to apply practices that mitigate the potential impacts from climate change, and adapt to it.

San Marcos, Huehuetenango, Quiché, Quetzaltenango, and Totonicapán are a priority for climate change adaptation activities due to the likelihood of significant physical impacts of severe events, dependence of the population on climate sensitive sectors such as agriculture, the percentage of population in high-risk areas, and the ability of the economy to respond to climate changes.

4 DESCRIPTION OF THE PROPOSED ACTION

To meet the two strategic objectives and support the purpose of the project, RVCP implementers will carry out activities under six components that will strengthen the competitiveness and expand the number of existing farmer-owned agribusiness enterprises (cooperatives and associations) within the value chains. The components are:

Component 1 - Improved value chain competitiveness: provide specialized technical assistance to expand the capacity of participating associations and cooperatives to increase their production and access to markets.

Component 2 - Expanded value chain participation: expand horticultural and coffee production and participation of target rural poor households.

Component 3 - Improved agricultural productivity: introduction of improved technologies and practices, Good Agricultural Practices, mitigation of the effects of and adaptation to climate change, and market-based certifications that improve the competitiveness of associations and cooperatives.

Component 4 - Expanded markets and trade, unleashing private sector innovation and investment. *(This component was not included in the cooperative agreement between USAID and ANACAFE, but was included in the agreement between USAID and AGEXPORT.)*

Component 5 - Increased food crop productivity and improved utilization: increase the domestic production and consumption of nutritious crops and improve their utilization.

Component 6 - Improved competitiveness of handicraft value chain: strengthen the participation of women in handicraft value chains and increase the productivity and competitiveness of artisan associations and cooperatives.

Components 1-3 cross cut across the principle value chains of coffee, cardamom, horticulture, fruit orchards and cardamom. Cardamom and fruit orchard value chains were approved in November 2014, therefore activities are just starting. Component 5 is specific to health, nutrition and food security activities with households.

The following RVCP activities involving education, technical assistance, preparation of business plans, and municipal strengthening are integral to the Proposed Action; however, as identified in the RVCP Initial Environmental Examination (LAC-IEE-12-55), they were categorically excluded from further environmental review [pursuant to 22CFR216.2(c)(2)³⁰.]

- Development of business “brand”, such as logo, banners and business cards.
- Strengthening organizational governance, business and financial planning and management.
- Facilitate access of producer organizations to financial and credit services.
- Development of an Investment Fund and Electronic Platform.
- Participation of producers in national and international commercial conventions, conferences, and fairs to facilitate market access.
- Pilot program of secondary education specializations in coffee and horticulture production.
- Integration and cooperation with local municipal governments, municipal development committees (COMUDE), and community development committees (COCODE)
- Communications, such as RVCP electronic newsletters.

In addition, and per CFR 216.2(c)2(viii), the following interventions in health and nutrition are not expected to carry out activities that will directly affect the environment (e.g. construction, water supply, or wastewater treatment):

- Technical assistance and training in health and nutrition to participating families to increase nutritional value of food, produce clean and safe food, and increase food availability throughout the year.
- Training in health and nutrition, aimed at primary school teachers.

4.1 RVCP ACTIVITIES BY VALUE CHAIN

The following interventions by value chain and Component 5 are the focus of this Environmental Assessment. Many RVCP activities are common across value chains, including:

- Commercial alliances between producer organizations and export companies.
- Economic empowerment of women and youth, including increasing their participation in value chains, associations, and cooperatives.
- Expand women’s leadership and decision-making.

³⁰ (i) Education, technical assistance, or training programs except to the extent such programs include activities directly affecting the environment (such as construction of facilities, etc.);

(iii) Analyses, studies, academic, or research workshops and meetings, (v) Document and information transfers;

(xiv) Studies, projects, or programs intended to develop the capability of recipient countries to engage in development planning, except to the extent designed to result in activities directly affecting the environment (such as construction of facilities, etc.).

- Strengthen the organizational and associative bases in order to incorporate new producers into the value chain.

Other practices or technologies implemented on the ground can be specific to the crop and require specialized technical assistance, per value chain.

RVCP Technical Assistance Extension System

Implementers, AGEXPORT and ANACAFE and their consortium partners (SCF, COMART, FEDECOAG, FEDECOCAGUA, and ARTEXCO), have trained 132 technicians and 178 para- technicians (also called *promotores*) to support 222 producer groups and 6,509 families to implement the activities and practices described in this section. (The AGEXPORT extension system is also led by Business Specialists who are responsible for business development activities, including supervising implementation of business plans and the Agricultural Technicians.)

RVCP Agricultural Technicians and Agricultural *Promotores* are hired by the project to provide technical assistance and training to the associations and their member farmers. RVCP technicians are professionals in agricultural or forest sciences with experience in the value chain they are working. They provide specialized technical assistance to the producers and the para-technicians (*promotores*) of the organizations often through group events, such as training, field days, demonstrations, experience sharing, and field trips. They also visit individual farms. Technicians coordinate and supervise the activities of para-technicians to ensure the diffusion and application of new technologies and best practices. Both technicians and para-technicians are responsible for project monitoring data collection, as well.

Para-technicians are from the local communities and producer organizations and, in the AGEXPORT extension system, for example, can be responsible for reaching 80 - 100 farmers in the various communities that comprise the membership of the producer group. Para-technicians are recognized for their experience with the value chain product, staple crops (corn and beans), and home gardens. They have extension experience, can read and write – some of them have high school degrees such as in coffee cultivation – and all of them can communicate in local languages.

Both, ANACAFE’s and AGEXPORT’s extension systems, are developing “model farmers” or “innovative producers” (master farmers) who are selected and committed to dedicating land on which to model best practices. The objective of the model farm is to promote, demonstrate, and teach new practices to producer group members. While the focus of RVCP technical assistance and training is to participating farmers, non-participating farmers can benefit from the Master Farmer’s knowledge and training by participating in group trainings offered at the farm, or visiting the Master Farm.

Table 13: RVCP Extension System

RVCP Extensionists	Technicians		Para-technicians (<i>Promotores</i>)		Master Farmers/Farms (Model or Innovative Farmers)	
	ANACAFE	AGEXPORT	ANACAFE	AGEXPORT	ANACAFE	AGEXPORT
<i>Consortiums</i>						
Coffee	34	8	44	22	--	4
Horticulture & Fruit	13	41	14	40	--	29
Cardamom	NA	6	NA	10	NA	0
Handicrafts	13	5	4	30	NA	NA
SAN	12	--	--	14	--	--

-- = data unavailable. NA = Not Applicable

The *Rural Coffee Centers* (implemented by ANACAFE) is one emerging model of a Master Farmer program in San Marcos. CERCAFE's are designed to: a) provide technical assistance to selected farmers and their families, and demonstrate practices that address social, economic and environmental factors, including health, education, food security, leadership and participation; b) coffee production, livestock production and farm diversification; and c) the protection and sustainable use of water, soils and forests within the family farm system. Selected CERCAFE farmers commit to:

- Sign a letter of cooperation with ANACAFE.
- Develop a map of the family farm system.
- Develop a future map of the family farm system.
- Establish a system to register productive activities and income.
- Implement management plans as provided by ANACAFE.
- Permit ANACAFE and other organizations to carry out training events and experience exchanges on the farm.
- Participate in training events programmed by ANACAFE and other organizations.
- Be an active member of the producer organization.
- Share their experiences and lessons learned.

The Environmental Assessment team visited two CERCAFE model farms in San Miguel de Ixtahuacán. The ANACAFE technician, who designed the CERCAFE model (two years ago), reports he will be developing at least five CERCAFE models per producer group (in that area) over the coming two years.

RVCP provides technical assistance, training, practices and technologies in the following value chains:

Coffee:

(89 producer groups; 8,246 producers; 9,866.71 hectares)

- **Technical assistance and training in production issues** for organic, conventional and mixed coffee crops to increase performance and yields. Production topics include organic and conventional production and pest and disease management including new, more efficient and more environmentally friendly organic pesticides for coffee plantations.
- **Purchase, training in using and maintenance of motorized sprayers** with a two-stroke engine, and handling and storing petroleum products (oil, fuels, etc.).
- **Renewal of plantations:** improvement and recovery of degraded and eroded soil areas through establishment of new coffee plantations and shade species; soil improvement and fertilization plans; establishment of coffee rust and other disease resistant coffee seedlings, nursery establishment; irrigation and management for nurseries; establishment of agroforestry systems. (To maintain soil cover during renovation practices

Practices and Technologies in Coffee Value Chain Implemented

2013 – 2014

- Live barriers.
- Individual terraces.
- Acequias (irrigation ditches).
- Oxidation pits.
- Composting of coffee pulp.
- Shade tree management in systems.
- Improvements/repairs to mechanical pulping equipment.
- Provision of equipment: drills, sprayer pumps (brand Royal Condor STD 18 lt), fumigation sprayers, tree pruners.
- Provision of coffee pulping manual mills (brand Servicios Integrados Industriales with 20qq capacity), modules of semi-integrated coffee pulping machines (brand Jota Gallo),
- Provision of gas and fuel wood silo dryers.
- Pesticide and Integrated Pest Management training.

Donation of coffee rust resistant

- include: cutting back plants at their stem to maintain soil cover and planting other crops.)
- **Identification and diversification of native and non-native shade species for coffee crops.**
 - **Improvement in post-harvest management and processing,** including wet milling (new and remodeled), as well as new and remodeled artisanal processing, “beneficios ecológicos” or eco-friendly wet milling technologies improved drying technologies and treatment of coffee waste water and training in occupational health and safety measures.
 - **Analysis of the effect of coffee rust in coffee cultivation and management design for the small farmer:** approximation of area affected; restoration of plantations, planting of coffee varieties resistant to coffee rust, including proposals for pesticides to control pests and diseases in conventional and organic coffee.
 - **Technical assistance to promote improved technologies or practices:** Training in soil conservation techniques, use and handling of pesticides, fertilization plans and shade management. Follow-up trainings for those with certifications.
 - **Support quality certifications where the market requires them:** Training for maintenance of certifications, training for tracking of certification rules, elaboration of regulations within the organization for compliance with certification rules.
 - **Promotion of practices to mitigate effects of and adaptation to climate change:** training manuals of agricultural practices for climate change adaptation, including technology transfer and practice selection guides; partnership with TNC to establish demonstration sites in four municipalities.
 - **Implementation of USAID-approved mitigation and monitoring measures** from the project (2013) EMPRs:
 - Annual training in the safe use of pesticides and IPMs per 2012 PERSUAP, including the 2013 coffee-rust amendment.
 - Proper disposal of plastic pesticide containers, such as construction of metal collection “cages” and disposal of pesticide containers via the Agrequima³¹ collection service.
 - Construction and use of bio-beds as areas for pesticide equipment washing and pesticide preparation.
 - Establish native vegetative barriers along borders of coffee farms and edges of streams and rivers to capture run-off.

PERSUAPS and Included RVCP Crops

Safe Use Action Plan -SUAP- , 10/01/2012:

French beans, sweet pea, snow pea, garden pea, lima beans, Brussels sprouts, onion, potato, carrots, tomato.

PERSUAP amendment with emphasis on coffee rust, Oct 2013; Safe Use Action Plan -SUAP-, 10/01/2012: Coffee

³¹ Agrequima is a guild of associated agrochemical companies (multi-nationals and manufacturers, formulators and distributors) with the mission of being a model in the industry of crop nutrition and protection that promotes innovative, sustainable and environmentally-responsible agriculture, contributing to the improvement of Guatemalan livelihoods.

http://www.agrequima.com.gt/index.php?option=com_content&view=article&id=112&Itemid=268

- Soil conservation practices such as contour planting, individual terracing, cover crops, live and dead barriers, mulching.
- Pruning or re-planting of old plantations completely or in blocks.
- Incorporate (roya – uninfected) pruning into mulch.
- More frequent coffee plant renovation.
- Training in shade management.
- Manual control of weeds (versus herbicides).
- Recollection of seedling bags and their proper disposal.
- Do not burn plastic bags.
- Training in the conservation and efficient use of water during wet milling.
- Implement water treatment systems for coffee waste water (aguas mieles) in collective mills
 - pre-treatment, chemical/biological treatment, management of organic sludge, final disposal of treated waters and reuse of organic wastes,
- Construction and training in the use of filter pits.
- Design and construction of recirculating wet mills to recycle water during artisanal milling.
- Application of Cal (calcium hydroxide) and biological agents to coffee pulp.
- Compost organic waste and coffee waste water/pulp.

Horticulture:

(90 producer groups; 7,619 producers, and 1,008.44 hectares)

- **Technical assistance and training in production topics to increase horticultural production quality and yields:** (Crops: French beans, sweet pea, snow pea, garden pea, lima beans, Brussels sprouts, onion, potato, carrot, broccoli, cabbage, cauliflower, tomato, chile pimiento, chile jalapeño). Fertilization planning, and management, composting, pesticide use and management, and technologies and sanitary practices to improve quality and meet certification requirements: field-based latrines, hand-washing stations and bio-beds.
- **Technical assistance and training in irrigation and conversion to drip-irrigation systems.**
- **Producer adoption of production systems under controlled conditions** such as macro-tunnels. (Macro-tunnel crops: tomato, chile pimiento, chile jalapeño). **Technical assistance and implementation of Good Agricultural Practices:** soil conservation practices such as contour planting, mulching, live and dead barriers, crop rotation, cover crops, utilization of organic fertilizers and terracing or bunds; training in the safe use and management of pesticides and the management of pesticide waste containers, and the

RVCP Practices and Technologies in Horticulture Value Chain Implemented

2013 – 2014

- Good Agricultural Practices per Global Gap standards.
- Laboratory soil analysis to guide fertilization planning.
- Phytosanitary plans in compliance with PERSUAP (all producer groups).
- Training in safe management and use of pesticides.
- Field latrines.
- Field hygiene stations.
- Conversion of sprinkler systems to drip irrigation.
- Mulching.
- Pesticide Personal Protection Equipment.
- Pesticide and integrated pest management training.
- Management of chemical product residuals according to chapter CB 8.9 de Global GAP including: Biodeps (bio-beds), Triple-washing sites, Pesticide container collection sites.
- Cholinesterase testing, 150 randomly selected producers (all tests were normal levels.)
- Equipment for a soil & water testing

monitoring of best management practices to meet certification standards.

- **Support quality certifications where the market requires them:** Training for maintenance of certifications, training for tracking of certification rules, elaboration of regulations within the organization for compliance with certification rules.
- **Diversification and introduction of new export crops** such as fruit orchards (apples, peaches and pears) and cardamom (as presented below).
- **Intermediate or final post-harvest processing:** e.g. selection, quality control, packing in re-used plastic boxes to avoid damage during shipment.
- **Introduce practices that mitigate effects of and support producers to adapt to climate change:** such as soil and water conservation practices; conversion to drip-irrigation. (The project will also establish collection sites/warehouses in existing buildings/rooms as well as construction of new ones to help shorten length and number of trips made to markets.)
- **Implementation of USAID-approved environmental mitigation measures** from project (2013) EMPRs:
 - Training in and implementation of IPM practices,
 - Training and implementation of safe pesticide use practices of the 2012 PERSUAP.
 - Construction and training in bio-beds.
 - Set up pesticide container collection with AGREQUIMA.
 - Implementation and training in efficient use and maintenance of drip irrigation systems.
 - Establish irrigation and irrigation maintenance schedules with systems users.
 - Monitoring of water quality and quantity.
 - Train in water conservation practices.
 - Locate macro tunnels or greenhouses in areas protected from strong winds and on less than 5% slope and away from water ways.
 - Re-use plastics such as discarded irrigation tubing, and ARGYL such as by chopping up and mixing into organic material.
 - Incorporate organic waste into worm and regular compost systems.
 - Dispose of inorganic waste in official landfills or farm-based disposal pits.
 - Ensure the application of soil conservation methods (such as contour planting, live and dead barriers, acequias) and apply mulch as a soil cover.

The following activities in cardamom and fruit orchard value chains were initiated in January 2015, at the request of USAID, and the details of which are in development with the participating producer organizations.

Fruit orchards (apples, peaches and pears):

(Four producer groups; 123 producers; 70 hectares)

- **Technical assistance and training in crop management to increase yields and quality** and in best agricultural practices such as soil conservation and management, pesticides safe use and management, fertilization and post-harvesting practices.
- **Development and implementation of association environmental mitigation and monitoring plans.**

Cardamom:

(One association of five producer groups; 805 producers; 1,050 hectares)

- **Technical assistance and training in production topics to increase cardamom quality and yields** and introduce best agricultural practices, such as crop sanitation and management, shade management and pest and disease management (e.g. Thrips.)
- **Improved technologies in post-harvest management**, such as more efficient cardamom drying technologies and practices including preventative maintenance and repair of existing dryers to increase their efficiency to increase their efficiency (therefore, using less firewood per batch of cardamom dried)
- **Incorporation of fuel wood and multi-use agroforestry species** to provide shade in 324 ha of existing Cardamom plantations; establish cardamom and tree nurseries. (Cardamom plantations in the *Zona Reina* are not intercropped with coffee.)
- **Introduce practices that mitigate effects of and support producers to adapt to climate change:** implementation of nurseries with cardamom plants selected for their resilience to the effects of climate change, pest and disease; soil conservation practices that reduce erosion and improve soil stability; cardamom agroforestry systems with native fuel wood species and 5 climate change demonstration farms that put into practice up to 30 climate change practices proposed in the AGEXPORT climate change manual.
- **Environmental review of activities, and development and implementation of Environmental Mitigation and Monitoring Plan (EMMP).**

Handicrafts: (38 producer groups; 2,241 producers)

- **Provide training and technical assistance to strengthen production of handicrafts:** training in designs, image, web page, markets; training in specific production lines (e.g. various items from palm trees.)
- **Assess incorporation of new production techniques**
- **Development of products according to customer needs**, such as new designs.
- **Improved technologies or production practices** such back-strap looms and inputs and modern looms tailored to the artisans, implementation of looms for bracelets, equipping workshops with treadle looms for weaving wool, carding machinery and machinery for thread spinning; sewing machines.
- **Opening of national and international markets and search for new markets.**
- **Gender: women's empowerment in the value chains.** Inclusion of women of all ages, particularly elderly and more knowledgeable, expert women in production of handicrafts.
- **Environmental Mitigation: implementation of USAID-approved mitigation measures**³² per project (2013) EMPRs:

Practices and Technologies in Handicrafts Value Chain Implemented 2013 – 2014

- Provision of treadle looms
- Purchase of toxic free dye textile threads to avoid chemical wastes.

³² RVCP implementing partners explained that participating handicraft organizations are buying thread already dyed, not dying it themselves. Various mitigation measures were included in the USAID-approved project EMPRs that were related to the direct and indirect impacts of thread dying, such as wastewater treatment, occupational health and safety plans, and PPE. However, since dying is not taking place at the RVCP workshops, those mitigation measures have not been

- Carry out an environmental management diagnostic with handicraft organizations to identify priorities and mitigation measures.
- Verify legal sources of wood per INAB certifications.
- Improve the efficiency and effectiveness of machinery to conserve energy and reduce waste.
- Promote the correct recollection and disposal of solid waste such as plastic bottles, glass, and re-use remnants of cloth and other raw materials.
- Assess noise levels generated by machinery per municipal standards.

4.2 RVCP FOOD SECURITY AND NUTRITION ACTIVITIES

Component 5: Food Security and nutrition (6,509 families)

- **Establishment of home gardens:** micro-drip irrigation systems of 50 m² or less, establishment of raised fields for planting vegetables and soil conservation, provision of high-nutrition seeds, training in nutritionally balanced recipes, increased soil fertility through application of organic fertilizers/composting.
- **Establishment of school home gardens.**
- **Alternative methods for purification of water for human consumption:** provision of water filters and training in use and maintenance.
- **Improved, fuel-efficient stoves built in schools and homes.** Establishment of stoves and training for use and maintenance.
- **Construction of Community Demonstration Centers of Food Security and Nutrition (CCDSAN)**
At the time of writing of this report, it was still not clear if this activity would be carried out. For that reason, the EMMP in Annex D has a separate section for appropriate mitigation measures if the CCDSAN's are constructed.
- **Implementation of USAID-approved mitigation measures** per project (2013) EMPRs:
 - Analysis and monitoring of water supply and demand for home garden irrigation.
 - Rainwater harvesting in home gardens.
 - Soil conservation practices based on slope, terraces (on slopes > 10%) contour planting (on slopes 5 – 9%), live and dead barriers, incorporation of plant material into soil and minimum to no-till practices.
 - Teach families home-remedies for garden pests (natural pesticides).
 - Safe pesticide use per the PERSUAP.
 - Construction of bio-beds and training and use of PPE.
 - Small-scale construction best practices: selection

Component 5	
Practices and Technologies Implemented 2013 – 2014	
<ul style="list-style-type: none"> - Training in home gardens under natural production. - Training in school gardens under natural production (pesticide-free/organic). - Improved bean seeds planted. - Drip irrigation systems installed in home gardens. - Drip irrigation systems installed. - Water purification filters distributed. - Improved cook stoves donated. - Provision of vegetable seeds for home gardens: carrots, cabbage, cauliflower, lettuce, beets, radish, chard, green beans 	

included in the proposed action. It also has not been possible to verify the wastewater treatment practices of Rio Blanco, the company that supplies the project with non-toxic threads, an issue addressed later in the report.

of construction sites with less than 5% slope and deposit construction solid waste in official sanitary landfills and plan will be reviewed and approved by a certified engineer; construction will meet earthquake resistance standards.

- Construct improved latrines (maximum 2) at CCDSANS.
- Construct filtration pits to absorb grey-water generated in CCDSANS.
- Designate a group of people to be in charge of CCDSAN maintenance and train them in maintenance.

5 SCOPING

5.1 BACKGROUND AND METHODOLOGY

Between February 15 and March 4, 2015, and with AGEXPORT and ANACAFE staff, a multi-disciplinary Scoping Team carried out site visits and consultations with stakeholders who are directly and indirectly affected by the proposed action, and consultations with key informants (Annex C). The purpose of the consultations was to identify issues – potential impacts due to the nature of the proposed activity as well as those observed by the EA Team - with RVCP activities, and begin identifying potential solutions. The issues and alternatives in Section 5.2 were informed by the following sources:

1. Consultations with 34 stakeholders/stakeholder groups who are directly affected by or participating in the activities of the proposed action, including in-briefing and out-briefing with USAID/Guatemala and 28 RVCP producer groups.
2. Site visits to farms of the 28 producer groups (cooperatives, associations) participating in the RVCP.
3. Consultations with 11 stakeholders indirectly affected and not directly participating in activities of the Proposed Action, such as municipal government leaders, and key informants who could provide professional opinion on specific topics, such as The Nature Conservancy and the Association of Private Natural Reserves of Guatemala.
4. The assessment of potential impacts of the proposed actions by Scoping Team during site visits and their direct observation of coffee production and post-harvest processing; horticultural production and post-harvest processing including apple production; handicraft production; and cardamom agroforestry systems; and
5. Secondary sources and previous environmental reviews such as the July 2014 Rural Value Chains Program Environmental Compliance Audit (carried out by the Cadmus Group) and the September 26, 2012 USAID Initial Environmental Examination (LAC-IEE-12-55).
6. Follow-on field visits and meetings with AGEXPORT and ANACAFE staff and RVCP participants (May 12 – 20 and June 1 – 5, 2015) to further identify and design alternatives and assess their impacts.

The Initial Environmental Examination identified the following potential impacts to the Western Highlands from the USAID-funded Intermediate Result 2.1 activities in coffee production and horticulture:

- Soil erosion and degradation due to excessive rainfall runoff.
- Contamination of soils and water and human health from pesticides.

- Liquid and solid waste pollution by effluent from coffee processing and post-harvest processing of crops.
- Sustainability of water resources: water use, quality and management in irrigation schemes.

The LAC-IEE-12-55 ETD required that after one year of implementation, USAID/Guatemala would conduct an environmental compliance audit of RVCP activities and that audit recommendations will be incorporated into subsequent implementing partners' work plans. The subsequent Environmental Compliance Audit of the Rural Value Chains Project (Cadmus 2014) verified that threats to soils, water, and human health continue. It also stated:

“The most significant adverse environmental impacts observed were poor water management associated with irrigation and potential land use change. While these impacts were not anticipated by the Initial Environmental Examination and the respective Environmental Threshold Decision and USAID is not funding major irrigation or new lands conversion, these are indirect effects of USAID-funded project interventions and need to be addressed (p. viii).”

Based on the results of this Audit, the USAID BEO (per Action Memorandum November 26, 2014) required a Scoping Statement and Environmental Assessment of the RVCP that covers at least the following significant issues:

- “Indirect and cumulative environmental impacts of the RVCP, especially on land use change such as deforestation, land clearing and impacts on protected areas and endangered species.
- Impacts of crop fertilization methods.
- Impacts of post-production processing.
- Water use for agricultural production and processing.
- Waste management agricultural production and processing.
- Pesticide use and integrated pest management.
- Other impacts from post harvesting processing.” (p. 2).

The following section summarizes these and other issues with the proposed action, which are more fully described in the Scoping Statement (LAC-SS-15-03), approved on June 10, 2015. Issues are those potential and observed problems with the proposed action that have direct and indirect effects on the environment, as well as cumulative impacts on watersheds and water resources, livelihoods, vulnerable groups, and local capacity to adapt to climate change. Indirect and cumulative effects are critical to take into consideration because although they might not have direct environmental effects, when not accounted for in project design and implementation, they can lead to unintended effects or aggravate existing conditions.

5.2 KEY ISSUES ANALYZED IN THE EA

Summary of Key Issues with Direct Environmental Consequences

ISSUE 1- FOREST DEGRADATION: FOREST HABITATS AND ASSOCIATED BIODIVERSITY CAN BE NEGATIVELY IMPACTED BY THE CONSUMPTION OF FUEL WOOD FOR DRYING CARDAMOM. FUEL WOOD PURCHASED FOR CARDAMOM DRYING MAY BE ILLEGALLY AND UNSUSTAINABLY HARVESTED.

Western Highland forests are being degraded by firewood demand, which negatively impacts forest composition and biodiversity. Fuel wood extraction can change landscape mosaics, impact sensitive habitats and endemic flora and fauna species, and damage watersheds (e.g. water recharge sites). RVCP activities in the cardamom value chain are just initiating offering an opportunity to address from the start the threat cardamom drying presents to *Zona Reina* forests. As explained in section 2.0, Existing Conditions, from 13.514 m³ (USDA data) to 8.83 m³ (AGEXPORT data) of wood is burned per metric ton of cardamom. USDA (2014) estimates that, nationally, 3,192.79 hectares is deforested (or degraded) on a yearly basis from cardamom drying. (Quiche and *Zona Reina* estimates are not yet available.) Given the significance of existing conditions, the recommended alternative strengthens the proposed action by testing the efficiency of cardamom drying machines the project will improve, planting small-scale fuel-wood plantations and planning for and managing firewood production in RVCP cardamom farms to meet demand and minimize impacts on surrounding forests and protected areas.

ISSUE 2 - DIVERSITY OF NATIVE SPECIES IN AGROFORESTRY SYSTEMS: THE PROPOSED ACTION'S SELECTION OF SHADE TREE SPECIES, AND THAT OF NON-NATIVE OR INVASIVE SPECIES, TO BE USED IN PROJECT AGROFORESTRY SYSTEMS HAS THE POTENTIAL TO AFFECT BIODIVERSITY ON FARMS.

The RVCP is helping producers to improve shade management and plant native and non-native species in coffee farms. Only native species are being promoted by the project in cardamom systems and no invasive species³³ are being planted in either coffee or cardamom agroforestry systems. Still, *Ingas* and *Gravilea* - an introduced species - dominate many of the coffee systems visited during scoping. While shade tree systems can be diverse, three visited by the EA team during scoping were composed of six species or less. The EA recognizes project efforts to diversify with native species, as well as internationally-accepted standards of diversification with 10 – 12 different native species in shade-grown coffee agroforestry systems³⁴. Also, coffee producers of the RVCP will benefit from more specific technical assistance for shade tree species based on the altitude and aspect of a given site.” (Cadmus 2014, p. 18).

³³ Verified in the CONAP “Black List of Exotic Species”.

http://www.chmguatemala.gob.gt/colecciones/especies-exoticas-invasoras/Lista%20Negra%20Especies%20Exoticas%20-con%20excepciones-vf.pdf/at_download/file

³⁴ AGEXPORT (2014), “Diseños y Diversificación de Sombra en Plantaciones de Café Establecidas”, in Manual de Buenas Prácticas Agrícolas para Técnicos Agrícolas del área rural.

ISSUE 3 - SOIL EROSION: COFFEE FIELD RENOVATION AND ESTABLISHMENT CAN CREATE CONDITIONS FOR SOIL EROSION IF SOIL MANAGEMENT AND CONSERVATION MEASURES ARE NOT APPLIED PROPERLY.

The 2014 Audit found that in coffee farms the “use of beneficial soil management techniques were not uniformly applied across coffee producers” (p. 16). Even when farmers are undertaking soil management techniques, the renovation and establishment of new coffee plantations on steep slopes and fragile soils exposes farmers to the risk of severe erosion and even landslides, especially as more extreme rains, intensify. “Soil type, slope, precipitation, and organic matter content all impact susceptibility to soil erosion” and RVCP practices should be tailored to those conditions (Cadmus 2014 p. 16). The EA incorporates practices and mitigation measures that can better protect soils during renovation and establishment of coffee fields.

ISSUE 4- WATER MANAGEMENT AND CONSERVATION: WATER IS BEING USED FOR IRRIGATION IN SOME HORTICULTURE CROPS AND FOR COFFEE PROCESSING WITHOUT SUFFICIENT MEASUREMENT AND MONITORING OF WATER USE, SUPPLY AND DEMAND.

While project promotion of drip irrigation systems can conserve water, the lack of data regarding water consumption and needs for crop production and irrigation, and that of coffee processing, has the potential to result in the inefficient use of water and compete with domestic water supplies. The RVCP analyzes water management at the plot level upon changing from sprinkler to drip irrigation; however, the measurement and monitoring of water volume supply and in use is not a regular practice from farmers and farmer associations so the RVCP is not able to analyze the amounts of water saved, nor per system. In addition, for coffee processing, eco- friendly wet mills (where water is being recycled and water consumption is reduced significantly) are being implemented as best practices for coffee processing on model farms. However, the lack of measurements of supply and monitoring of the water volumes makes it difficult to assess water conservation or water balances. (For larger mills, ANACAFE has developed systems to use less water, recycle and treat water and there is a detailed manual according to the size and type of mill indicating the measures to be taken.)

Ineffective or improper water management (measurement and monitoring), in the face of the effects of climate change, can result in the inefficient use of water and even compete with water supplies for domestic use. When farmers understand water requirements of the related production activities and adopt the appropriate water management, conservation and monitoring practices, it improves the sustainability of the system, especially for climate change adaptation purposes. Measurement and monitoring is needed to determine the amount of water available from sources where possible; amounts used in RVCP coffee processing and irrigation activities, and supply/demand balances. Understanding water balances and crop requirements is essential to water conservation and avoiding potential conflicts over water use.

ISSUE 5 – WATER POLLUTION: A) EXISTING COFFEE WASTE WATER DISPOSAL SYSTEMS USING FILTER PITS HAVE THE POTENTIAL TO OVERFLOW (SUCH AS IN WET COFFEE PROCESSING AT THE ASOCIACIÓN CHAJULENSE IN QUICHE AND AS IDENTIFIED IN THE JULY 2014 AUDIT, P. 24) AND CAN CAUSE SURFACE AND GROUND WATER CONTAMINATION WHEN WATER IS NOT TREATED OR FILTER PITS NOT DESIGNED CORRECTLY, AND B) AGRICULTURE PRODUCTION ACTIONS SUCH AS PESTICIDE APPLICATION, FERTILIZER USE, AND COMPOSTING CAN DETERIORATE WATER QUALITY DUE TO INAPPROPRIATE LOCATION OF THE ACTIVITIES, LACK OF BUFFER ZONES, AND WHEN BEST MANAGEMENT PRACTICES ARE NOT FOLLOWED.

The wastewater generated during coffee processing can spill out of filter pits and sometimes into neighboring arroyos, and latrines can be placed too closely to waterways or just uphill from productive

units. The EA team observed a couple of such latrines at risk of contaminating water or production, at Finca Xix and at the ADIP, Asociación de Desarrollo Integral de productores Palqui. The potential environmental impacts of filter pits (to surface and groundwater, as well as the emission of GHGs from the wastewater) is a commonly understood drawback of this technology. They can also be a personal safety hazard. In this case, filter pit overflow is attributed to a too uniform design of the filtration hole that does not take into account the types of soils it is being constructed in and the amount of water used by the farmer during processing. The location of the filter pit is also an issue, as well as its protection from rainwater. The recommended alternative promotes a re-conditioning of filter pits based on local conditions such as soils, climate and their correct location, and an instructional guide that will provide farmers with design recommendations.

The July 2014 Audit also cited concerns that over-fertilization and crop fertilization methods, as well as poorly sited compost piles are polluting local surface waters. The location of compost piles was also a concern of the Scoping Team, having observed one located too close to a waterway in Chajul; however, this is not the norm. According to the July 2014 Audit, fertilization methods are not always guided by soil analyses that help producers know how much and what they should apply, which would help to avoid run-off of this organic material into neighboring water bodies. The RVCP technical team is promoting soil analysis before recommending any fertilization dosages. The Audit recommends various improvements: “dosages should be based upon soil analyses and dosage should be adjusted based on the results of those analyses; increased attention related to methods of fertilizer application and potential adverse impacts of over-fertilization should be emphasized, and record keeping of fertilizer use can be improved.” (Cadmus 2014 p.vi) The proposed action develops fertilization plans with producers; however, the implementation of best management practices and mitigation measures needs to be reinforced and monitored with sufficient frequency by extension agents.



This is an example, from one small producer from Chajulense of an artisanal coffee mill. It includes a water tank, a pulp tank and finally everything goes to the last tank (yard) with a border. A filtration pit receives the coffee wastewater (shown in the second picture) through a pipe. The filter pit is not deep enough, and according to the producer does overflow. (Photos by EA Water Resources Specialist, Carlos Cobos.)



Figure 1: A filter pit in Chajul that shows potential risk of overflow down the hillside. (Photo by EA Water Resources Specialist, Carlos Cobos.)

ISSUE 6 – PEST AND DISEASE MANAGEMENT: COFFEE RUST, THRIPS, AND OTHER PESTS/DISEASES ARE IMPACTING COFFEE, CARDAMOM, AND FRUIT TREE PRODUCTION, AS WELL AS HORTICULTURE PRODUCTION. PESTICIDE USE IS SEEN AS A SOLUTION TO MINIMIZING PEST AND DISEASE IN CROP PRODUCTION BUT CAN NEGATIVELY IMPACT HEALTH AND WATER QUALITY, ESPECIALLY IN AREAS UNDER ORGANIC PRODUCTION SUCH AS ON ORGANIC COFFEE FARMS IN THE ZONA REINA, AT THE HEADWATERS OF THE CHIXOY RIVER BASIN.

The project has been carrying out activities under the guidance of the Economic Growth PERSUAP (2012) and an amended coffee rust PERSUAP (October 2013); a new coffee rust PERSUAP was approved in January 2015. Still, three primary issues are of concern:

1. *Variations in pesticide use and safe use standards³⁵ and practices.* For example, the EA team observed pesticides located in the house, next to a dining room (as seen at a home of a member of the Asociación de Caficultores Miguelenses, San Miguel Ixtahuacán, San Marcos), while in other cases pesticides are located in a specific room outside of and next to the house (as seen at a home of a member of the Cooperativa Integral Agrícola 21 de Octubre, San Pablo, San Marcos). The EA team also observed variations in bio-bed design and construction, such as the absence of protective walls around the bio-bed and wash water at the bio-bed site. The July 2014 Audit found, “In general, increased training in application, management, storage, and use of pesticides is needed to comply with the Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP) and conditions of the Initial Environmental Examination (IEE)” (p. vi).



³⁵ The July 2014 Audit cites various inconsistencies with pesticides being used by RVCP participants and the project PERSUAP Based on observations in the field and interviews with producers, the environmental audit results indicate that participants in the RVCP are not compliant with the PERSUAP. Based on active ingredients in commonly used pesticides such as Duett, the first active ingredient in epoxiconazole + carbendazim is listed as a fungicide not to be used on USAID projects. In addition, copper oxide and tea tree oil (*Melaleuca alternifolia*) are utilized by producers, but not included in the approved PERSUAP list” (Cadmus 2014, p.30).. “

Figure 2: Example of incomplete construction of bio-bed and inappropriate location.³⁶ (Photo by EA Water Resources Specialist, Carlos Cobos.)

2. *The appropriate coffee-rust resistant varieties to plant per local conditions and international markets.* For example, during consultations with the Cooperativa Integral Agrícola 21 de Octubre (in San Pablo, San Marcos) and the Asociación de Productores de Café del area Ixil, APROCAFI (Nebaj, Quiché), farmers argued they are interested in renovating their coffee plantations as long as the coffee rust resistant variety will be accepted by international markets for its organoleptic qualities.
3. *The lack of standardized IPM practices in project value chains that can be applied in conventional and organic systems.* Asociación Chajulense, in Chajul, Quiché and the Rio Azul Cooperative in Jacaltenango are two examples identified during scoping of organically certified associations threatened by members' decision to convert from organic to conventional systems due to the lack of IPM that will effectively treat coffee rust. It was also noted in the July 2014 Audit, "In both coffee and horticulture, there was a lack of knowledge regarding Integrated Pest Management (IPM) techniques which may foster greater reliance on agrochemicals in the shorter term." (p. vi) The EA emphasizes the training in IPM and updating project technical assistance and training to adhere to the January 2015 regional coffee PERSUAP. In cardamom, organic standards will be promoted.

The EA also requires updating of existing PERSUAPS for crops that had not been included, and updating and continuing the technical assistance and training in application, management, storage, and use of pesticides. "Continual reinforcement related to proper pesticide use, including use of Personal Protective Equipment (PPE), location of pesticide preparation/disposal areas, and dosages should be integrated as a core theme of the RVCP moving forward." (Cadmus 2014, p. vi). It also recommends the project work with associations to better communicate and assess with their members the pesticides currently in use and compare them to the lists of permitted products in the PERSUAP, that are provided by the project.

ISSUE 7 - LITTER AND SOLID WASTE MANAGEMENT: IMPROPER SOLID WASTE MANAGEMENT IN AGRICULTURAL PRODUCTION AND PROCESSING, HANDICRAFT PRODUCTION AND IN PLANT NURSERIES CAN CONTRIBUTE TO THE COMMUNITY-WIDE PROBLEM WITH INORGANIC LITTER AND WASTE, A PROBLEM EXPERIENCED THROUGHOUT GUATEMALA.

Waste management is not only a community-wide issue throughout the Western Highlands but also at national level. Waste generated by RVCP producers contributes to this problem when it is not properly disposed. Most communities and municipalities do not have landfills or ways to recycle waste. (It is also part and parcel of the members versus non-members issue discussed in the next section.) Of special concern is inorganic waste, such as plastics from drip irrigation tubes, pesticide containers and black plastic soil covers, as well as debris from macro-tunnel construction or the discarded black bags in which plant seedlings grown in nurseries. On farms, within associations and in *centros de acopio* and processing centers, the project should "strengthen solid waste management and identify options for

³⁶ In this case, the bio-bed is located too close to a nursery and it does not include a roof to protect against rain. Other biodeps on model farms included walls, too. It is also considered small for the number of producers using it.

handling agrochemical and inorganic waste, especially in more remote sites where waste management is particularly challenging” (Cadmus 2014, p. vii). All associations should be trained in solid waste management, and best management practices for nurseries are identified in the EMMP.

ISSUE 8 - IF HANDICRAFT RAW MATERIALS ARE BOUGHT FROM UNSAFE AND UNSUSTAINABLE SOURCES, THEY COULD IMPACT HUMAN HEALTH, PLACE INDIRECT PRESSURES ON A NATURAL RESOURCE, AND NEGATIVELY IMPACT HANDICRAFT PRODUCTION.

The raw materials used in handicraft production could present issues if the threads are dyed with toxic substances or if other raw materials, such as wood are illegally harvested. Human health can be affected and water supplies contaminated by the toxic chemicals used to dye threads during textile production. While RVCP participant ARTEXCO does not dye thread used for handicraft production, but buys thread that is already dyed and free of known toxic chemicals (Jorge Oliveros, Director ANACAFE, personal communication April 2, 2015), the July 2014 Audit recommends “verification (via a certification or other information) that the thread does not contain harmful chemicals and/or toxic substances ...” (Cadmus 2014 p. 31). Verification of legal supply of raw materials, such as of wood, can also be carried out.

ISSUE 9 - INADEQUATE OCCUPATIONAL HEALTH AND SAFETY CONDITIONS IMPACT AIR QUALITY IN THE WORK ENVIRONMENT, DAMAGE INFRASTRUCTURE AND CAN POLLUTE LOCAL SOILS AND WATER.

In at least three of the coffee processing mills³⁷ visited by the Scoping Team, inadequate occupational health and safety conditions were reported by stakeholders or observed by the Scoping Team. For example, UPC Café Teresa con Espíritu de Mujer’s toasting equipment was poorly installed and created excessive vibration and dust. (Another processor observed by the Scoping Team emitted smoke indoor which is inhaled by the laborers.) While the faulty equipment was installed prior to the RVCP, its continued use in coffee toasting presents risks to worker health and safety. Some associations also spoke of small workspace in which to do their processing. The EA presents simple alternative actions that build off the Proposed Actions to develop a culture of occupational health and safety.

ISSUE 10: CONSERVATION OF LOCAL AGROBIODIVERSITY: CROPS PROMOTED IN HOME GARDENS DO NOT REFLECT THE FULL RANGE OF MEDICINAL AND OTHER VEGETABLES THAT PARTICIPANTS LIKE TO EAT OR USE, POTENTIALLY LIMITING THE BENEFITS OF LOCAL AGROBIODIVERSITY THAT HAS TRADITIONALLY BEEN CONSERVED IN HOME GARDENS AND THEIR BENEFITS TO FOOD SECURITY AND NUTRITION.

Women of the *Cooperativa Integral de Producción Artesanal* in La Jacaltequita, a group that’s been working with the RVCP for two years, expressed concern that home gardens could include a greater variety of vegetables and medicinal herbs, such as artichokes, absinthe and lemon tea. In addition, and as mentioned in Section 2.0, Existing Conditions, the home garden has also traditionally been a space for cultivation of native plants, conserving local agrobiodiversity. In the Western Cuchumatanes and Western Volcanoes regions of the Western Highlands, primitive cultivars can still be found including wild relatives of maize, beans, avocado, chile, potato and tomato, and other native crops of regional or local use. This area has the greatest genetic diversity of major wild relatives of cultivated plants native to

³⁷ Asociación Chajulense, Chajul, Quiché; UPC Café Teresa con Espíritu de Mujer, La Democracia, Huehuetenango; Cooperativa Agroproductiva y de Servicios varios San Bartolo, R.L., Chiantla, Huehuetenango.

Guatemala. Project design of home garden interventions can strengthen the function of the home garden as a nutrition and food security intervention that also helps to conserve local agrobiodiversity.

Summary of Key Issues with Indirect Environmental Consequences

Issue 11: Differing and competing agricultural practices between RVCP participating members and non-members can indirectly limit the effectiveness, replication and sustainability of the agricultural and environmental best management practices and technologies promoted by the project.

The most mentioned concern with the Proposed Action by stakeholders during the Scoping was the different, and sometimes competing, practices between association members (participants in the project) and non-members and the capacity of members to meet certification and environmental standards because of it. Differences include pesticide use and practices (especially between organic producers and non-organic neighbors), members implementing practices to control coffee rust next to non-members who do not, differing soil conservation methods between members and non-members which impact their downhill neighbor (e.g. via erosion), non-members contaminating rivers with coffee processing waste water, and solid waste management practices between the two groups. There are even issues with non-members stealing coffee seedlings. This issue is inextricably linked with the replication and institutionalization of project-promoted best practices and local environmental governance capacity; that of communities, municipalities or national institutions such as the National Ministry of Environment or the National Institute of Forests. The EA presents alternatives to RVCP community engagement and RVCP technology transfer and training strategies.

This issue was also brought up by ANACAFE and discussed at the USAID meeting on March 6, 2015. One alternative, expanding project activities to a larger set of beneficiaries was recognized as not financially feasible; however other alternatives to community engagement and outreach strategies are presented.

ISSUE 12 - LAND USE MONITORING: PROJECT BASELINE DATA (THAT OF THE RVCP OR MEP) WAS NOT DESIGNED TO COLLECT, MAP OR MONITOR LAND USE INFORMATION OF PARTICIPATING FARMS IN A WAY THAT FACILITATES THE MONITORING OF LAND USE CHANGE.

Although the EA team did not directly observe evidence of the conversion of forest to RVCP activities (as further described in Section 5.3), there also does not exist systematic baseline data and monitoring procedures of project actions in farms. Some RVCP producer groups maintain records (such as farmer name, size of plot, crops, yield/harvest, and production techniques used); however, this information is not standardized and collected across the project. The exact locations and extension of land area under RVCP coffee, horticulture, cardamom, coffee or other crops, including fallow land into which future agricultural production may occur, or areas under irrigation, needs to be collected in a standardized way by the project to facilitate monitoring of sustainable land use³⁸ Mapping of participating farmer land use was not considered necessary to the project baseline, either, and farm

³⁸ In the approved Scoping Statement (LAC-SS-15-03), the USAID BEO identifies the contribution land use information makes to “monitoring potential environmental impacts and implementation of mitigation measures” as well as performance monitoring and reporting of RVCP results (p.1). The BEO condition states, “Therefore, the Environmental Assessment (EA) should explicitly include in one of its alternatives the mapping of farmer landholdings and land use as well as monitoring of land use change in the project area.” (p. 2)

planning is not systematically carried out. The project may have limited control over many of the factors that go into land use decision-making, however, the EA recommends standardized land use data collection and monitoring that can be taken within the timeframe of the project to better inform and monitor production objectives and the sustainability of the project.

ISSUE 13 - TECHNICAL ASSISTANCE AND TRAINING IS NOT HAVING THE EXPECTED RESULTS (FULLY ADDRESSING ENVIRONMENTAL MANAGEMENT NEEDS) AND MAY BE LIMITED BY LANGUAGE AND LITERACY BARRIERS.

The variability in the application of environmental management best practices observed during the July 2014 Audit could be attributed to time (the associations were recently organized and are in the process of adapting to new agricultural practices) and in other cases, to training. “(The) implementing partners need to provide further training and support to their respective field technicians and extension agents to include more training on water, pesticide, and waste management.” (Cadmus 2014 p. iv). Also, technical assistance materials are in Spanish, however, as noted in the consultation with the Cooperative Integral Agrícola Nuevo Porvenir, the beneficiaries speak Mam. The majority of RVCP beneficiaries are indigenous, and “these communities are characterized by high rates of poverty, discrimination, malnutrition, infant mortality and low education levels...In many communities, the potential for knowledge sharing is constrained by language barriers, low education levels and the lack of economic resources to implement best practices and lessons learned” (Cadmus, 2014, p. 3).

While models and best practices were evident at certain sites (e.g. Pesticide Brigades, CERCAFES, pesticide container collection sites and the correct design of biobeds), the EA team observed they could be better shared and taught across implementing partners, associations and farmers to facilitate learning and more uniform application of best practices.

ISSUE 14 - SUSTAINABILITY OF ENVIRONMENTAL BEST MANAGEMENT PRACTICES - ECONOMIC AND SOCIO-CULTURAL FACTORS: 1) WILL ASSOCIATIONS BE PROFITABLE ENOUGH TO AFFORD AND ENCOURAGE THEIR MEMBERS (PRODUCERS) TO ADOPT PRACTICES SUCH AS THE MACRO TUNNELS, LATRINES AND HAND WASHING STATIONS, OR METAL FENCING? (THE JULY 2014 AUDIT POINTS TO EXISTING CHALLENGES WITH INVESTING IN EQUIPMENT SUCH AS THE PERSONAL PROTECTIVE EQUIPMENT USED DURING PESTICIDE SPRAYING) AND 2) LIMITED YOUTH INVOLVEMENT IN ACTIVITIES AND DECISION-MAKING, EXPERIENCED DURING SCOPING, INCLUDING THAT OF YOUNG WOMEN, CAN LIMIT THE CAPACITY OF NEW GENERATIONS TO CARRY FORWARD BEST MANAGEMENT PRACTICES.

The capacity and willingness of producers to maintain environmental management best practices beyond the life of the project is of particular concern, especially when they have not achieved an economic return on their products that supports their continued application³⁹. (Certification will help to continue maintain best agricultural practices and the project is promoting certification as a way to maintain market access. Which may come with certification.) Also, the participation of younger men and women in associations, influences the sustained application of best management practices. Older male adults dominated the association leadership with whom the Scoping Team met. (See Annex D). While ages were not systematically asked for during Scoping meetings, there was a marked difference between the majority of the associations that were met with and that of Nueva Mision Santa Clara. The Nueva Mision Santa Clara executive committee was made up of men around 30 years old or younger.

³⁹ This concern stems from interacting factors that contribute to the irregular quality of export products driving down prices.

(Ages were asked for.) When asked why, they said it was a conscious decision of their membership to invite youth into the organization and appoint their younger members into these leadership positions. (Young women were not yet represented on the executive committee.) They also explained that youth migration out of their community was not as high as in other parts of the Western Highlands, therefore there are more youth available and interested in agricultural production activities.

5.3 ISSUES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

Issue: Conversion of forest to RVCP-supported horticulture, fruit orchard, coffee or cardamom production.

The EA team did not directly observe evidence of forest reduction from land use change from RVCP activities (such as deforestation or conversion of forest to agro-forestry or agriculture by RVCP participants). Also, the project is carrying out agricultural production related activities in parcels already under agricultural use, in some cases those that were lying fallow or fitting horticultural production into the agricultural calendar of a productive unit, such as after corn and beans have been harvested. The absence of observed land use change is evidence of the project's approach of improving and intensifying production in parcels already under agricultural use. (Please see textbox for more information on APRODEFI and Finca Xix, a site of potential land use change identified in the July 2014 Audit.)

Issue: Greenhouse Gas Emissions - coffee waste (honey water) decomposition and transportation of products from farm to market have the potential to emit greenhouse gases, specifically methane gas emissions from decomposing coffee waste.

On September 8, 2015 the USAID's Low Emission Development Strategy (LEDS) Project in Guatemala signed a letter of collaboration with the National Coffee Association (ANACAFE) to establish a coordinated mechanism for promoting actions and technologies to reduce greenhouse gases (GHG) emissions and strengthen environmental management practices in the Guatemalan coffee sector.

LAND USE AND FINCA XIX

On May 18-19, 2015, the Environmental Assessment team visited the farm Finca Xix, which is land being managed by the RVCP-participating association APRODEFI (Asociación Pro Desarrollo de la Familia Ixil) in Nebaj, Quiché. The RVCP is working with APRODEFI at Finca Xix in horticulture and the USAID-funded CNCG is supporting coffee agroforestry systems and climate change adaptation activities.

The farm was identified in the July 2014 Audit as an area of potential land use change. Finca Xix is a unique example, within the RVCP Project, of one contiguous unit of forest and agricultural land (43 ha) that was purchased by APRODEFI (in 2010) with three objectives in mind: education, food security and production, and economic development. A land use plan was developed for the farm that includes areas designated for staple crops, livestock, horticulture, coffee, forestry, forest conservation, reforestation, and a plant nursery. To help pay the loan, APRODEFI applied to the Guatemalan Forest Authority (INAB) to receive approval to harvest timber on the farm. APRODEFI's forest management plan, which includes three cycles of harvesting, was approved in 2013. Other than these INAB-approved clear-cuts, which are being reforested, the EA team did not see any other evidence of land use change on the farm. Instead, abandoned fields (that had been deforested and placed into agricultural by previous owners) are

Under this framework agreement, the Project will provide technical assistance to develop ANACAFE's environmental management policy with the following priority topics: climate change adaptation, improvement in coffee production through vulnerability reduction, climate change mitigation and emissions reductions, and biological diversity (ecosystem goods and services). This joint initiative will allow ANACAFE to identify mitigation actions focused on environmental sustainability and economic development in the coffee sector, with the potential to promote adoption of climate change mitigation actions and practices among its 120,000 smallholder farmers.

Issue: Land tenure of RVCP participants can influence their capacity to invest in best management practices and land management long term.

While land tenure is an important external factor that can influence the sustainability of RVCP agricultural production practices, it is also a highly complex issue in Guatemala with overlapping land rights claims and histories. Although some people expressed concern with the land tenure issue, the EA team concurred that addressing land tenure issues of farmers is outside the scope of the project. The project objectives do not focus on governance type actions but instead are focused on food security and income generation working within the existing land tenure situation.

5.4 ENVIRONMENTAL ASSESSMENT METHODOLOGY

Following scoping, the Environmental Assessment carried out further research, consultations and site visits to: 1) discuss the significant issues with the Proposed Action identified during Scoping, 2) develop reasonable alternatives, 3) assess direct, indirect and cumulative impacts on the environment by the alternatives, including the no action, the Proposed Action and a third alternative set of actions, and 4) identify associated mitigation measures. The full methodology and estimated timing of the Environmental Assessment is presented in the June 10, 2015-approved Scoping Statement (LAC-SS-15-03).

These activities were carried out in close coordination with RVCP implementing partners AGEXPORT and ANACAFE. Two weeks of site visits, formal and informal meetings (May 12 – 20 and June 1 – 5) were carried out with AGEXPORT and ANACAFE staff. Two meetings were also carried out with AGEXPORT, ANACAFE, USAID/Guatemala mission RVCP AOR, Glenda de Paiz, MEO Regina Soto and acting MEO, Teresa Robles. The drafting of this document also included five instances of document review, including conference calls and in-person meetings with the implementing partners and USAID, to finalize the alternatives that are described in the next section and project mitigation measures.

6 DESCRIPTION OF ALTERNATIVES

6.1 ALTERNATIVES CONSIDERED BUT DISMISSED AND ALTERNATIVES CARRIED FORWARD

During the scoping process, stakeholders and the Environmental Assessment team identified various the alternatives that could address the issues identified and improve existing conditions. The following

identified alternative actions were eliminated from further consideration for reasons of timing, cost and meeting project purpose and need.

- **Identification of a local thread dying company interested in building their capacity to provide toxic-free thread and improve the management of their resulting liquid wastes.** *It was determined that the costs of water treatment were cost-prohibitive and the construction of water treatment plants is outside the scope of the project.* Instead, the project will continue to seek out companies that produce non-toxic threads, in addition to Río Blanco, the current source.
- **Planting only native species in coffee agroforestry systems.** (Only native species will be planted in cardamom agroforestry systems.) *This alternative was revised for coffee systems because the non-native species *Grevillea Robusta* (*Gravilea*) provides benefits that are not found in native species.*⁴⁰ Instead, the project will increase the diversity of native plants in agroforestry systems⁴¹ by incorporating those that have already been identified, and fruit trees, and planting *Gravilea* in agro-climatically appropriate areas.
- **Demonstration of “New Microbeneficios Technology”.** New coffee processing technology from Costa Rica and Colombia that more efficiently uses water was considered to be installed at selected demonstration sites. “Micro Coffee Mills”, a Colombian technology, has different characteristics according to each manufacturer; however, in general the micro mills are built to process 450 kg to 2,500 kg/hour of green coffee and require electric or gasoline generated power. It consists of a de-pulping machine without water, a de-mucilaginator of a vertical wash that leaves the grain ready for drying. They are usually built in a structure of 5 – 10 m² to keep all the parts together. They use 100 liters of water for each 500 Kg of green coffee. The pulp and honey waters decompose faster since they have less water content. *The present cost is around US\$20,000 so it is currently unaffordable to RVCP producers; however, ANACAFE is trying to find a local Guatemalan company to build one at a more affordable price.*
- **Demonstrate Bio-digesters at sites where the conditions for their use can be found.** Bio- digesters are an alternative way to treat the liquid waste generated from the wet coffee process, as well as a way to contain and use the methane gas generated from

⁴⁰ *Gravilea* maintains leaf cover during the dry months whereas the majority of the multi-use native, nitrogen-fixing species, in the Western Highlands such as *Leucaena leucocephala* (*Leucaena*), *Gliricidia sepium* (*madre cacao*) y *Calliandra calothyrsus* (*calliandra*), *Alnus arguta* (*Aliso*), *Inga spuria* (*Chalum*), *Erythrina* sp. (*Palo de pito*), *Baccharis vaccinioides* (*Arrayán*) are deciduous and lose their leaves during the dry season. (Arias, 1994). For this reason, *Gravilea* has been a well accepted introduced tree into the Guatemala shade grown systems. The EA recommends the increased diversification of the agroforestry systems with native species, and with fruit trees in order to improve household diet and income. (Such as, *Musa paraisiaca* (*banana*), *Mangifera indica* (*mango*), *Citrus cinensis* (*naranja*), *Byrsonima crassifolia* (*nance*) y *Persea americana* (*aguacate*).

⁴¹ While shade grown coffee agroforestry systems are necessarily designed per site-based characteristics (aspect, soils, climate, etc.) here are some common standards AGEXPORT (2014b) recommends shade grown coffee systems have a minimum of 10 species of trees and a minimum density of 70 trees per hectare. July 2014 Rainforest Alliance standards (12 native species per hectare including fruit trees, at least 40% shade and at least two canopy strata) and in Bird Friendly standards which include 40% shade cover, a diversity of at least 10 woody species, and three stratum of structural diversity. http://nationalzoo.si.edu/scbi/migratorybirds/coffee/quick_reference_guide.cfm

decomposing coffee and livestock wastes. Bio-digesters also provide an alternative source of cooking fuel to firewood. (See textbox.)

However, at this time, many RVCP producers do not have sufficient number of livestock (3-4 cows) to maintain a bio-digester. (Less than 3% of the members of the San José Obrero Cooperative have sufficient livestock to maintain a bio-digester operational year-round.) Producers also have limited knowledge of how to raise healthy livestock in semi-stabled conditions. Bio-digesters would need to be demonstrated at more consolidated coffee processing sites (versus on individual's farms); and at sites with the right conditions for their use. Conditions include:

- Adequate quantities of manure or number of stabled livestock (e.g. production of manure equivalent to at least three healthy cows, depending on the size of the biodigester.)
- Appropriate livestock management practices, such as semi-stabled cows (or other livestock enclosures).
 - Planting and harvest of forage for livestock feed (at least two forage types and the equivalent of at least 1.5 ha of forage).
 - At sites where the soils are already adequately fertile and the incorporation of coffee pulp and cow dung is not a better option.
 - A flat and safe location is available, and
 - A maintenance plan can be implemented.

Bio-digester Example

The Escalante family of the San José Obrero Cooperative in La Libertad, Huehuetenango established a bio-digester and feeds it “honey water” and pulp during the coffee harvest season – from late October to early March. The rest of the year, the family maintains the bio-digester operational with the waste generated from their two dairy cows. The cows are fed with banana mucilage, and are relatively unhealthy. (The farm has limited pasture since the Escalantes do not want to change coffee fields to grazing.) The bio-digester cost

\$3,000 and was installed by ACERE Consultants of Costa Rica. Mrs. Escalante is very happy with the gas the bio-digester produces because it doesn't smoke like firewood does, which she inhales from her firewood fueled stove. The family has also

Encourage Participation of Master Farmers and Producer Groups in COCODE (Community Development Advisory Councils) COCODEs are local development committees with the objective of providing a political space to community members to promote and participate in community development and decision-making. In some communities, COCODEs are very active and meet three to four times per year, as councils and in assemblies. The EA team considered the COCODE as an opportunity for sharing project and producer objectives, issues and best practices, as well as to advocate for production-related needs at a local level. However, it appears that not all COCODEs are of equal value and can be highly politicized and problematic as an alternative to address some of the communication issues that can contribute to differing and competing practices between members and non-members. (Issue 11.)

At the start of the RVCP, ANACAFE had designed a strategy to link producer groups to COCODEs, in order to increase their effect on decisions having to do with local development. However, during implementation of this strategy it became apparent that in actuality, the majority of COCODEs have become managers of physical infrastructure works, such as roads, multiple use rooms, schools and water. They do not address a wider range of topics related to economic development in their communities. This concentration in infrastructure construction has also facilitated the interference into COCODEs by government functionaries (departmental and municipal) and politicians who are looking to politicize the

COCODE with objectives other than community development. *Project intervention in COCODEs is a governance-related activity that at this time is not within the capacity of the implementing partners to carry out.*

Section 6.2 presents the actions of the three principle alternatives considered:

- A. No Action: No investment made by USAID into achieving the RVCP objectives in the target value chains.
- B. Proposed Actions: RVCP as described in Section 4.
- C. Alternative C Actions.

The actions presented in Alternative C are those that can respond to the issues with the Proposed Action as described in Section 5 in the project period. They bring to bear technologies, strategies and practices that strengthen environmental sustainability of RVCP farms, protecting or improving soil, water and forest conditions. Alternative C incorporates activities that address the key issues not adequately addressed by the Proposed Action. (A comparison of the actions of the three alternatives can be found in Annex E.)

6.2 NO ACTION

The No Action alternative is an absence in USAID-funded assistance to interventions that fulfill the purpose of the RVCP, “to increase sustainable market-led growth in rural areas as a means of sustainably reducing rural poverty and chronic malnutrition” (USAID 2012b). The No Action alternative will not continue to invest USAID funds into activities that expand markets and trade, nor increase food crop productivity in the highly malnourished municipalities of the five departments of the Western Highlands. It also will not make any additional investment in technical assistance, training, equipment or other activities to 1) improve value chain competitiveness, 2) expand value chain participation, or 3) improve agricultural productivity of RVCP- served producers.

However, the No Action assumes the continuation of coffee, horticulture, fruit, cardamom and handicraft production by producers in the five departments. Also, RVCP implementing partners, AGEXPORT and ANACAFE and their consortium partners, will continue to provide technical assistance and training to coffee, horticulture and handicraft groups; however, at a much more limited scale. One significant difference between the No Action and Proposed Action is the availability of technical assistance and training to farmers. As noted in the final evaluation of the USAID-funded *Empresas Caficultoras Competitivas*, the project permitted ANACAFE to expand their on-going technical assistance and training to small producers who had not been able to take advantage of ANACAFE’s support beforehand (USAID/Guatemala 2012.) Without project assistance, the No Action alternative fields the following numbers of technicians by RVCP implementing partner:

Table 14: No Action Extension System

RVCP Extensionists	Coffee (ANACAFE, FEDCOCAGUA)	Horticulture (AGEXPORT)	Handicrafts (ARTEXCO, COMART)	SAN (FUNCAFE, INCAP)

Technicians	16 (ANA y FEDECOCAGUA) 3 coffee technicians paid by producer organizations	0 (FEDECOAG) 1 per 6-8 organizations (AGEXPORT)	0 (ARTEXCO) 3 (COMART)	0
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Technicians will be working without the assistance of para-technicians and master farms would be those limited to the MAGA CADER program (further described below.) The predicted effects of limited No Action technical assistance, per value chain, are described next.

Additionally, the number of producer groups certified as a result of the two previous USAID-funded projects, *Empresas Caficultoras Competitivas* and *Acceso a Mercados Dinámicos para Pequeñas y Medianas Empresas Rurales*, is used as the baseline of No Action producers implementing the best practices promoted by these two implementing partners.

The No Action alternative also takes into account on-going Guatemalan and other bilaterally-funded initiatives, such as Guatemala's Ministry of Agriculture food security Rural Development Learning Centers (CADER) which are further described below in the Food Security and Nutrition activities, and the results of CAMBio, a GEF/UNDP/CBEI-funded cardamom and biodiversity project carried out in the *Zona Reina*.

The following identifies No Action interventions and practices per value chain.

Coffee Value Chain (31 certified producer groups, estimated 6,130.30 ha)

Because of its importance to the national economy, coffee production will continue to take place in Quetzaltenango, Quiché, Huehuetenango and San Marcos. ANACAFE has been working with coffee producers to improve production and commercialization since its founding in 1960.

Training and technical assistance delivered to this reduced audience is expected to be limited to production topics, especially as they are related to the control of coffee rust. Practices or technologies that do not require further investment on the part of ANACAFE or the small coffee farmers are expected to be implemented, such as:

- **Technical assistance and training in production issues** for organic, conventional and mixed coffee crops to increase performance and yields. Production topics include organic and conventional production and pest and disease management including new, more efficient and more environmentally friendly organic pesticides for coffee plantations.
- **Technical assistance to promote improved technologies and practices.** Practices that help farmers protect and improve their soils on steep hillsides such as contour planting, individual terracing and application of compost and fertilization planning would reach a limited number of small producers.
- **Promotion of practices to mitigate effects of and adaptation to climate change** will be contained to soil conservation and shade management practices.

- **Identification of native and non-native shade species for coffee crops.** Shade management practices have a long history in Guatemala and would continue. Twenty-five years ago, farmers began incorporating Gravilea and Inga into coffee plantations and they have generally been accepted as the most beneficial trees to associate with coffee for their nitrogen fixing properties, windbreaks and during the dry season some of them do not drop their leaves. Under the No Action alternative, coffee farms will continue to incorporate these trees into their systems. Identification and incorporation of native species may not be implemented or promoted as much as in the Proposed Action.
- **Support quality certifications where the market requires them.** Under the No Action alternative, 31 coffee associations that are certified by national or international certification bodies are applying the environmental and social practices that meet the standards required by these markets (see Table 16), such as organic and fair trade production. While certification is not a guarantee, best practices are expected to continue into the future. Table 15 presents the number of certified coffee by department as a result of the USAID-funded predecessor of the RVCP, *Empresas Caficulturas Competitivas*.

Table 15: No Action certified coffee by department

Department	Certified Coffee Organizations (#) <i>Organic (USDA), Rainforest Alliance, C.A.F.E (Starbucks), Fair Trade, Utz</i>	Area Certified Coffee (Ha)
Huehuetenango	12	3,178.3
San Marcos	13	987.00
Quetzaltenango	1 Organic and fair trade	204.00
Quiché	6 Organic of which 3 are free trade	1,761.00
Totonicapán	0	0
Total	31	6,130.30

Table 16: Certifications and standards for coffee value chain

Value chain	Environmental standards	What for?
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Value chain	Environmental standards	What for?
Coffee	Rainforest Alliance: Norms for group certification. March 2011 (<i>version 2</i>) http://www.san.ag/biblioteca/docs/SAN-S-3-1S_Norma_para_Certificaci%C3%B3n_de_Grupos.pdf	It considers the economic, social and environmental aspects (Source: http://www.san.ag/biblioteca/docs/SAN-S-3-1S_Norma_para_Certificaci%C3%B3n_de_Grupos.pdf)
	C.A.F.E practices Starbucks http://www.scsglobalservices.com/starbucks-cafe-practices Standards: http://www.scscertified.com/retail/docs/CAFE_GUI_EvaluationGuidelines_V2.0_093009.pdf	It evaluates the economic, social and environmental aspects of coffee production which are measured against a defined set of criteria detailed in the C.A.F.E. Practices Generic and Smallholder Scorecards (source: http://www.scsglobalservices.com/starbucks-cafe-practices)
	UTZ certified Standards: http://www.scsglobalservices.com/utz-certified	Water, waste, soil fertility, and environmental management, no deforestation of primary forests, IPM, diversification of production, to support ecological diversity and economic resilience, respect labor, and safe and healthy working conditions (source: http://www.scsglobalservices.com/utz-certified)
	Fair Trade Certification General criteria for fair trade, 2011 version. http://www.fairtrade.net/fileadmin/user_upload/content/2011-12-29_SPO_SP.pdf http://www.fairtrade.net/small-producer-standards.html	Trade, best agricultural practices, such as environmental protection, labor conditions, business and development (source: http://www.fairtrade.net/fileadmin/user_upload/content/2011-12-29_SPO_SP.pdf)
	MayaCert – Organic standards: USDA Organic Standards 7 CFR 205, December 2013. http://www.mayacert.com/docs/usda/norma.pdf Ecological Standards: <u>MayaCert</u> - Norma de Producción Ecológica MayaCert, version 4, September 2014 http://www.mayacert.com/docs/otros/normaECO.pdf	Mainly environmental and production management.

With limited to no access to credit, and very limited technical assistance and training available via ANACAFE and FEDECOCAGUA, analysis might take place on a few farms; however, it is expected that plantations will not be renewed.

- **Analysis of the effect of coffee rust in coffee cultivation and management for small farmers.**

When following the national strategy to control rust, farmers will:

- Replace coffee plants with younger, healthier and more fungus-resistant varieties (e.g. CR95, Sarchimor, Lempira and Parainema), and protect them as they grow.

- Use systemic pesticides combined with agronomic practices such as shade management, fertilizer management, and weed free plantations (AGEXPORT 2014a, p. 25-26.)
- **No renewal of plantations:** No improvement and recovery of degraded and eroded soil areas through: a) establishment of new coffee plantations and shade species, b) soil improvement and fertilization plans, c) establishment of coffee rust and other disease resistant coffee seedlings, d) nursery establishment with irrigation and management systems, and e) establishment of agroforestry systems.

The following activities would also most likely not continue under the No Action alternative because they require significant additional investment by producers.

- **Post-harvest management and processing of coffee with improved technologies (they would continue with inefficient and old technologies).** The No Action would not provide financing for the acquisition of new technologies such as new and remodeled wet milling technology, as well as new and remodeled artisanal processing, improved drying technologies, treatment of coffee waste water, and training in occupational health and safety measures.
- **Purchase, training in using and maintenance of motorized sprayers** with a two-stroke engine, and handling and storing petroleum products (oil, fuels, etc.)
- **Implementation of USAID-approved mitigation and monitoring measures:** practices such as the separation of solids from and chemical treatment of coffee waste/honey water (*aguas mieles*) and safety equipment and training in pesticide use.

Horticulture and Fruit Orchards Value Chains (producers in six RVCP target municipalities; three certified producer groups; 38 certified ha)

ANACAFE will not continue to support horticulture organizations in San Marcos and Huehuetenango, and AGEXPORT technical assistance and training will be limited geographically. No Action interventions in horticulture will be focused on:

- 1) Horticulture producer groups/associations in six (of the 12 RVCP) municipalities, selected for their capacity to meet export company criteria.
- 2) Producer groups will not be selected based on poverty, food security or nutrition characteristics, thus not meeting project purpose and need.
- 3) One AGEXPORT technician will work with six - eight producer groups. (There is one technician for each group in the Proposed Action.) Local para-technicians will not be hired.

The following activities are expected to continue within this limited geography:

Technical assistance to improve agricultural production: No Action technical assistance will provide guidance in fertilization planning and soil conservation techniques (e.g. composting, mulching, live and dead barriers, contour planting, composting) as well as those that will fulfill export standards, such as of Global Gap. Bio-beds and hand-washing stations will also be constructed to help producers meet export market standards. Existing less efficient irrigation technologies, such as sprinkler systems, will continue to be used.

Enhancement of production systems under controlled conditions: Less than half of the target producers will adopt production practices under controlled conditions such as macro-tunnels or greenhouses.

Support quality certifications where the market requires them: Three No Action organizations were certified with the support of the USAID-funded RVCP predecessor, *Acceso a Mercados Dinámicos para Pequeñas y Medianas Empresas Rurales*. While certification does not guarantee a continuation into the future of environmental and occupation health and safety best practices, AGEXPORT's model of connecting buyers and producers especially when certified, helps sustain them. One example is of the Tesco certification (see Table 18), standards specifically required by Tesco grocery stores in the United Kingdom.

Table 17: No Action certified horticulture by department

Department	Certified Horticulture Organizations (#) <i>Global Gap, Tesco</i>	Area Certified Horticulture (Ha)
Huehuetenango	0	0
San Marcos	0	0
Quetzaltenango		
Quiché	3	38
Totonicapán	0	0
Total	3	38

Table 18: Certifications and standards for horticulture and fruit orchards value chains

Value chain	Environmental standards	What for?
Horticulture	GlobalG.A.P http://www.globalgap.org/uk_en/what-we-do/globalg.a.p.-certification/globalg.a.p./ Standards: <a fruit-fl\"+or+\"fv\")&fq='con_locales:(\"en\")&fq=gg.document.type:(\"rules\")"' href="http://www.globalgap.org/uk_en/documents/?fq=g.g.standard.lg:(\">http://www.globalgap.org/uk_en/documents/?fq=g.g.standard.lg:(\"fruit-fl\"+OR+\"fv\")&fq=con_locales:(\"en\")&fq=gg.document.type:(\"rules\")	<i>“It covers all stages of production, from pre-harvest activities such as soil management and plant protection product application to post-harvest produce handling, packing and storing”.</i> source: http://www.globalgap.org/uk_en/for-producers/crops/FV/
	Tesco http://www.scsglobalservices.com/tesco-nurture	Food safety, environmental and labor standards for all fresh fruits and vegetables required by Tesco stores of the United Kingdom.

Fruits and Fruit orchards	GlobalG.A.P http://www.globalgap.org/uk_en/what-we-do/globalg.a.p.-certification/globalg.a.p./	<i>“It covers all stages of production, from pre-harvest activities such as soil management and plant protection product application to post-harvest produce handling, packing and storing”.</i> source:
	Tesco http://www.scsglobalservices.com/tesco-nurture	Food safety, environmental and labor standards for all fresh fruits and vegetables required by Tesco stores of the United Kingdom.

Improvement in post-harvest management and processing: Under the exporter-led model of the No Action alternative implemented by AGEXPORT, less than half of the target horticulture producers will attain 1) the capacity to guarantee high levels of quality products to meet buyer requirements, and 2) practices such as packaging their products in re-used plastic boxes to avoid damage during shipment.

Promotion of practices to mitigate effects of and adaptation to climate change: Climate change adaptation practices will be limited to soil conservation measures and adoption of production under controlled conditions. Few, if any, producers will have the capacity to invest in more efficient irrigation schemes continuing to use old technologies such as sprinklers.

The No Action will not carry out the following activities:

Implement USAID-approved mitigation and monitoring measures, and existing PERSUAPs: Pesticide selection and application will be based principally on the advice farmers receive from the local vendor, as well as guided by Global Gap criteria for certified producers.

Diversification and introduction of new export crops, and market alliances: Cardamom and fruit orchards will not receive technical assistance or training from AGEXPORT. Cardamom production will continue as identified next. Production of apples, peaches and pears in orchards will continue without the application of best agricultural practices such as soil conservation and management, pesticide safe use and management, fertilization, and post-harvesting practices.

Cardamom Value Chain

Under the No Action alternative, the five RVCP associations that are already producing cardamom are expected to continue with their traditional production schemes. AGEXPORT will not continue to carry out activities in the Cardamom value chain; however, Zona Reina producers may receive (limited) technical assistance from Guatemala’s Ministry of Agriculture extension agents or via other Guatemalan private institutions such as CARDEGUA, the Guatemalan Cardamom Association. Traditional production includes incorporation of native shade species into cardamom agroforestry systems and *de facto* organic production. (Pesticide-free, not certified.) However, the threat of infestation by Thrips (*Sciothrips cardamomi*) from neighboring Cobán is pressuring producers to adopt chemical methods to control it.

Technical assistance and training to improve cardamom production: Agronomic practices promoted by CARDEGUA or the Ministry of Agriculture, such as cardamom crop sanitation/pruning methods

organic pesticides and other integrated pest management practices may be practiced, along with the application of pesticides to cope with and contain eventual outbreaks of pests and diseases.

Firewood powered cardamom-drying technologies: Under the No Action alternative, 805 cardamom producers in the Zona Reina will continue to burn between 8.8 m³ and 13,514 m³ of firewood to dry one ton of cardamom. The only source of fuel for cardamom drying will continue to be firewood, which will be harvested and bought via legal and illegal means. Cardamom will continue to be dried using inefficient stoves and firewood needs will continue to be assessed and monitored empirically, resulting in its unsustainable consumption.

Incorporation of multi-use agroforestry species into cardamom plantations: In cardamom fields, multi-use agroforestry species are slowly being incorporated by cardamom farmers for shade, firewood, food and timber purposes, changing cardamom mono-cultures to agroforestry systems (CATIE, 2013.) As a result of the CAMbio green credit program, 130 hectares of cardamom changed from monoculture to agroforestry systems. Under the No Action alternative, producers will continue to plant species native to the Zona Reina in cardamom agroecosystems on a more limited basis (than the target 324 ha of the Proposed Action.) These native species include: 1) *Vismia* sp. 2) *Terminalia amazonia*, 3) *Swietenia* sp, 4) *Inga* sp., 5) *Terminalia chiriquensis*, 6) *Nectandra reticulata*, 7) *Gliricidia sepium*, 8) *Tabebuia donnell-smithii*, 9) *Virola* sp., 10) *Vochysia guatemalensis*, 11) *Dialium guianense*, and 12) *Pouteria sapota*.

The following activities will not be carried out:

Promotion of practices to mitigate effects of and adaptation to climate change: Due to the limited technical assistance in the *Zona Reina*, the 805 cardamom producers will not be introduced to climate change mitigation practices that will allow them to adapt themselves to climate variability.

Environmental review of activities, and development and implementation of Environmental Mitigation and Monitoring Plan (EMMP): The No Action alternative does not require an environmental review of cardamom growing activities, nor identify potential impacts and measures to mitigate environmental consequences of cardamom production in the *Zona Reina*.

Handicrafts Value Chain

No Action activities with handicraft producers will be limited to those that will meet the demand of exporters and organizations who can meet them with limited technical assistance. A maximum of three technicians of the COMART (Handicraft Commission) in AGEXPORT will be available to serve all of Guatemala's handicraft producers, helping targeted handicraft groups that are already formed to create products and designs for the export market and connecting with buyers. When that is achieved, COMART technical assistance moves on to other organizations per market demand. Therefore, the No Action alternative is expected to carry out the following activities:

- **Provide training and technical assistance to strengthen production of handicrafts:** training in design, image, web page, markets, and specific production lines such as the production of various items from palm trees.
- **Assess incorporation of new production techniques.**
- **Development of products according to customer needs, such as new designs.**
- **Opening of national and international markets and search for new markets.**

- **Environmental Mitigation:** one mitigation measure, the verification of non-toxic threads, is required by the export market.

While improved technologies or production practices might be required to meet the quality and product type required by the export market, the absence of credit under the No Action alternative, will make it difficult for handicraft organizations to adopt them. The following activities are not expected to be carried out in the No Action alternative:

- **Improved technologies or production practices:** It will be difficult for artisans to adopt technologies such backstrap looms and inputs and modern tailored looms, implementation of looms for bracelets, equipping workshops with treadle looms for weaving wool, carding machinery and machinery for thread spinning, and sewing machines.

Handicraft organizations are predominately made up of women artisans, therefore No Action activities are oriented to women. However, they do not explicitly carry out gender activities such as:

- **Gender:** women's empowerment in the value chains. Inclusion of women of all ages, particularly elderly and more knowledgeable, expert women in production of handicrafts.

Food Security and Nutrition

Food and nutrition activities are expected to be carried out via the Ministry of Agriculture CADER (Rural Development Learning Centers.) “CADERS are training centers comprised of organized community members that are coordinated by rural agricultural promoters. The rural agricultural promoter is a community member who has demonstrated leadership in guiding rural development, and serves as a liaison between the community and extension agents.” (USDA 2014). CADERS are generally made up of 25 families per rural agricultural promoter. Promoters are volunteers who “coordinate a demonstration field plot where technology transfer can be delivered within a participative and educational methodology.” (USDA 2014). CADERS demonstrate applicable and affordable technologies such as seed inputs, irrigation, adequate integrated pest management, and other practices to address food security both in terms of increasing agricultural productivity and producing a more diversified array of crops. The USDA/Counterpart International Project (2012 – 2015) is supporting the development of CADERS in 114 municipalities in the Departments of Quetzaltenango, Quiché, Totonicapán, San Marcos, and Huehuetenango.

Under the No Action alternative, RVCP producers will need to join or form a CADER to participate in the following activities:

Demonstration of home gardens: Establishment of raised fields for planting vegetables and soil conservation, increased soil fertility through application of organic fertilizers/composting; micro-drip irrigation systems of 50 m² or less.

Improved, fuel-efficient stoves built in schools and homes: Establishment of stoves and training for their use and maintenance.

The No Action will not **establish school gardens, alternative methods for purification of water for human consumption** nor will **USAID-approved mitigation measures be implemented.**

6.3 ALTERNATIVE B – PROPOSED ACTION

AS DESCRIBED IN SECTION 4.0

6.4 ALTERNATIVE C ACTIONS

Alternative C includes activities in the Proposed Action that fulfill the Purpose and Need of the project: “to increase sustainable market-led growth in rural areas as a means of sustainably reducing rural poverty and chronic malnutrition.” (USAID 2012b). Like the Proposed Action, Alternative C works with 222 coffee, vegetable, cardamom, fruits and handicraft organizations in 30 municipalities of the five departments of the Western Highlands to:

- Improve value chain competitiveness.
- Expand value chain participation.
- Improve agricultural productivity.
- Expand markets and trade (in Quiché, Quetzaltenango, and Totonicapán)
- Increase food crop productivity and improve utilization.
- Improve competitiveness of handicraft value chain.

However, Alternative C includes actions that respond to issues with the Proposed Action, described in Section 5, and improve on existing conditions to increase sustainability. Alternative Actions are described below.

Each alternative action is related to an issue, and in some cases, a connected Proposed Action. Alternative C actions that cut-across all the value chains are presented first, organized under the issue that they address. Then, specific alternative actions for coffee, cardamom, handicraft, horticulture and fruit orchard production, and food security and nutrition activities are presented, also by issue.

Cross-cutting Alternative Actions: Coffee, Cardamom, Horticulture and Fruit Orchards, Handicrafts and Food Security and Nutrition (Component 5)

The following alternative actions address issues that cut across the RVCP agricultural value chains by introducing or improving existing training, technology transfer and learning methodologies and land use monitoring. Also, actions are identified to improve occupational health and safety and solid waste management in the value chains.

ISSUE 13 - TECHNICAL ASSISTANCE AND TRAINING IS NOT HAVING THE EXPECTED RESULTS (FULLY ADDRESSING ENVIRONMENTAL MANAGEMENT NEEDS) AND MAY BE LIMITED BY LANGUAGE AND LITERACY BARRIERS.

Alternative Action: Exchange of Experiences/Field Trips with Master Farmers, Producer Groups, Para-technicians and Project Technicians

Alternative C facilitates the exchange of experiences, successful models and best practices between producers served by the two implementing partner consortiums, as well as between their technicians, para-technicians, and Master Farmers. Alternative C includes workshops, field trips/exchanges or co- implementation of field activities that will “cross-fertilize” experiences and knowledge across geographies, farmers and technical staff of the implementing partners in order to improve the capacity, knowledge of each to implement and best practices. It also encourages greater experience sharing with other projects in the region, such as the CNCG. Alternative C ensures best practices are more widely communicated, learned and adopted across the RVCP value chains and regions, contributing to their more uniform and standardized application.

Master Farmers are also supported to attend trainings at demonstration and training centers, participate in experience exchanges and field trips to cross-fertilize learning and practice, and to build their capacity to share their experiences to groups of interested farmers. Like MAGA’s CADER program, RVCP master farmers can host trainings with neighboring farmers (members of the RVCP producer group or not) and share their knowledge and practice. These exchanges of experience are also recommended when RVCP master farmers overlap with other master farmer programs, such as the Ministry of Agriculture’s CADER. Also, Alternative C creates opportunities for Master Farmers to learn from other model programs in Guatemala or even neighboring countries, such as USAID/Honduras’s FTF ACCESO and those of Zamorano.

Various models and best practices have been identified within the RVCP. *Pesticide Brigades*, as practiced by some FEDECOCAGUA cooperatives, are an example of one way to producer organizations and encourage the correct and safe application of pesticides. The *Rural Coffee Centers* (implemented by ANACAFE) is one emerging model of the Master Farmer program that can be adapted to all of the agricultural value chains. *Community Demonstration Centers for Food Security and Climate Change Adaptation* (implemented by AGEXPORT and TNC) may also serve as demonstration and training sites of best practices and technologies for Master Farmers in coffee and horticulture production, food security and climate change adaptation practices. The *Mesa de Concertación de Café* in Ixil is a model for organizing producers in a region to address important production-related issues.

Alternative Action: Publish extension materials in pictographs to reach illiterate producers.

ISSUE 11 - DIFFERING AND COMPETING AGRICULTURAL PRACTICES BETWEEN RVCP PARTICIPATING MEMBERS AND NON-MEMBERS CAN INDIRECTLY LIMIT THE EFFECTIVENESS, REPLICATION AND SUSTAINABILITY OF THE AGRICULTURAL AND ENVIRONMENTAL BEST MANAGEMENT PRACTICES AND TECHNOLOGIES PROMOTED BY THE PROJECT.

Exchange of Experiences/Field Trips with Producers and Project Technicians: to learn successful approaches to address issues among producers in a particular geographic area such as exemplified by the *Mesa de Concertación de Café* in Ixil.

ISSUE 9 - INADEQUATE OCCUPATIONAL HEALTH AND SAFETY CONDITIONS IMPACT AIR QUALITY IN THE WORK ENVIRONMENT, DAMAGE INFRASTRUCTURE AND CAN POLLUTE LOCAL SOILS AND WATER.

Connected Proposed Actions: Improvement in post-harvest management and processing in coffee, cardamom and horticulture, improved technologies and production practices in handicrafts and training in occupational health and safety measures.

Alternative Action: Promote a culture of occupational health and safety Alternative C promotes the development of an institutional culture of *occupational health and safety in handicraft, coffee, cardamom, vegetable and fruit processing enterprises* along the value chain, helping to protect human health and enterprise assets. This alternative entails two principle activities:

1. **Develop organizational capacity to establish, supervise and monitor the implementation of occupational health and safety as needed.** In processing centers of three or more workers, Alternative C develops occupational health and safety plans (scaled to the size and production of the SME). Workers are trained to support plan implementation by running simulations, conducting mock emergencies, and providing regular internal training in practices that will promote a culture of occupational health and safety incentive plans (even just recognition) could be implemented, such as recognition of “safe producer of the month” to those correctly using Personal Protection Equipment, or for the number of days without incidents in processing facilities. They should also include the use of signage of evacuation routes, the location and contact information for hospitals and/or health centers, police and fire stations, or other risk management organizations/resources in the community/municipality.
2. **Create alliances with local public and private organizations dedicated to occupational health and safety, emergency response and related practices.** RVCP will also help associations to establish relationships with local public and private organizations that can reinforce a culture of occupational health and safety. Alliances with the national training organization, INTECAP, the Red Cross, and Guatemala’s Social Security Institute (IGSS) can be developed to provide training on these issues, and especially when there is limited support from other organizations such as universities, certification organizations or exporters. Alliances with municipal fire departments or health centers should also be developed to provide training to designated workers in first aid and other emergency response skills.

ISSUE 7 - LITTER AND SOLID WASTE MANAGEMENT: IMPROPER SOLID WASTE MANAGEMENT IN AGRICULTURAL PRODUCTION AND PROCESSING, HANDICRAFT PRODUCTION AND IN PLANT NURSERIES CAN CONTRIBUTE TO THE COMMUNITY-WIDE PROBLEM WITH INORGANIC LITTER AND WASTE, A PROBLEM EXPERIENCED THROUGHOUT GUATEMALA.

Alternative Action: Training in Solid Waste Management: Horticulture, fruit, coffee, cardamom and handicraft technicians, para-technicians and organizations will be trained to identify and employ solid waste management practices that help to manage the inorganic waste generated by their activities, such as disposal of plastics from macro-tunnels, pesticide containers, or plastic bags in nurseries. Practices include but are not limited to coordination of agro-plastic collection services, as exemplified by the Agrequima program CampoLimpio⁴², the re-utilization of remnants of cloth and thread in handicraft workshops, or the correct burial of inorganic waste in pits on farms.

⁴² Agrequima is a guild of associated agrochemical companies (multi-nationals and manufacturers, formulators and distributors) with the mission of being a model in the industry of crop nutrition and protection that promotes innovative, sustainable and environmentally-responsible agriculture,

ISSUE 12 - LAND USE MONITORING: PROJECT BASELINE DATA (THAT OF THE RVCP OR MEP) WAS NOT DESIGNED TO COLLECT, MAP OR MONITOR LAND USE INFORMATION OF PARTICIPATING FARMS IN A WAY THAT FACILITATES THE MONITORING OF LAND USE CHANGE.

The following alternative actions improve RVCP capacity to geo-position and record the production units of participating farmers and result in an analysis of RVCP land use.

Alternative Action: Land Use Monitoring: aims to identify (by taking GPS points) on a GIS map the locations of the productive units and collect land use data of a sampling of RVCP farmers. This information will contribute to the MEP project mapping, monitoring and evaluation⁴³.

LAND USE DATA COLLECTION AND ANALYSIS

RVCP can support the producer associations to carry out a process with their members in which they document their land uses, such as areas in coffee production, horticulture and food crops (e.g. corn and beans). Land use data collection involves four principle actions:

- Develop a standardized land use data collection form within each value chain.
 - Train technicians and para-technicians to carry out this process with producer groups to identify, locate and assess RVCP production-related land uses, including irrigated RVCP productive units and fallow land that could be put under production.
 - Geo-position farmer production units in which the RVCP is working (one point at center of plot.)
 - Incorporate the land use information and geo-positioned productive units into a GIS database.
 - This may be carried out with a prioritized sample of associations, such as those near protected areas or in priority water recharge zones or located in deforestation hotspots and those that are already collecting land use data,.

Cooperativa Agrícola Integral San José Obrero

This cooperative is an example of the highly dispersed farms commonly found in the Western Highlands. Farmers joined together and registered their agroforestry systems and forests into Guatemala's forest incentive programs. The cooperative has 419 members in 23 producer groups in the municipality of La Libertad. They have 65.50 ha of community and 5.99 ha of individual agroforestry systems registered in the PINPEP and PINFOR programs. The registered productive areas and forests are geo-positioned. They use GPS technology to locate coffee productive areas on geo-referenced maps, have developed a management plan, and a full time forestry para-

Examples of this recordkeeping can already be found in RVCP participating organizations. Some examples include, APRODEFI and the Finca Xix land use plan (Nebaj, Quiché), the Cooperativa Agrícola Integral San José Obrero, (La Libertad, Huehuetenango), and the Asociación Chajulense (Chajul, Quiché). In addition, ANACAFE's CERCAFE farmers are developing actual and future farm plans on which land uses can be documented.

The Asociación Chajulense is a group of more than 600 organic coffee producers in Quiché. Some of them have produced organically since 1992. To meet certification requirements, each year the association

contributing to the improvement of Guatemalan livelihoods.

http://www.agrequima.com.gt/index.php?option=com_content&view=article&id=112&Itemid=268

⁴³ Mapping of the production units requires an agreement between MEP and RVCP

collects data on the areas under coffee production and the land uses of their member's farms, including soil conservation practices such as terracing or dead and live barriers and the use of pesticides, herbicides and fertilizers. Specific parcels are not geo-positioned; however, the number of hectares under other land uses is recorded such as *cuerdas* of land dedicated to corn and beans, forests, pastures and areas in brush/secondary growth. Forty RVCP coffee associations are certified and seven horticulture groups, potentially carrying out similar land use data collection activities. (See Section 2.0, Existing Conditions, p. 26.)

RVCP can draw from these experiences (*ergo*, the Experience Sharing alternative action) to **develop a standardized land use data collection form** within each value chain and train project technicians and para-technicians to carry out a simple land use data collection process with coffee, horticulture, fruit orchard and cardamom associations to identify, locate and assess RVCP-related land uses. Technicians and Para-technicians can be trained to geo-position the productive units (one point in the center of the parcel).

Land use data collection consists of at least⁴⁴ gathering and documenting the following information in a sample selection of associations:

- 1) Landholders' name.
- 2) Total area available to agricultural production (currently under production and fallow).
- 3) Area (m²) of each productive unit of the RVCP value chains (e.g. area under coffee, horticulture, or fruit orchard production and fallow.)
- 4) The productive units will be geo-positioned with one point taken in the middle of their plot. (AGEXPORT and ANACAFE technicians can be trained to take GPS points of selected parcels.)
- 5) Area under irrigation in the RVCP productive units per parcel and related information for irrigation management and monitoring purposes. (Per Alternative C)

Due to the timing and scale of the RVCP project, land use data collection and monitoring can be carried out with a sample selection of RVCP associations and farmers, such as those located within or close (5km) to sensitive areas - deforestation hotspots, watershed headwaters and protected areas - and with those who are already collecting land use data. Analysis of the mid-project baseline and end of project data can contribute to the reporting of the benefits of the project objectives.

It is recommended that the geographic analysis of the collected data be carried out **in collaboration with the USAID Monitoring and Evaluation Program (MEP)**⁴⁵ and be incorporated into the on-going MEP mapping and monitoring initiative.

⁴⁴ Ideally, if the time and resources existed, the land use data collection process would also include soil type and topography, number of springs, rivers or any other water body in or immediately adjacent (bordering) to the productive unit, and identify other special conditions (forests, protected areas, watershed recharge area) where the farm resides. (These can be registered under "Special Conditions".) This would develop a valuable farm and crop-planning tool, and identify problem areas such as erosion, potential or current landslides, pest or disease, flooding or other issues that occur as well as the practices the farmer is applying to address them.

⁴⁵ It requires an agreement between MEP and RVCP

Alternative Actions: Coffee Value Chain

Alternative C will 1) improve value chain competitiveness, 2) expand value chain participation, and 3) improve agricultural productivity of the targeted coffee producers in the five departments. Like the Proposed Action, it will conduct the following connected actions, as described in the Proposed Action alternative:

- Technical assistance and training in production issues
- Purchase and training in use and maintenance of motorized sprinkler pumps
- Renewal of plantations
- Identification and diversification of native and non-native shade species for coffee crops.
- Support quality certifications where the market requires them
- Technical assistance to promote improved technologies and practices
- Improvement in post-harvest management and processing
- Analyze the effect of coffee rust in coffee cultivation and management design for the small farmer
- Promote practices to mitigate effects of and adaptation to climate change
- Implement USAID-approved mitigation and monitoring measures

However, to improve upon existing conditions and address issues with the Proposed Action related to coffee production and processing, Alternative C incorporates the following additional actions:

ISSUE 3 - SOIL EROSION: COFFEE FIELD RENOVATION AND ESTABLISHMENT CAN CREATE CONDITIONS FOR SOIL EROSION IF SOIL MANAGEMENT AND CONSERVATION MEASURES ARE NOT APPLIED PROPERLY.

Connected Proposed Action: Renew plantations. Alternative C continues with the renewal of plantations as in the Proposed Action. It also incorporates the following practice into plantation renewal:

Alternative Action: Plant nitrogen fixing, multi-use grasses (as live barriers and for mulch and livestock fodder) and green manures during renovation, as well as native fuel wood/shade trees or fruit trees (see next alternative). Especially in coffee rust infected farms, pulling out old, infected coffee plants and replanting with other multi-use vegetation such as grasses and trees, offers farmers an alternative use for their aged plots while coffee plants mature. The grasses provide a way to improve the health of their cows, goats and sheep, when they have them. (Fodder may also be sold to neighboring farmers to generate income.) The project may encourage farmers to adopt this practice in abandoned coffee fields, as well as in those that are awaiting renewal.

ISSUE 4 - WATER MANAGEMENT AND CONSERVATION: WATER IS BEING USED (FOR IRRIGATION IN SOME HORTICULTURE CROPS) AND FOR COFFEE PROCESSING WITHOUT SUFFICIENT MEASUREMENT AND MONITORING OF WATER USE, SUPPLY AND DEMAND.

Alternative Action: Water Management and Conservation in coffee wet milling processes trains farmers in measurement and monitoring of water use and practices that support its conservation, and climate change adaptation measures. Coffee farmers and water system committees will be trained in the following water measurement and management practices:

- Assessment/measurement of volume and quality of water used and needed during coffee processing per quintal, farmer and/or processing site.

- Assessment of volume used in coffee processing per water system. (e.g. number of producers processing coffee per harvest season per system; volume of water used per producer.)
- Measurement of available water supply per water system (from the catchment point that feeds the water system) and the percentage used and required for coffee processing to determine supply/demand balances and make projections for the future.
- Practices that can be adopted to conserve water during processing including turning off taps, measurement and control of use, and capture and re-use of filtering water.
- Compare water use with and without water conservation practices during coffee processing.
- Monitoring of supply and use to periodically assess continued capacity to meet agricultural production needs.

ISSUE 5 – WATER POLLUTION: A) EXISTING COFFEE WASTE WATER DISPOSAL SYSTEMS USING FILTER PITS HAVE THE POTENTIAL TO OVERFLOW (SUCH AS IN WET COFFEE PROCESSING AT THE ASOCIACIÓN CHAJULENSE IN QUICHE AND AS IDENTIFIED IN THE JULY 2014 AUDIT, P. 24) AND CAN CAUSE SURFACE AND GROUND WATER CONTAMINATION WHEN WATER IS NOT TREATED OR FILTER PITS NOT DESIGNED CORRECTLY, AND B) AGRICULTURE PRODUCTION ACTIONS SUCH AS PESTICIDE APPLICATION, FERTILIZER USE, AND COMPOSTING CAN DETERIORATE WATER QUALITY DUE TO INAPPROPRIATE LOCATION OF THE ACTIVITIES, LACK OF BUFFER ZONES, AND WHEN BEST MANAGEMENT PRACTICES ARE NOT FOLLOWED.

Alternative Action: Promote re-conditioning of “honey water” (coffee wastewater) treatment filter pits to avoid over-flows based on water volumes and site-based features and conditions.

To ensure that the artisanal filter pits used to treat coffee wastewater generated from micro-wet milling work correctly, the re-conditioning of the filter pit may be required. First, the amount of water needed during processing must be measured and monitored. The second step consists of the correct (and well documented) design of the filter pits that is based on site-specific factors, such as the type of soil, an infiltration test, water volume and pit size. Systems may also consider a cascading filter pit design to manage the volume of wastewater. During re-conditioning, the project should establish the ranges (e.g. soil types, water volumes) under which filter pit technology can be applied, and identify other methods that could be used when the system does not meet the requirements. Finally, this alternative requires training project technicians, para-technicians and farmers in the design methodology and re-construction, as well as the correct location of filter pits (away from streams and other bodies of water), the measurement of the volume of water used and controlling potential overflow.

Alternative Action: Development of instructional materials that give general recommendations to farmers, para-technicians and technicians on how to design a filter pit based on local conditions and volume of coffee wastewater generated.

ISSUE 6 – PEST AND DISEASE MANAGEMENT: COFFEE RUST, THRIPS, AND OTHER PESTS/DISEASES ARE IMPACTING COFFEE, CARDAMOM, AND FRUIT TREE PRODUCTION, AS WELL AS HORTICULTURE PRODUCTION. PESTICIDE USE IS SEEN AS A SOLUTION TO MINIMIZING PEST AND DISEASE IN CROP PRODUCTION BUT CAN NEGATIVELY IMPACT HEALTH AND WATER QUALITY, ESPECIALLY IN AREAS UNDER ORGANIC PRODUCTION SUCH AS ON ORGANIC COFFEE FARMS IN THE ZONA REINA, AT THE HEADWATERS OF THE CHIXOY RIVER BASIN.

The sub-issues are:

- 1) *Variations in pesticide use and safe use standards⁴⁶ and practices.*
- 2) *The appropriate coffee-rust resistant varieties to plant per local conditions and international markets.*
- 3) *The lack of standardized IPM practices in project value chains that can be applied in conventional and organic systems*

Alternative Action: Train project technicians, para-technicians and farmers in the Integrated Pest Management practices of the Programmatic Pesticide Evaluation Report and Safe Use Action Plan (PERSUAP) for Coffee, with Emphasis on Coffee Rust, approved January 2015. Alternative C also incorporates the aforementioned successful models of technology transfer (e.g. Pesticide Brigades) to ensure the 2015 approved pesticides and safe use practices are being applied.

Table 19: Integrated Pest Management (IPM) practices for Coffee Leaf Rust

IPM practices for Coffee Leaf Rust –La Roya- (Hemileia vastatrix)	Pesticides to integrate into IPM
<ul style="list-style-type: none"> • Increase shade of coffee plants (plant trees) to increase biodiversity; this promotes growth of <i>Verticillium/Lecanicillium lecanii</i> “white halo” fungus and other species that attack and control rust. • Use certified varietal and disease-free planting material. • Do crop and plant monitoring to quickly locate and deal with disease symptoms. • Plant new certified varieties (like Catimor, Sarchimor) with resistance to coffee leaf rust. • Do hand weeding/chopping of weeds, especially with new young plantings. • Conduct proper pruning of coffee plants to reduce woody growth and strengthen the overall plant. • Cut or renovate old plantations (i.e., with plants older than 30 years) with new and/or resistant seedlings. • Manage soil and plant fertility for coffee by conducting soil and leaf analyses to determine macro and micronutrient requirements, and fertilize accordingly. • Use organic mulch to cover soil and help decompose dropped leaves. • Control abandoned coffee farms that serve as a source of rust 	<ul style="list-style-type: none"> • Implement preventive chemical control by using copper-containing fungicides like Bordeaux mixture, copper hydroxide, cuprous oxide, copper oxychloride or tribasic copper sulfate. • Implement preventive chemical control by using fungicides containing ferbam, mancozeb, maneb or ziram. • Implement curative chemical control by using fungicides containing any of the following active ingredients: azoxystrobin, captan, cyproconazole, flutriafol, fosetyl aluminum, myclobutanil, oxycarboxyn, propiconazole, pyraclostrobin, tebuconazole, triadimefon, triadimenol

⁴⁶ The July 2014 Audit cites various inconsistencies with pesticides being used by RVCP participants and the project PERSUAP. “Based on observations in the field and interviews with producers, the environmental audit results indicate that participants in the RVCP are not compliant with the PERSUAP. Based on active ingredients in commonly used pesticides such as Duett, the first active ingredient in epoxiconazole + carbendazim is listed as a fungicide not to be used on USAID projects. In addition, copper oxide and tea tree oil (*Melaleuca alternifolia*) are utilized by producers, but not included in the approved PERSUAP list” (Cadmus 2014, p.30).

Cross-cutting alternative action: Exchange of Experiences/Field Trips with Master Farmers, Producer Groups, Para-technicians and Project Technicians, sharing and promoting the adoption of successful models, such as the **Pesticide Brigades**, in other producer groups.

Cardamom Value Chain

Alternative C will continue to support 805 cardamom producers (in five associations) encompassing 1,050 ha in Zona Reina. Alternative C will carry out these proposed actions:

- Introduce practices that mitigate effects of and help cardamom producers to adapt to climate change, and
- Via this Environmental Assessment, review proposed activities and design and implement an Environmental Mitigation and Monitoring Plan (EMMP).

Alternative C also incorporates actions that respond to issues identified with the following connected proposed actions.

ISSUE 6 – PEST AND DISEASE MANAGEMENT: COFFEE RUST, THRIPS, AND OTHER PESTS/DISEASES ARE IMPACTING COFFEE, CARDAMOM, AND FRUIT TREE PRODUCTION, AS WELL AS HORTICULTURE PRODUCTION. PESTICIDE USE IS SEEN AS A SOLUTION TO MINIMIZING PEST AND DISEASE IN CROP PRODUCTION BUT CAN NEGATIVELY IMPACT HEALTH AND WATER QUALITY, ESPECIALLY IN AREAS UNDER ORGANIC PRODUCTION SUCH AS ON ORGANIC COFFEE FARMS IN THE ZONA REINA, AT THE HEADWATERS OF THE CHIXOY RIVER BASIN.

The sub-issues are: 1) Variations in pesticide use and safe use standards⁴⁷ and practices. 2) The appropriate coffee-rust resistant varieties to plant per local conditions and international markets. 3) The lack of standardized IPM practices in project value chains that can be applied in conventional and organic systems.

Connected Proposed Action: Technical assistance and training in production topics to increase cardamom quality and yields and introduce best agricultural practices, such as crop sanitation and management, shade management and pest and disease management (e.g. Thrips.)

Alternative Action: Train project technicians, para-technicians and farmers in the findings of the PERSUAP for cardamom production (as developed by the USAID) in the Zona Reina. A new activity to RVCP, cardamom production and the potential use of pesticides to combat Thrips and other pests or disease, has not yet been evaluated. Given the very minimal use of pesticides in the Zona Reina, the project should train farmers in PERSUAP findings in integrated pest management practices, as well as natural pesticides being considered (e.g. Neem).

Alternative Action: Promote organic standards to cardamom producers in Zona Reina. Alternative C promotes practices in cardamom production that would meet USDA organic standards. While it is not

⁴⁷ The July 2014 Audit cites various inconsistencies with pesticides being used by RVCP participants and the project PERSUAP. “Based on observations in the field and interviews with producers, the environmental audit results indicate that participants in the RVCP are not compliant with the PERSUAP. Based on active ingredients in commonly used pesticides such as Duett, the first active ingredient in epoxiconazole + carbendazim is listed as a fungicide not to be used on USAID projects. In addition, copper oxide and tea tree oil (*Melaleuca alternifolia*) are utilized by producers, but not included in the approved PERSUAP list” (Cadmus 2014, p.30).

expected producers will achieve certification, organic criteria will guide RVCP technical assistance in production

Cross-cutting alternative action: Exchange of Experiences/Field Trips with Master Farmers, Producer Groups, Para-technicians and Project Technicians, sharing and promoting the adoption of successful models, such as the **Pesticide Brigades**, in other producer groups.

Issue 1- Forest degradation: forest habitats and associated biodiversity can be negatively impacted by the consumption of fuel wood for drying cardamom. Fuel wood purchased for cardamom drying may be illegally and unsustainably harvested.

Alternative Action: Sustainable fuel wood management planning. Sustainable management planning of firewood will identify the current demand for firewood of the RVCP cardamom associations, and inventory/assess existing legal supply. It will forecast firewood consumption and yield into the future, helping the cardamom producers identify management actions they can take to develop their farms and forests for a sustained yield. It also will raise awareness of the importance of the sustainable and legal harvest of firewood from natural forests. The main objective of sustainable fuel-wood management plan is to use technical criteria to guide the reforestation and consumption of firewood used by the RVCP cardamom associations, identifying firewood harvest limits in natural forests and on farms, and actions that can help make up for firewood deficits.

Alternative Action: Small-scale Fuel wood Plantations. This alternative aims to fill legal firewood supply deficits and reduce ecosystem degradation in natural forests. Alternative C works with the cardamom producers to identify areas to plant with firewood species on their farm, and trains them to maintain these plantations for the medium- and long-term. Plantations, of 0.5 ha or more, should be planted on abandoned or unused land that isn't already forested (primary or secondary growth). Under Alternative C, producers will only plant species native to the Zona Reina. Fuelwood trees have been identified in the FIDA/AGEXPORT study, and native species already being planted include: 1) *Vismia* sp. 2) *Terminalia amazonia*, 3) *Swietenia* sp, 4) *Inga* sp., 5) *Terminalia chiriquensis*, 6) *Nectandra reticulata*, 7) *Gliricidia sepium*, 8) *Tabebuia donnell-smithii*, 9) *Virola* sp., 10) *Vochysia guatemalensis*, 11) *Dialium guianense*, and 12) *Pouteria sapota*. No exotic species will be introduced; no species are invasive. Native trees will be planted, species common to the forest ecosystem of the Zona Reina and the forests and protected areas of the region, such as Visis Caba and biological corridors such as El Amay- Montaña and El Amay-Cerro Chupac. The RCVP will continue to build the capacity of cardamom farmers to cultivate native trees from seed and establish communal nurseries.

Connected Proposed Action: Improved technologies in post-harvest management, such as more efficient cardamom drying technologies and practices including preventative maintenance and repair of existing dryers to increase their efficiency.

Assess improved designs of present cardamom drying technologies. Assess efficiency of the cardamom-drying technologies and methods the Proposed Action will implement that modify present systems and reduce firewood use. It will be done at pilot sites, comparing efficiency of the current cardamom dryers with the efficiency of the new proposed dryer design.

Horticulture and Fruit Orchards

Alternative C carries out the following connected actions of the Proposed Action, without modification.

- **Technical assistance and training in production topics to increase horticultural production quality and yields.**
- **Support quality certifications where the market requires them.**
- **Diversification and introduction of new export crops** such as cardamom (as otherwise presented in previous section) and apples, peaches and pears.
- **Intermediate or final post-harvest processing:** e.g. selection, quality control, packing in re-used plastic boxes to avoid damage during shipment, and
- **Implementation and monitoring of USAID-approved environmental mitigation measures**
from EMMPS and USAID Environmental Guidelines, and existing PERSUAPs.

The following alternative actions are proposed to address the issues with the related connected actions (of the Proposed Action.)

ISSUE 4- WATER MANAGEMENT AND CONSERVATION: WATER IS BEING USED FOR IRRIGATION IN SOME HORTICULTURE CROPS AND FOR COFFEE PROCESSING WITHOUT SUFFICIENT MEASUREMENT AND MONITORING OF WATER USE, SUPPLY AND DEMAND.

Connected Proposed Action: Technical assistance and training in irrigation and conversion to drip-irrigation systems.

Alternative Action: Irrigation Water Management Plan and Implementation. Conversion or establishment of irrigation systems will include an overall diagnosis and plan of the system, as well as measurement of water supply and demand. An irrigation management plan includes not only maintenance and operation, but also the management of water and the irrigation system as a whole, including water measurement and monitoring and how to change the operation when drought or other problems and needs arise.

The irrigation system will be analyzed from the source(s) its flows, the conduction pipes, the distribution tank and the plots. Irrigation management planning includes the following:

- A technical design of the irrigation system, which should include the **measurement of water availability** (source water flow from the catchment point that feeds the system), **and crop requirements considering soil types, production and harvesting.** Select and design the irrigation system to obtain the best results based on these characteristics for each parcel. Design should include estimates for expansion of system based on crop requirements, water availability and the delivery system.
- **Establish a monitoring system that measures water volume and quality being used by irrigation.** Monitor the quality and quantity of water at different points in the system, at the system catchment point and per irrigated parcels (per *cuerda* or square meters and crop). Monitor percent volume used for irrigation per system.
- **An operational plan for the system,** which includes a diagram and details of the existing infrastructure, limitations, and expansion plans. Identification of risks and contingency plans (e.g. for drought, damage and repairs), as well as a maintenance plan and its costs.

- In addition, the irrigation management plan should include **soil and water conservation and irrigation management best practices** on a plot-by-plot basis. (e.g. mulching, contour planning, fertilization practices and appropriate timing of irrigation.)
- **Train the users** not only in the day-to-day operation and maintenance, but also in water management taking into account different aspects (e.g. drought, flooding, soil moisture, soil infiltration, volume of water used and crop phase.)
- **Create (or strengthen, if one exists) a committee or organization** to manage the irrigation system (in some cases irrigation boards exist but need training and systematization).
- **Provide training to para-technicians, technicians and members of the irrigation committee** on the plans of the system, water monitoring, how to make operational plans, and how to make changes in need and availability.

Alternative Action: Compare volume of water used (per cuerda or square meter per crop) by the two systems – sprinkler systems and RVCP-installed drip irrigation systems with management (including soil conservation practices) in demonstration sites.

ISSUE 6 – PEST AND DISEASE MANAGEMENT: COFFEE RUST, THRIPS, AND OTHER PESTS/DISEASES ARE IMPACTING COFFEE, CARDAMOM, AND FRUIT TREE PRODUCTION, AS WELL AS HORTICULTURE PRODUCTION. PESTICIDE USE IS SEEN AS A SOLUTION TO MINIMIZING PEST AND DISEASE IN CROP PRODUCTION BUT CAN NEGATIVELY IMPACT HEALTH AND WATER QUALITY, ESPECIALLY IN AREAS UNDER ORGANIC PRODUCTION SUCH AS ON ORGANIC COFFEE FARMS IN THE ZONA REINA, AT THE HEADWATERS OF THE CHIXOY RIVER BASIN.

The sub-issues are: 1) Variations in pesticide use and safe use standards⁴⁸ and practices.

Alternative Action: Training of project technicians, para-technicians and farmers in the PERSUAP as amended by the USAID to include crops and pesticides not reviewed such as apples, peaches, green peppers and jalapeño peppers.

Cross-cutting alternative action: Exchange of Experiences/Field Trips with Master Farmers, Producer Groups, Para-technicians and Project Technicians, sharing and promoting the adoption of successful models, such as the **Pesticide Brigades**, in other producer groups.

Handicraft Value Chains

Alternative C incorporates the following proposed actions:

- **Assess incorporation of new production techniques.**
- **Develop products according to customer needs**, such as new designs.
- **Improve technologies or production practices** such back-strap looms and inputs and modern looms tailored to the artisans, implementation of looms for bracelets, equipping workshops with treadle looms for weaving wool, carding machinery and machinery for thread spinning, sewing machines.

⁴⁸ The July 2014 Audit cites various inconsistencies with pesticides being used by RVCP participants and the project PERSUAP. “Based on observations in the field and interviews with producers, the environmental audit results indicate that participants in the RVCP are not compliant with the PERSUAP. Based on active ingredients in commonly used pesticides such as Duett, the first active ingredient in epoxiconazole + carbendazim is listed as a fungicide not to be used on USAID projects. In addition, copper oxide and tea tree oil (*Melaleuca alternifolia*) are utilized by producers, but not included in the approved PERSUAP list” (Cadmus 2014, p.30).

- **Open national and international markets and search for new markets.**
- **Gender: women's empowerment in the value chains.** Include women of all ages, particularly elderly and more knowledgeable, who are expert in handicraft production.

Alternative C incorporates the following two alternative actions into handicraft business planning to address the following issue with the proposed action:

ISSUE 8 - IF HANDICRAFT RAW MATERIALS ARE BOUGHT FROM UNSAFE AND UNSUSTAINABLE SOURCES, THEY COULD IMPACT HUMAN HEALTH, PLACE INDIRECT PRESSURES ON A NATURAL RESOURCE, AND NEGATIVELY IMPACT HANDICRAFT PRODUCTION.

Alternative Action: Train handicraft organizations to verify if raw materials meet market requirements, are legal and non-toxic. Alternative C will train the handicraft organizations to assess the legality of the sources of their raw materials on which their production depends, as well as to verify if threads are non-toxic meeting market requirements.

Alternative Action: Identify other providers of non-toxic thread with wastewater treatment plant in Guatemala or regionally to meet export market requirements. Currently, non-toxic thread is purchased from one company, Rio Blanco. Neither RVCP nor the EA team was successful in verifying if the wastewater generated by the plant is properly treated or contaminating surface or ground water. Other companies that will or can provide non-toxic thread and can verify their wastewater treatment practices will be identified in Guatemala or even on a regional basis. A cost-analysis of sourcing threads through a new company will be made.

Food Security and Nutrition Activities

Alternative C will continue to carry out the following proposed actions:

- **Demonstration/establishment of home gardens:** establishment of raised fields for planting vegetables and soil conservation, increased soil fertility through application of organic fertilizers/composting; micro-drip irrigation systems of 50 m² or less, training in nutritionally balanced recipes.
- **Establishment of school home gardens.**
- **Alternative methods for purification of water for human consumption:** provision of water filters and training in use and maintenance.
- **Improved, fuel-efficient stoves built in schools and homes.** Establishment of stoves and training for use and maintenance.
- **Implementation of USAID-approved mitigation measures** such as safe pesticide use, irrigation water assessment and management, rainwater harvesting and soil conservation practices.

Alternative C incorporates the following alternative actions to address the following issues:

ISSUE 4- WATER MANAGEMENT AND CONSERVATION: WATER IS BEING USED FOR IRRIGATION IN SOME HORTICULTURE CROPS AND FOR COFFEE PROCESSING WITHOUT SUFFICIENT MEASUREMENT AND MONITORING OF WATER USE, SUPPLY AND DEMAND.

Connected Proposed Action: Demonstration/establishment of home gardens: micro-drip irrigation systems of 50 square meters or less; establishment of raised fields for planting vegetables and soil conservation.

Alternative Action: Demonstrate the harvesting of rainwater for vegetable gardens in master farms to offset the use of domestic supplies or for other agricultural uses. Rainwater-harvesting systems can be demonstrated in the “CERCAFES” or on the AGEXPORT master farm equivalents. Harvested rainwater can be used to irrigate vegetable gardens. [It is important to pay attention to the condition of the roofs (as they can be very rusted or damaged) and to ensure that there is enough space for the storage of water.]

Alternative Action: Apply mulch to home gardens to conserve soil moisture. Train families in these and other irrigation best management practices such as irrigation timing (e.g. not during the height of the day when evapotranspiration can be greatest.) and monitoring of water use. These measures help improve soil fertility and conserve water.

ISSUE 10: CONSERVATION OF LOCAL AGROBIODIVERSITY: CROPS PROMOTED IN HOME GARDENS DO NOT REFLECT THE FULL RANGE OF MEDICINAL AND OTHER VEGETABLES THAT PARTICIPANTS LIKE TO EAT OR USE, POTENTIALLY LIMITING THE BENEFITS OF LOCAL AGROBIODIVERSITY, THAT HAS TRADITIONALLY BEEN CONSERVED IN HOME GARDENS, AND THEIR BENEFITS TO FOOD SECURITY AND NUTRITION.

Alternative Action: Exchange of Experiences between AGEXPORT and ANACAFE/FUNCAFE to learn successful approaches to food sovereignty of participating families. ANACAFE and FUNCAFE are implementing a home garden development model that can be adopted across the RVCP. The model includes semi-structured interviews that help to monitor project food security results, as well as to prioritize the species desired by families for their nutritional content. Upon identification of desired vegetables and herbs they are promoted with families. Also, it identifies desired native plants that can be consumed and encourages the development and sharing of recipes. Finally, the home garden model encourages the sale of surplus vegetables to generate additional resources for the household. This experience should be shared and “cross-fertilized” with the re-designed strategy of AGEXPORT and INCAP that supports families to select healthy crops to grow, provides small scale irrigation, and in some cases links the home gardens with small animal production (protein).

For a comparative presentation of the actions of the No Action, Proposed Action and Alternative C, please see Annex E.

7 ANALYSIS OF IMPACTS OF THE ALTERNATIVES

In this section, impacts of the three alternatives - No Action, Proposed Action and Alternative C actions – are described by the activities carried out in each value chain. Positive, negative, direct, indirect and cumulative effects of activities are presented, as well as measures to mitigate negative consequences. Mitigation measures presented in this section are summaries of 1) the Proposed Action mitigation measures as approved in the project EMPRs and 2) Alternative C mitigation measures which incorporates or improves upon some of the Proposed Action mitigations measures and are described in their entirety in Annex D, EMMP.

A comparison of the consequences of the three alternatives as they relate to the issues identified in the environmental assessment can be found in Section 8, Comparison Table.

7.1 ENVIRONMENTAL CONSEQUENCES OF NO ACTION BY VALUE CHAIN

The following section presents the environmental consequences of activities that are expected to continue to be implemented by AGEXPORT and ANACAFE under the No Action alternative per each value chain, and those activities that would be discontinued due to lack of USAID-financing. While some best management practices are expected to continue to be promoted under the No Action alternative (as described below), it is expected that the USAID-approved mitigation measures – as defined in the Proposed Action across all value chains and components of the project – will not be carried out.

The impacts generated by the No Action alternative are not expected to significantly improve upon existing conditions nor fully address the issues identified in this assessment. A summary of the No Action response to the issues can be found in the Comparison Table in Section 8.0.

Coffee Value Chain (31 certified organizations; 6,130.30 certified ha.) - Summary of Impacts

Positive Effects	Negative Effects
<ul style="list-style-type: none"> • Certified producers will apply pesticide safe use, soil & conservation, shade management, solid waste management and occupational health and safety practices. • Organic producers will not use pesticides • The use of native and non-native coffee shade trees helps to avoid erosion, keep moisture in the soil, improve soil fertility and protect biodiversity. • Technical assistance help farmer identify ways to combat coffee rust. 	<ul style="list-style-type: none"> • Harm to human health from application of pesticides. • Over application of pesticides and washing of sprayer pumps contaminate surface waters, and accumulate in soils and groundwater. • Build-up of toxic chemicals in soils and water poisoning beneficial microorganisms in the soil as well as downstream aquatic fauna and flora. • Aging of coffee plantations and limited access to credit reduces production. • Soil erosion, compaction and degradation in old coffee fields. • Persistence of coffee rust decreases production. • Agroforestry systems dominated by Ingas and Gravilea. • Coffee wastewater contaminates local surface waters.

Cumulative Actions: Coffee rust epidemic; aging hillside coffee plantations and unproductive plants (60% of coffee farms need to be renovated/renewed.) Advance of annual crops (corn and bean) up hillsides. Multiple coffee producers (e.g. 200 in one association) over a watershed, all individually processing their coffee in artisanal mills and discharging coffee wastewater into streams and rivers.

Cumulative Effects: Accumulation of coffee wastewater contamination downstream. Abandonment of coffee fields and change in use to other non-agro forestry crops (corn and beans) decreases watershed protection and forest cover. Abandoned coffee fields increase pest outbreaks such as coffee rust in regions where climate conditions (e.g. temperature) are a trigger.

Coffee Value Chain Detail - No Action Impacts

Technical assistance and training in production issues

Positive direct and indirect impacts: Certified producers will continue to more safely apply pesticides using Personal Protection Equipment (PPE). Organic producers will not use pesticides and therefore avoid above mentioned negative direct and indirect impacts. Also, certified organizations will continue to implement best agricultural management practices such as management of shade grown coffee and soil conservation methods.

Negative direct impacts: Non-certified coffee farmers may apply highly toxic pesticides (unapproved by USAID) and will apply them ineffectively and without personal protection equipment which can cause burns and harm health. Over application of pesticides will increase run-off into neighboring water sources and accumulation in soils, killing beneficial micro-organisms.

Negative indirect impacts: The ineffective and over application of pesticides can reduce their effect on the infestation of pests and diseases as well as the accumulation of these toxins in soils and water bodies (springs, rivers, and lakes.) Thereby, pest infestation might not be reduced, and micro-organisms in soils, and flora and fauna in water can also be affected. Limited capacity to provide technical and financial assistance to farmers will affect the reproduction of coffee rust tolerant plants throughout the RVCP intervention areas, and organic producers might decide to switch to inorganic and start applying pesticides (unapproved by USAID.)

Technical assistance to promote improved technologies or practices

Positive direct and indirect impacts: Certified farms are protecting and improving their soils, managing shade cover, and implementing organic practices that help to protect local water bodies and human health.

Negative direct impacts: Only those organizations with certifications will implement best agricultural and environmental practices. The rest of farms will be exposed to erosion processes that can lead to landslides. Lack of shade management will provoke the outbreak of coffee pests such as Ojo de Gallo, Cercospora, and rust. Other impacts related to pesticide use, mentioned above.

Negative indirect impacts: Pests and diseases may increase due to the lack of integrated pest management methods and improper pesticides use on uncertified farms.

Promotion of practices to mitigate effects of and adaptation to climate change

Positive direct and indirect impacts: Soil conservation best practices in certified farms will increase soil fertility (and carbon capture.), for example introducing organic matter derived from coffee waste improves soil fertility and humidity. Shade management practices protect soils during extreme weather events, such as planting trees that serves as windbreaks. ,

Negative direct impacts: None.

Negative indirect impacts: Climate change adaptation practices such as soil conservation methods that do not take into account technical criteria (soil depth and slope) can be ineffective during the rainy season. Limited institutional capacity from ANACAFE will restrict the dissemination of climate adaptation practices.

Native and non-native shade species for coffee crops

Positive direct and indirect impacts: The use of native and non-native species in coffee agro forestry systems provide shade cover that helps to protect soils from erosion, to regulate the hydrological cycle at local or regional level (e.g. recharge water sites), to provide mulch to coffee plants by fallen shade tree leaves which helps to keep moisture and enrich soils with organic matter (e.g. leaves from the Guama.)

Negative direct impacts: Coffee agro forestry systems will continue to be dominated by introduced *Gravilea* and *Inga* species, and limited overall diversity within the agroforestry system (six species observed during scoping; 69% *Inga* and *Gravilea*; 30% others.) Thereby, presence of native tree species and biodiversity is reduced and local ecosystems can be biologically fragmented.

Negative indirect impacts: Limited understanding of the potential impacts on wildlife, especially effects on threatened and endangered species, in large agroforestry landscapes dominated by introduced *Gravilea* and *Inga*.

Support quality certifications requested by market

Positive direct and indirect impacts: Organic certification directly helps to reduce risks to human health and the environment from the use of toxic pesticides. Rain Forest Alliance, Fair Trade, TESCO, Maya Cert/USDA, UTZ certification protect worker health and that of the environment including solid waste management. These standards help to protect natural resources such as water bodies and soil from toxicity from the over use of pesticides and fertilizers; and to preserve local and regional biodiversity indexes. Certified coffee associations develop organizational capacities to attain certification standards. Certification promotes quality improvement which allows access new market niches. As a result, farmers receive improved and more secure incomes.

Negative direct impacts: None.

Negative indirect impacts: None.

Analysis of the effect of coffee rust in coffee cultivation and management design for small farmers

Positive direct and indirect impacts: ANACAFE and FEDECOCAGUA technical assistance help a limited number of coffee farmers to design a plan to combat coffee rust on their farm, in accordance with the Guatemalan national strategy.

Negative direct impacts: None.

Negative indirect impacts: Small farmers have limited resources to invest in new plants and coffee field renewal, and are not able to wait until coffee plants mature to receive a return on their crop⁴⁹. (Therefore, coffee crops are abandoned and changed into another agricultural crop.) Rust resistant varieties, such as Sarchimor, may not meet the organoleptic standards required by certain market niches (e.g. Japanese market).

(No) Renewal of plantations

Positive direct and indirect impacts: None.

Negative direct impacts: 60% of Guatemala's coffee farms need to be renovated and renewed. With limited technical assistance, soils will be exposed to erosion, compaction and degradation, even renovating coffee plantations.

Negative indirect impacts: The limited capacity to reach all of the target RVCP small producers means production decrease due to coffee rust and aging coffee plants on a majority of the RVCP

⁴⁹ As noted in the final evaluation of the USAID-funded *Empresas Caficulturas Competitivas*, access to credit and their ability to pay while renovated plantations mature (three years) are significant barriers for small coffee producers.

target farms. Farmers with eroded soils and without fertilization plans may have reduced income because of the reduction of yields. Since coffee plantations do not generate returns to fulfill family needs, land use change might be promoted to switch from coffee agro forestry systems to other short-term return crops (e.g. cash crops such as maize, tomato, etc.).

Post-harvest management and processing of coffee via inefficient and old technologies

Positive direct and indirect impacts: None.

Negative direct impacts: RVCP small producers will continue to use the filter pit method to capture artisanal waste water. They are often incorrectly designed, and overflow into rivers, streams or arroyos. Coffee waste water increases biological oxygen demand (BOD) 6 kg for each 100 pounds of coffee milled. Small producers mill approximately 6,000 pounds a season and an estimated 200 – 300 liters of water per 100 pounds processed. That means that approximately 18 m³ of water can be discharged over several days and a total BOD of 360 kg potentially discharged directly into surface waters (streams and rivers.) Decomposing coffee waste will pollute local waters and emit methane, a greenhouse gas. Also, human health can be affected when coffee drying equipment is poorly installed. For instance, the generation of dust and vibration may have long term health effects, and damage infrastructure.

Negative indirect impacts: Incorrectly designed coffee drying equipment and ill-maintained coffee waste decomposition emits greenhouse gases into the atmosphere (e.g. carbon dioxide and methane) contributing to climate change effects. The water contamination arising from overflow of filter pits and resulting water pollution can generate local disagreements especially with downstream villages that receive upstream water contamination. Inefficient coffee drying equipment also impacts surrounding forest due to the over extraction of fuel wood.

No purchase, use and maintenance of motorized sprinkler pumps

Positive direct and indirect impacts: None.

Negative direct impacts: Limited financial support and training can result in the unsafe and ineffective use of sprinkler pumps by farmers who afford to purchase them. Pesticide use can also continue with manual sprayer pumps, which present risks to human health. Washing pumps and/or spilling agrochemicals into streams or rivers pollute surface waters and can contaminate drinking water downstream. Petroleum sub-products like fuel and oil can spill and/or leak into the soil, waters and also affect human health.

Negative indirect impacts: Without personal protection equipment, pesticide application affects skin and respiratory organs as pesticides are sprayed out under more pressure than manual pumps.

Horticulture Value Chain (producers in six RCVP target municipalities; three certified organizations, 38 certified ha.) - Summary of Impacts

Due to the geographic focus of the No Action alternative (per exporter criteria), it is assumed that the producer groups served by AGEXPORT in six of the target 12 RVCP municipalities will generate the positive impacts of No Action activities. Negative impacts are those generated by non-certified producer groups and those not receiving AGEXPORT technical assistance.

Positive Effects	Negative Effects
<ul style="list-style-type: none"> • Healthy crops, more fertile soils, and pests and 	<ul style="list-style-type: none"> • Harm to human health from application of

Positive Effects	Negative Effects
<p>diseases controlled.</p> <ul style="list-style-type: none"> • Pesticide containers collected; less plastic litter. • Water resources better protected from pesticide residue. • Improved occupational health and safety in certified groups • Access to export markets increases farm incomes. 	<p>pesticides.</p> <ul style="list-style-type: none"> • Over application of pesticides can result in toxicity, contamination of soils and waters and harm to human health. • Contamination of surface waters from inappropriately sited/designed best practices such as latrines or compost piles and pesticide containers washed in streams. • Inefficient irrigation systems. • Soil erosion, compaction and degradation in horticulture parcels. • Pesticide containers and inorganic waste litter from processing and packaging litter the community. • Certified organizations at risk of losing certification when best practices cannot be sustained.

Cumulative actions: Small horticulture landholders will continue using pesticides empirically resulting in a direct impact to rivers and health.

Cumulative effects: Cumulative effects could be undertaken at large scale, for instance, within watersheds where multiple small landholders are spilling pesticides and their used containers in rivers which will negatively impact soils, water and its aquatic biodiversity. This will also affect downstream villages where locals and/or cattle will drink this water. Solid waste accumulation in the community will also negatively affect community members, for example the risk of unintentionally using pesticide bottles for drinking purposes or accumulation of litter in waterways and downstream.

Horticulture Value Chain Detail - No Action Impacts

Technical assistance and training in production topics to increase horticultural production quality and yields.

Positive direct and indirect impacts: The rational use of pesticides, the generation of composting material, and the implementation of technical fertilisation plans will help horticulture associations to have healthy crops, fertile soil, and pests and diseases controlled. Therefore, yields and family income will increase.

Negative direct impacts: Non-certified and producers not served by AGEXPORT in six municipalities will not be able to implement sanitary practices such as hand washing stations nor pesticide mitigation measures (e.g. bio-beds.) Over application of pesticides can result in toxicity, contamination of soils and waters and harm to human health.

Producers will continue washing the pesticide containers in water bodies and will be less inclined to wear proper equipment to protect themselves from a direct contact with pesticides. Build-up of toxic chemicals in soils and water poisoning beneficial microorganisms in the soil as well as downstream aquatic fauna and flora. With the No Action analysis, the latrines will be set too

close to waterways. Compositing piles also built the risk of damaging waterways run-off and contribute to the accumulation of macro elements in the soil and water.

Negative indirect impacts: Limited technical assistance restricts implementation of latrines. Fencing and certification monitoring activities will be absent or limited affecting horticulture yields and crop health.

Technical assistance and training in irrigation and conversion to drip-irrigation systems.

Positive direct and indirect impacts: Where macro-tunnels are adopted, they will help to control pests and diseases and increase yields per unit area, in less than half of the target producer groups.

Negative direct impacts: AGEXPORT will have limited funds to support the conversion of irrigation and production systems under controlled conditions such as macro-tunnels or greenhouses. Inefficient irrigation systems will continue to draw down community water supplies.

Negative indirect impacts: Horticulture producers will not reach expected yields and will not manage their water efficiently. Home gardens will not produce enough to improve food security.

Technical assistance and implementation of Best Agricultural Practices.

Positive direct and indirect impacts: In less than half of RVCP target associations, soil conservation measures protect farms from erosion and improve soil fertility, improving crop health and indirectly watershed conditions. In communities that Agrequima serves, used pesticide containers are collected in receptacles. This action reduces litter and potential contamination by toxic chemicals not only for human beings but also water bodies. The triple wash of pesticide containers in bio-beds and their burial in appropriately designed and managed trash pits eliminate potential contamination. Indirectly, monitoring of best management practices by AGEXPORT supports organizations to achieve environmental management certification standards. The certification provides incentives to access to additional market niches, thus diminishes potential impacts on soils, water, biodiversity and human health.

Negative direct impacts: Eroded soils will prevail on steep terrains, especially on farms that were not part of previous projects. The unsafe use of pesticides as a result of the application of unapproved pesticides, will harm human health, and contaminate soil and water. Pesticides containers can be thrown in rivers and surrounding public areas.

Negative indirect impacts: Farms with eroded soils will have reduced returns on their production, affecting their income. Erosion on farms can have a negative impact from sedimentation accumulating on nearby down slope farms. Farms not applying best practices required by international markets standards will have limited access to export markets.

Support quality certifications where the market requires them.

Positive direct and indirect impacts: Certified horticulture associations apply best environmental and social practices. This allows them to enhance quality in production process to access new market niches. Therefore, better international markets and prices are received. Global GAP and TESCO certifications improve health, productivity and environment. These

standards will help to protect natural resources, such as water bodies and soil, from the use and over use of toxic pesticides. Therefore, local and regional biodiversity indexes will be preserved.

Negative direct impact: Farms that have not been in the certification program but could have been with the RVCP would have less opportunity to participate in certification and thus potentially reduce their income. Also, the more farms involved in certification would yield greater volume of products and thus the opportunity for increased markets due to increased volume is lost.

Negative indirect impact: Certification is not a guarantee for continued application of best practices, especially in category B or C organizations, that are just initiating and organizational development is weak. (Yet, most likely category C organizations would not be able to qualify for certification in the first place.)

Diversification and introduction of new export crops such as (cardamom) and fruit orchards: *The No Action will not work with fruit orchards nor cardamom farmers. Traditional practices will prevail. See more on cardamom in next section.*

Positive direct and indirect impacts: None.

Negative direct impacts: Over-application and the use of unapproved pesticides will impact human health and add toxic chemicals to the environment. Existing farmers would be less diversified in crop production and would be more vulnerable to risks from disease/pest and GCC impacts on their existing crops.

Negative indirect impacts: In the long-term, health can be affected due to the use of toxic pesticides.

Intermediate or final post-harvest processing.

Positive direct and indirect impacts: In about half of the target producer groups, horticulture products will meet export quality; therefore, associations will obtain high returns. Also, creates better work conditions.

Negative direct impacts: Horticulture producers not covered by AGEXPORT will produce low quality products that will not be allowed to enter into international export markets. Hygiene standards will affect product quality and work health and safety. Generated organic and inorganic solid waste will litter the environment.

Negative indirect impacts: Production practices will not meet export quality standards (e.g. Global Gap or Tesco) therefore the farmer will not be able to market higher paying international markets. Farmers will receive less return on production when they sell their vegetables to the “coyote” at the farmgate.

Introduce practices that mitigate effects of and support producers to adapt to climate change. *The No Action will not carry out this activity.*

Positive direct and indirect impacts: Soil conservation practices implemented by certified organizations and producer groups of the six municipalities will support soil carbon

sequestration. Production under controlled conditions, such as macro-tunnels and green houses, helps farmers adapt to climate fluctuations and intense weather events.

Negative direct impact: Uncertified organizations and their producers in other six municipalities will not take actions to improve soil fertility, organic matter or humidity, thus increasing vulnerability to climate change.

Negative indirect impact: Inefficient irrigation systems will place pressure on local water supplies especially during drought.

Cardamom Value Chain (0 producers; 0 hectares) - Summary of Impacts

Positive Effects	Negative Effects
<ul style="list-style-type: none"> Multi-use, native trees incorporated into cardamom agroforestry systems. 	<ul style="list-style-type: none"> Pesticide use (USAID unproved) in Zona Reina can harm human health as well as contaminate waters and soils (in relatively pesticide-free are of Guatemala). Firewood harvested illegally and unsustainably from local forests degrading forests and neighboring protected areas. Burning firewood for cardamom drying emits GHGs into atmosphere. Potential land use change from natural forest to cardamom production.

Cumulative actions: The indiscriminate and unsustainable extraction of fuel wood from natural forests to dry cardamom has contributed to degrading habitats, ecosystems and protected areas in and around Zona Reina. The continued extraction of firewood for domestic use.

Cumulative effects: The volume of fuel consumption between 8.8 m³ and 13.5 m³ to dry one tonne of cardamom is expected to persist. Domestic consumption per capita is estimated at 1.28 – 2.06 m³ / year (URL, IARNA, 2009). Cumulative impacts could be experienced in Zona Reina and its watersheds where multiple cardamom producers may harvest fuel wood and firewood for domestic use at the same time period, potentially negatively affecting habitats and natural forests. Over time, the inadequate development of the cardamom value chain and poorly planned fuel wood extraction may undermine the long-term economic and landscape benefits from natural forests.

Cardamom Value Chain Detail - No Action Impacts

Technical assistance and training in production topics

Positive direct and indirect impacts: None.

Negative direct impacts: Potentially highly toxic pesticides will be used with limited guidance on appropriate and safe use, which can result in harm to human health, as well as contamination of soils and water.

Negative indirect impacts: Zona Reina is at risk of converting natural forest into agroforest and monoculture cardamom production as trees are continually cut for drying and home consumption with no other fuel source or methods of obtaining fuelwood from other sources.

Improved technologies in post-harvest management

Positive direct and indirect impacts: None.

Negative direct impacts: the lack of efficient cardamom drying technologies can result in an unsustainable extraction and illegal purchase of fuel wood to dry cardamom which can degrade natural forest around cardamom plantations (e.g. Zona Reina, Uspantán, Quiché). According to AGEXPORT and USAID, currently cardamom producers utilize between 8.8 m³ and 13.5 m³ of fuel wood to dry one tonne of cardamom. Forest degradation affects the integrity and health of ecosystems with high ecological, social and economic value, especially impacting flora that provides food, and provokes adverse effects on threatened and endangered species and their habitats.

Negative indirect impacts: Forest degradation due to fuel wood extraction can exacerbate potential vulnerabilities to climate change (e.g. steep slopes) such as landslides (erosion) and water flows that contribute to flooding (downstream areas). Indirectly, forest degradation can also promote illegal extraction and sale of fauna and flora (e.g. Tillandsias). Subsequently, locals might find illegal timber markets as another income sources. Harvesting timber from natural forest on the steeply sloped hillsides can generate run-off that affects fragile water sources such as streams and rivers. Provision of hydrological services to downstream users can also be vulnerable to these indirect negative impacts.

Incorporation of fuel wood and multi-use agroforestry species

Positive direct and indirect impacts: In cardamom fields, multi-use agroforestry species have been incorporated for shade, firewood, food and timber purposes. Under the No Action alternative, producers will continue to plant species native to the Zona Reina in cardamom agro-ecosystems, thus supporting local biodiversity.

Negative direct impacts: None

Negative indirect impacts: None

Introduce practices that mitigate effects of and support producers to adapt to climate change. *The No Action does not carry out this activity.*

Positive direct and indirect impacts: None.

Negative direct impacts: Burning firewood under existing old technology to dry cardamom emits GHGs (carbon dioxide).

Negative indirect impacts: None

Handicrafts Value Chain - Summary of Impacts

From 1 – 3 COMART (the handicraft commission in AGEXPORT) technicians will be available to work with established handicraft organizations per market demand. (No new handicraft organizations will be

developed by COMART.) Positive impacts are generated by those (unspecified number) COMART groups. Negative impacts are generated by handicraft production without COMART support.

Positive Effects	Negative Effects
<ul style="list-style-type: none"> • Production with AZO-free textile reduces harm to human health. • New designs open up handicraft organizations to more markets. 	<ul style="list-style-type: none"> • Contamination of water resources by thread dying companies • Handicraft raw materials such as wood or palm may come from illegal or unsustainable supplies • Solid waste generated in handicraft workshops litter the environment.

Cumulative actions: Hundreds of thread dying small business and handicraft workshops use toxic dyes and release untreated waters into the environment in the Western Highlands.

Cumulative effects: Handicraft production using non-toxic threads improves demand for thread dying companies not using the target toxins, however does not guarantee that other contaminants from thread dying are not polluting the environment when wastewater is released.

Handicraft Value Chain Detail - No Action Impacts

Provide training and technical assistance to strengthen production of handicrafts.

Positive direct and indirect impacts: Export market seeks AZO-free textile products, thus it is expected the potential impacts on human health from handling this product will be reduced, if not eliminated in target associations. Handcrafters have skills to produce high quality of handicrafts and connections to help them be exported. This helps them to market their products as well as increase their revenue derived from international sales.

Negative direct impacts: Production of solid and liquid waste can go directly to water bodies affecting the environment.

Negative indirect impacts: Water treatment of the only provider of export quality AZO-free thread in Guatemala can result in contamination of surface water around the thread company production plant.

Assess incorporation of new production techniques, and development of products according to customer needs, such as new designs.

Positive direct and indirect impacts: New designs open up handicraft organizations to new markets and greater returns on their work.

Negative direct impacts: Handcrafters will empirically continue producing the same types of handicrafts that can generate liquid and solid waste, and occupational health and safety effects harming their health.

Negative indirect impacts: Returns on production will not increase; potential for markets for traditional (not-new designs) products to shrink thus income can shrink too.

Improved technologies or production practices. *The No Action is not expected to improve technologies or production practices.*

Positive direct and indirect impacts: None.

Negative direct impacts: Handcrafters will empirically continue producing the same amount of handicrafts that generate solid and liquid wastes and occupational health and safety effects harming their health.

Negative indirect impacts: Returns on production will not increase, nor time invested in manufacture of a product decrease, thus income will remain the same.

Gender: women's empowerment in the value chains. *The No Action will not explicitly carry out gender activities.*

Positive direct and indirect impacts: Women already participating in COMART-supported handicrafts will earn income from their arts and skills which will contribute to family incomes. Hence, complementing family income and investing in health, nutrition and education of children. Handicraft production provide opportunities for learning to be exchanged along generations of women, thus conserving traditional knowledge as well as adding value to knowledge and skills of the elderly.

Negative direct impacts: None.

Negative indirect impacts: None.

Food Security and Nutrition - Summary of Impacts

Food Security and Nutrition activities are a continuation of the Ministry of Agriculture's CADER program. Under the No Action alternative, RVCP producers would need to join or form a CADER to participate in the following activities.

Positive Effects	Negative Effects
<ul style="list-style-type: none"> • CADERs provide training to up to 25 families with regards to the establishment of home gardens and practices. • Improved cook stoves will save family money on the purchase of firewood. • This will also minimize forest degradation. 	<ul style="list-style-type: none"> • Limited variety of vegetable seeds may influence capacity of home garden to meet nutritional goals. • Wood burning stoves emit GHGs into atmosphere. • Continued consumption of untreated water making people sick • Irrigation water can deplete domestic water supplies creating scarcity issues.

Cumulative actions: Community springs are principally tapped for domestic consumption.

Cumulative effects: Home gardens are mostly irrigated from community systems, which can contribute to scarcity in domestic supply.

Food Security and Nutrition Detail - No Action Impacts

Establishment of home gardens

Positive direct and indirect impacts: CADERs provide training to up to 25 families in a community in establishment of raised fields for planting vegetables and soil conservation, training in nutritionally balanced recipes, and increased soil fertility through application of organic fertilizers/composting, resulting in more productive home gardens and improved family nutrition. Irrigation systems allow families to produce their own food year-round.

Negative direct impacts: Irrigation systems can contribute to scarcity of domestic water supplies, especially during the dry season and in municipalities with high indices of water scarcity.

Negative indirect: Limited provision of vegetable seeds by CADER program (due to limited government resources) reduces nutritional value of home gardens.

Improved, fuel-efficient stoves built in schools and homes.

Positive direct and indirect impacts: Families save money on firewood and time collecting it. Improved health conditions from less smoke emitted by stoves and inhaled in the kitchen by family members while cooking. Indirectly, improved cook stoves decrease pressure on surrounding forests.

Negative direct: Farmers throughout the RVCP intervention area will continue using firewood stoves that will affect surrounding forests plantations and natural forests.

Negative indirect: Wood burning stoves emit GHGs (e.g. carbon dioxide) into the atmosphere, thus contributing to climate variability.

The No Action will not **provide alternative methods for purification of water for human consumption.**

Positive direct and indirect impacts: None.

Negative direct impacts: In those places where water may present a degree of pollution (e.g. e.coli), farmers will continue have gastrointestinal health problems.

Negative indirect impacts: None.

8 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION BY VALUE CHAIN

The following impact analysis is based on the findings of the EA team – potential and observed - and the impacts or weaknesses with the project mitigation measures identified during the July 2014 Audit, as presented in Section 5.2 *Key Issues Analyzed in the EA*. While mitigation measures had been identified by project implementers, in 2013, impacts may persist due to limitations in their implementation. The Proposed Action improves on conditions and issues compared to the No Action alternative; however, Alternative C incorporates additional actions or mitigation measures that further improve the environmental management of the project.

In the summary tables, descriptions of the mitigation measures of the proposed action identified in their EMPRs are abbreviated. Many of them have been carried over into the Alternative C sometimes in a slightly modified form to reflect current conditions (e.g. updated PERSUAPS) and address the issues. The complete description of the final mitigation measures of the recommended alternative, as agreed to with the project implementing partners, is in the Environmental Mitigation and Monitoring Plan in Annex D.

Coffee Value Chain - Summary of Impacts

The proposed action fields 42 technicians and 66 para-technicians to provide technical assistance and training to 89 producer groups; 8,246 coffee farmers on 9,866.71 hectares. The proposed action influences 58 more producer groups and approximately 2,115 more hectares than the No Action.

Positive Effects	Principle Negative Effects	Mitigation Measures
<ul style="list-style-type: none"> • Organic practices and pesticides as well as IPM eliminates or reduces risk of toxic contamination of soils and water. • Pesticides are more efficiently applied. • Soil conservation practices avoid or reduce erosion. • Compost and fertilization improves soil humidity, structure, and fertility. • The use of native and non-native coffee shade trees helps to avoid erosion, keep moisture in the soil, improve soil fertility and protect biodiversity. • Improved drying coffee technologies produces higher quality coffee beans. • Ecological (coffee) wet milling technologies more 	<ul style="list-style-type: none"> • Variation in pesticide safe use practices contaminate soils and water with toxic chemicals and can harm human health. • Pesticide containers litter environment. • Soil erosion in old coffee fields during renewal when conservation measures are not designed per slope and soil depth, nor uniformly applied. • Reliance on introduced shade species (Gravilea) reduces incorporation of a more diverse array of native species that can be associated with coffee in agroforestry systems. • Run-off from applied fertilizers and compost piles pollute surface waters. 	<ul style="list-style-type: none"> • Annual training in the safe use of pesticides and IPMs per 2013 PERSUAP. • Proper disposal of plastic pesticide containers, such as construction of metal collection “cages” and disposal of pesticide containers via the Agrequima⁵⁰ collection service. • Construction and use of bio-beds as areas for pesticide equipment washing and pesticide preparation. • Establish native vegetative barriers along borders of coffee farms and edges of streams and rivers to capture run-off. • Soil conservation practices⁵¹ such as contour planting, individual

⁵⁰ Agrequima is a guild of associated agrochemical companies (multi-nationals and manufacturers, formulators and distributors) with the mission of being a model in the industry of crop nutrition and protection that promotes innovative, sustainable and environmentally-responsible agriculture, contributing to the improvement of Guatemalan livelihoods.

http://www.agrequima.com.gt/index.php?option=com_content&view=article&id=112&Itemid=268

⁵¹ Per USAID Environmental Guidelines for Agriculture and FAO soil conservation guidelines.

Positive Effects	Principle Negative Effects	Mitigation Measures
<p>efficiently use water. (Est.50-200 liters of water/qq; or a savings of et. 1,300-2,700 liters/qq.)</p> <ul style="list-style-type: none"> • Certification sets production and environmental management standards and facilitate access to more coffee markets. 	<ul style="list-style-type: none"> • Overflowing filter pits can contaminate local surface water. • Erosion and litter in coffee nurseries. • Insufficient data and methods of monitoring coffee parcels can indirectly result in unintended expansion of coffee parcels. • Variations in design of best practices on master farms can result in ineffective and incomplete mitigation of potential impacts. • Learning materials not printed in pictographs for illiterate learners limiting their application in communities where Spanish is not the first language. • Producers not learning complete mitigation measures. 	<p>terracing, cover crops, live and dead barriers, mulching.</p> <ul style="list-style-type: none"> • Pruning or re-planting of old plantations completely or in blocks. • Incorporate (roya-uninfected) pruning into mulch. • More frequent coffee plant renovation. • Manual control of weeds (versus herbicides). • Recollection of seedling bags and their proper disposal. • Do not burn plastic bags. • Training in shade management. • Training in the conservation and efficient use of water during wet milling. • Implement water treatment systems for coffee waste water (aguas mieles) in collective mills – pre-treatment, chemical/biological treatment, management of organic sludge, final disposal of treated waters and reuse of organic wastes. • Construction and training in the use of filter pits. • Application of Cal (calcium hydroxide) to coffee pulp.

Cumulative actions: Twenty years of planting introduced species into coffee agroforestry systems, Gravilea and Inga. More frequent intense rainfalls and prolonged drought as a result of climate change. Aging coffee plantations are being abandoned and some maize fields are being abandoned which are being converted to coffee. Coffee rust on neighboring farms where over-application of pesticides, or in neighboring abandoned coffee fields. Community-wide problem with litter and solid waste management.

USAID's Low Emission Development Strategy (LEDS) Project in Guatemala in collaboration with the National Coffee Association (ANACAFE) will promote actions and technologies to reduce greenhouse gases (GHG) emissions and strengthen environmental management practices in the Guatemalan coffee sector. This joint initiative will allow ANACAFE to identify mitigation actions focused on environmental sustainability and economic development in the coffee sector, with the potential to promote adoption of climate change mitigation actions and practices among its 120,000 smallholder farmers.

Cumulative effects: Continued establishment of agroforestry systems dominated by Gravilea and Inga reduces the diversity of local and endemic flora and fauna and is not representative of the region's natural forest composition (as might be represented in neighboring protected areas or forest reserves). Plantation establishment or renovation on steep slopes puts the farm at risk of landslides. Uncontrolled coffee-rust or resistance from improper pesticide application and lack of cultural control methods on neighboring farms can spread the rust and cause other challenges such as pesticide drift on organic coffee plantations. . Accumulated trash, especially plastics, in streams, rivers, along roadsides, and in communities in general, can kill wildlife, contaminate waters and help spread disease. Methane emission from decomposing coffee wastewater will be addressed via the USAID-funded LEDS Project collaboration with ANACAFE.

Coffee Value Chain Detail – Proposed Action Impacts

Technical assistance and training in production issues for organic, conventional and mixed coffee crops to increase performance and yields. Production topics include organic and conventional production and pest and disease management including new, more efficient and more environmentally friendly organic pesticides for coffee plantations. Implementation of the 2013 PERSUAP.

Associated USAID-approved implemented mitigation and monitoring measures

Annual training in the safe use of pesticides and IPMs per 2013 PERSUAP, proper disposal of plastic pesticide containers, construction and use of bio-beds as areas for pesticide equipment washing and pesticide preparation; establish native vegetative barriers along borders of coffee farms and edges of streams and rivers to capture run-off.

Positive direct and indirect impact: Organic practices and pesticides, as well as integrated pest management practices, eliminates or reduces risks of toxic contamination of soils and water, related harm to human health, and the generation of toxic solid waste in the environment. Training in the selection of appropriate pesticides, their safe use (per the 2013 amendment) and application, indirectly protects human health, decreases toxic chemicals in the environment and more effectively manages pests and disease such as the coffee rust.

Negative direct impacts: Variations in pesticide use, safe use standards and practices (such as bio-bed construction, PPE use, application of un-approved pesticides and pesticide storage) can result in the application of unapproved pesticides, harm human health, and contaminate soils and water with highly toxic chemicals. Training and implementation of the PERSUAP and above listed mitigation measures for pesticide use would minimize these negative impacts, especially if follow up monitoring is done to ensure that the mitigation measures are being implemented.

Negative indirect impacts: Build-up of toxic chemicals in soils and water poisoning beneficial microorganisms in the soil as well as downstream aquatic fauna and flora. PPE can be cost

prohibitive and therefore not all farmers will afford to use them, potentially exposing themselves to pesticide related human health risks and harm.

Purchase, training in using and maintenance of motorized sprayers with a two-stroke engine, and handling and storing petroleum products (oil, fuels, etc.).

Associated USAID-approved Implemented Mitigation and monitoring measures

Annual training in the safe use of pesticides and IPMs per 2013 PERSUAP, proper disposal of plastic pesticide containers, construction and use of bio-beds as areas for pesticide equipment washing and pesticide preparation; disposal of pesticide containers via the Agrequima service; establish native vegetative barriers along borders of coffee farms and edges of streams and rivers to capture run-off.

Positive direct and indirect impacts: The motorized sprayer more evenly sprays pesticides onto plants, controls its application, and covers more area⁵². Indirectly, PERSUAP trainings will result in a reduced and safer application of pesticides decreasing costs and potential negative impacts on the environment and human health.

Negative direct impacts: When motorized sprayers are not designed, calibrated, maintained or used correctly they can over-apply pesticides potentially harming the crop, as well as contaminating soils and water. Farmers not trained in their safe use can experience burns or intoxication. When bio-beds are not adequately designed and constructed, pesticides can spill into the environment contaminating soils, waters and impacting human health. Used plastic pesticide containers can litter the environment, contaminate waters and soils, and harm human health, especially where Agrequima service is not available.

Negative indirect impact: Build-up of toxic chemicals in soils and water poisoning beneficial microorganisms in the soil as well as downstream aquatic fauna and flora. PPE can be cost prohibitive and therefore not all farmers can afford to use them, potentially exposing themselves to pesticide related human health risks and harm. Farmers stop using motorized sprayers due to fuel and maintenance costs and go back to their traditional method of application which is more harmful.

Renewal of plantations: improvement and recovery of degraded and eroded soil areas through establishment of new coffee plantations and shade species, soil improvement and fertilization plans, establishment of coffee rust and other disease resistant coffee seedlings, nursery establishment, irrigation and management for nurseries, establishment of agroforestry systems. Implementation of the Regional Coffee PERSUAP especially cultural practices when renewing plantations.

Associated USAID-approved implemented mitigation and monitoring measures

Pruning or re-planting of old plantations completely or in blocks; soil conservation practices such as contour planting, individual terracing, cover crops, live and dead barriers, mulching; incorporate (roya – uninfected) pruning into mulch; more frequent coffee plant renovation; training in shade management;

⁵² The two-person boom sprayer has been found to causes less drift and more direct application than regular or motorized sprayers. (Recommendation by USAID REA Joe Torres).

manual control of weeds (versus herbicides); recollection of seedling bags and their proper disposal; do not burn plastic bags.

Positive direct and indirect impacts: Establishment of coffee agroforestry systems in previously degraded areas creates ground and canopy cover that directly protects soils, helping maintain their humidity, fertility and structure. Indirectly, coffee agroforestry systems improve watershed conditions and provide habitat for migratory and resident birds, pollinators and other fauna. Use of resistant coffee varieties and cultural management practices in renewed plantations would minimize rust and spreading of rust for improved yields.

Negative direct impacts: During plantation establishment or renovation and periods of pruning, soils can be exposed and vulnerable to erosion, especially when soil conservation measures are not adequately applied, nor the appropriate measure for slope of the land and soil depth is applied. (e.g. space between live barriers on steep slopes.) Coffee seedling nurseries generate erosion and litter.

Negative indirect impacts: Renovation reduces farmer production in the short-term, taking land out of production for 2-3 years while coffee plants get established and grow.

Identification and diversification of native and non-native shade species for coffee crops.

Associated USAID-approved implemented mitigation and monitoring measure

Training in shade management.

Positive direct and indirect impacts: Introduced shade species such as Gravilea and some Ingas, provide shade cover during the dry months when native shade species shed their leaves. This is especially important where soil needs to be protected from extended periods of drought and dry conditions. The leaf litter of Guama (local name for Inga sp.) has demonstrated to improve soil quality, is fast-growing and can be pruned for firewood. Also, both native and non-native shade species can fix nitrogen in soil improving its availability to coffee plants. Incorporation of more native shade species that also provide food for both families and local wildlife will result in multiple positive impacts: protect soils and improve their fertility from fallen leaves (and even fruit), greater slope stability, diversification of the family “fruit basket” improving their nutrition, and food and habitat for local wildlife including migratory birds and important local pollinators.

Negative direct impact: Current reliance on introduced shade species (Gravilea) reduces incorporation of a more diverse array of native species that can be associated with coffee in agroforestry systems. This minimizes benefits to biodiversity (e.g. native threatened and endangered trees) at local and landscape levels, as well as food security and nutrition of families when more fruit trees can be incorporated. Introduction of native species that can harm coffee plants, for example, pine species that can change soil chemistry.

Negative indirect impacts: None.

Improvement in post-harvest management and processing, including wet milling (new and remodeled), as well as new and remodeled artisanal processing, “Beneficios ecológicos” or eco-friendly

wet milling technologies improved drying technologies and treatment of coffee waste water and training in occupational health and safety measures.

Associated USAID-approved implemented mitigation and monitoring measures

Training in the conservation and efficient use of water during wet milling. Implement water treatment systems for coffee waste water (aguas mieles) in collective mills – pre-treatment, chemical/biological treatment, management of organic sludge, final disposal of treated waters and reuse of organic wastes, such as the coffee pulp and waste water, in compost. Construction and training in the use of filter pits. Application of Cal (calcium hydroxide) to coffee pulp to prevent smells, the proliferation of flies and to stabilize pH before incorporating into compost.

Positive direct and indirect impacts: Improved drying technologies results in higher quality coffee, use of less energy (fuel wood derived from the pruned trees of the shade grown systems, in a few instances), and creates improved work conditions. “Beneficios ecológicos”, or eco-friendly wet milling technologies more efficiently use water. (Est.50 - 200 liters of water/qq; or a savings of est.1,300 – 2,700 liters/qq.) Training in occupational health and safety indirectly supports workers to protect their health on the job.

Negative direct impacts: Incorrectly constructed filter pits allow coffee wastewater to overflow and run-off into nearby arroyos or streams contaminating surface waters as well as leaching contaminating ground water. Coffee waste decomposition emits methane gases into the air. Poorly installed coffee drying equipment creates vibrations that damages infrastructure. Smoke emitted during drying processes, indoors, impacts human health when workers inhale it.

Negative indirect impacts: Water is being used for coffee processing without a management plan based on measured need (e.g. per crop) or assessment of local water supply/balances potentially contributing to community scarcity and disagreements over water use.

Analysis of the effect of coffee rust in coffee cultivation and management design for the small farmers: approximation of area affected, restoration of plantations, planting of coffee varieties resistant to coffee rust, including proposals for pesticides to control pests and diseases in conventional and organic coffee.

Associated USAID-approved implemented mitigation and monitoring measures

Annual training in the safe use of pesticides and IPMs per 2013 PERSUAP, proper disposal of plastic pesticide containers, construction and use of bio-beds as areas for pesticide equipment washing and pesticide preparation; establish native vegetative barriers along borders of coffee farms and edges of streams and rivers to capture run-off.

Positive direct and indirect impacts: Proposed action includes the development of a strategy and training to producers in managing coffee rust on their farms. This will reduce infestation and improve plant production and the volume harvested by the producers, thus improving their returns.

Negative direct impacts: Human health effects from variations in safe use and storage of pesticides. Coffee plant nurseries generate erosion and litter.

Negative indirect impacts: Coffee rust resistant varieties do not always produce the quality of coffee demanded by the market. Reliance on and over application of pesticides can reduce effectiveness of pesticides against coffee rust and create resistance. PPE can be cost prohibitive and therefore not all farmers can afford to use them, potentially exposing themselves to pesticide related human health risks and harm.

Technical assistance to promote improved technologies and/or practices. Training in soil conservation techniques, use and handling of pesticides, shade management, follow-up trainings for those with certifications, fertilization plans.

Connected proposed action: Reuse wet milling waste, such as pulp, by incorporating into compost, making fertilizers, or applying directly as a nutritional source for the coffee grove.

Associated USAID-approved implemented mitigation and monitoring measures

Soil conservation practices such as contour planting, individual terracing, cover crops, live and dead barriers, mulching. Annual training in the safe use of pesticides and IPMs per 2013 PERSUAP; proper disposal of plastic pesticide containers; construction and use of bio-beds as areas for pesticide equipment washing and pesticide preparation; disposal of pesticide containers via the Agrequima service. Establish native vegetative barriers along borders of coffee farms and edges of streams and rivers to capture run-off.

Positive direct and indirect impacts: Soil conservation and shade management measures protect soil from erosion and fertilization plans improve soil fertility improving soil and crop health, and indirectly improving watershed conditions.

Negative direct impacts: Compost piles located near waterways and without appropriate vegetative buffer zones allow nutrients to run-off into surface waters. (See also above identified impacts from pesticide use.)

Negative indirect impacts: PPE can be cost prohibitive and therefore not all farmers can afford to use them, potentially exposing themselves to pesticide related human health risks and harm.

Support quality certifications required by market. Provide training to the organizations in maintenance of certifications, tracking certification regulations and development of regulations.

Associated USAID-approved implemented mitigation and monitoring measures

None.

Positive direct and indirect impacts: Proposed action develops associations' institutional capacity to meet coffee certification standards and requirements, thus strengthening their access to certified coffee markets, and in some cases receiving a premium on their production and increasing incomes. Compliance with organic certification standards decreases risks to human health and to the environment from toxic pesticides. Compliance with Rainforest Alliance and Fair Trade certifications also improve occupational health conditions, as well as the environmental management of coffee farms which decreases, if not eliminates, potential contamination of waters from coffee wastes and litter in the environment, and supports an increase in biodiversity. Certifications create market incentive to apply and monitor best management practices.

Negative direct impacts: None.

Negative indirect impacts: None.

Promotion of practices to mitigate effects of and adaptation to climate change: training manuals of agricultural practices for climate change adaptation, including technology transfer and practice selection guides. Partnership with TNC to establish demonstration sites in four municipalities.

Associated USAID-approved implemented mitigation and monitoring measures.

None.

Positive direct and indirect impacts: Directly, proposed action is introducing concepts about climate change to local governments and farmers and providing them with tools and practices that can be applied in their production to adapt to the changes they are experiencing. Indirectly, the process of identifying climate change related production challenges with farmers validates their observations of the impacts they are experiencing.

Negative direct impacts: Climate change adaptation practices such as soil conservation methods not designed per farm soils, soil depth and slope can cause unintended soil erosion. Water use in coffee processing not adequately measured or monitored to help farmers assess and manage water can limit climate change adaptation knowledge and practice.

Negative indirect impacts: None.

Implementation of USAID-approved mitigation and monitoring measures (see measures per activities above.)

Positive direct and indirect impacts: Identification of impacts and training in and application of measures that can be taken by producers to minimize impacts on their health and natural resources, indirectly improving environmental awareness and stewardship.

Negative direct impacts: Variation in mitigation measure design and application across the RVCP has limited their effectiveness, creating conditions for soil erosion, water pollution from coffee wastewater and composting, as well as placing human health at risk from variations in pesticide safe use practices.

Negative indirect impacts: Producers are not fully learning how to implement mitigation measures that most effectively avoid, minimize or eliminate impacts.

Horticulture and Fruit Orchard Value Chains - Summary of Impacts

The proposed action fields 54 technicians and 54 para-technicians in the target, highly malnourished 30 municipalities to provide technical assistance and training to 90 producer groups; 7,619 producers farming 1,008.44 hectares. The proposed action influences producers in at least six more target municipalities than the No Action, and four times more technical assistance is fielded to horticulture and fruit producers farming 970 more hectares than the No Action.

Positive Effects	Negative Effects	Mitigation Measures
<ul style="list-style-type: none"> • Good agricultural practices improves soil conservation by implementing soil conservation techniques. • Water is conserved by adopting more efficient irrigation schemes. • Composting and fertilization plans improves soil fertility, increasing yields and farmers income. • Certification process ensures access to new markets and reduces risk to human health and environment from toxic pesticides. • Climate change adaptation measures help farmers protect against potential losses in production and income. 	<ul style="list-style-type: none"> • Variations in design of mitigation measures, such as bio-beds and pesticide safe use and management, expose farmers to toxic components and can pollute soils and waters. • Pesticides for fruit crops applied without thorough review of toxicity or safe use and IPM practices (PERSUAP) harms human health, soil and water bodies. • Latrines located too closely to waterways contaminate wastewater into streams or rivers. • Run-off from compost piles located too close to waterways contribute nutrients to surface waters and increase BOD. • Small-scale construction can contaminate waters and soil and create human health & safety risks. • Accumulation of plastic waste and litter in environment from drip irrigation and macro- tunnels. • Expensive best practices, such as metal fencing or field latrines, will be difficult for producers to afford. • Conversion of sprinkler systems to drip irrigation can unintentionally draw down local water supplies. • Insufficient data and methods of monitoring horticulture parcels can indirectly result in unintended expansion of coffee parcels into land unsuited for this production. • Producers not learning 	<ul style="list-style-type: none"> • Training in and implementation of IPM practices, • Training and implementation of safe pesticide use practices of the 2012 PERSUAP. • Construction and training in bio-beds. • Set up pesticide container collection with AGREQUIMA. • Implementation and training in efficient use and maintenance of drip irrigation systems. • Monitoring of water quality and quantity. • Train in water conservation practices. • Locate macro tunnels or greenhouses in areas protected from strong winds and on less than 5% slope and away from water ways. • Re-use plastics such as discarded irrigation tubing and AGRYL (by chopping up and mixing into organic material). • Incorporate organic waste into worm and regular compost systems. • Dispose of inorganic waste in official landfills or farm-based disposal pits. • Ensure the application of soil conservation methods (contour planting, live and dead barriers, acequias) and mulch.

Positive Effects	Negative Effects	Mitigation Measures
	complete mitigation measures.	

Cumulative actions: Community springs are tapped for domestic water, first. Other sources (streams, non-community springs) can be tapped for multiple-uses.

Cumulative effects: A lack of measurement or monitoring of water supply or demand can result in scarcity and/or competing water use or when irrigation systems are expanded to accommodate more producers.

Horticulture & Fruit Orchard Value Chain Detail – Proposed Action Impacts

Technical assistance and training in production topics to increase horticultural production quality and yields: (Crops: French beans, sweet pea, snow pea, garden pea, lima beans, Brussels sprouts, onion, potato, carrot, broccoli, cabbage, cauliflower, tomato, chile pimienta, chile jalapeño) Fertilization planning and practices (i.e. composting and pesticide use and management), and technologies and sanitary practices to improve quality and meet certification requirements (e.g. field-based latrines, hand washing stations and bio-beds.)

Associated USAID-approved Implemented Mitigation and monitoring measures

Training in and implementation of IPM practices, training and implementation of safe pesticide use practices of the 2012 PERSUAP. Construction and training in bio-beds; set up pesticide container collection with AGREQUIMA.

Positive direct and indirect: Composting and fertilization plans improve soil fertility and soil moisture and structure, and thus production and farmers income. Reduces over application of fertilizers that can run-off into surrounding waters and increases nitrogen load to waters. Sanitary practices improve quality and meet Global Gap certification requirements, thus opening markets to producers and improving environmental health conditions.

Negative direct impacts: Variations in design of bio-beds expose producers to risks of toxicity by pesticides (e.g. absence of walls that protect users from splash or water for washing.) Latrines located too closely to waterways contaminate wastewater into streams or rivers. Run-off from compost piles located too close to waterways and contributes nutrients to surface waters and increase BOD.

Negative indirect impacts: Increase in horticultural production risks expansion of this land use onto steep slopes in the upper watershed that could erosion and diminish water supply. Expensive best practices required for certifications, such as metal fencing, field latrines and PPEs, will be difficult to replicate by producers, thus reducing the sustainability of the environmental or human health benefits of these measures over time.

Technical assistance and training in irrigation and conversion to drip-irrigation systems. Producer adoption of production systems under controlled conditions such as macro-tunnels or greenhouses. (Macro-tunnel crops: tomato, chile pimienta, chile jalapeño).

Associated USAID-approved implemented mitigation and monitoring measures

Implementation and training in efficient use and maintenance of drip irrigation systems; monitoring of water quality and quantity; train in water conservation practices. Locate macro tunnels or greenhouses in areas protected from strong winds and on less than 5% slope and away from water ways. Re-use plastics such as discarded irrigation tubing and ARGYL (by chopping up and mixing into organic material); incorporate organic waste into worm and regular compost systems. Dispose of inorganic waste in official landfills or farm-based disposal pits.

Positive direct and indirect impacts: Drip irrigation systems can conserve water and are easier to install and decommission during times when they are not needed.

Use of macro-tunnels also minimize water use, maximize yields/harvests in less space thus allowing other land for permanent crops, and minimize pesticide use and associated water use for pesticide application.

Negative direct impacts: Small-scale construction (e.g. of greenhouses, macro-tunnels or collection sites) can generate waste and soil erosion and harm human health from construction accidents. Accumulation of plastic waste and litter from drip irrigation systems, and when the structure is decommissioned. While drip irrigation systems can be more efficient, conversion of sprinkler systems to drip irrigation without measurement and monitoring of supply and demand can unwittingly draw down local water supply/availability.

Negative indirect impacts: Macro-tunnels can be blown away by strong winds or be undermined during heavy rains. Small-scale construction can indirectly contribute sedimentation into neighboring bodies of water from site-based excavation and run-off. Small-scale construction can indirectly generate adverse environmental health conditions from accumulation of standing water or chemicals and waste.

Technical assistance and implementation of best agricultural practices: soil conservation practices such as contour planting, mulching, live and dead barriers, crop rotation, cover crops, utilization of organic fertilizers and terracing or bunds; training in the safe use and management of pesticides and the management of pesticide waste containers, and the monitoring of best management practices to meet certification standards.

Associated USAID-approved Implemented Mitigation and monitoring measures

Ensure the application of soil conservation methods (contour planting, live and dead barriers, acequias) and mulch. Training in and implementation of IPM practices, training and implementation of safe pesticide use practices of the 2012 PERSUAP. Construction and training in bio-beds; set up pesticide container collection with AGREQUIMA.

Positive direct and indirect impacts: Soil conservation measures protect soils from erosion and improve soil fertility improving soil and crop health, and indirectly improving watershed conditions. In communities served by Agrequima, pesticide containers are removed from the community environment, thus reducing litter and potential contamination by toxic chemicals. Triple wash in bio-beds of pesticide containers and their burying in appropriately designed and managed trash pits (where Agrequima doesn't serve) reduce potential contamination. Indirectly, monitoring of best management practices supports organizations to meet environmental

management certification standards, which provide additional market incentive to continue their practice, thus diminish potential impacts on soils, water, biodiversity and human health.

Negative direct impacts: Variations in pesticide use, safe use standards and practices can result in the application of unapproved pesticides, harm human health, and contaminate soils and water with highly toxic chemicals.

Negative indirect impacts: PPE can be cost prohibitive and therefore not all farmers can afford to use them, potentially exposing themselves to pesticide related human health risks and harm.

Support quality certifications required by markets. Training to the organizations in maintenance of certifications, in tracking certification rules, and in the elaboration of regulations for compliance with certification.

Associated USAID-approved implemented mitigation and monitoring measures

See above.

Positive direct and indirect impacts: Proposed action develops association capacity to meet Global Gap and Tesco certification standards thus securing their access to certified markets, and in some cases receiving a premium on their production and increasing incomes. Compliance with certification standards decreases risks to human health and the environment from pesticides, and improves occupational health conditions, as well as the environmental management of vegetable farms which decreases, if not eliminates, potential contamination of waters from eroding soils and litter in the environment, and supports an increase in biodiversity.

Negative direct impacts: None.

Negative indirect impacts: None.

Diversification and introduction of new export crops (e.g. cardamom and fruit orchards.)

Cardamom impacts are described in next section. Fruit orchard impacts include:

Associated USAID-approved implemented mitigation and monitoring measures

None.

Positive direct and indirect impacts: Soil conservation and fertilization measures protect soils from erosion and fertility improving soil and crop health, and indirectly improving watershed conditions.

Negative direct impacts: Application of pesticides on fruit crops risks human health and pollutes soils and surface waters from under used or variations in pesticide safe use practices, as well as their over application and/or use of un-approved highly toxic pesticides.

Negative indirect impacts: Expansion of fruit production in orchards risks extending this land use.

Intermediate or final post-harvest processing: e.g. selection, quality control, and packing in re-used plastic boxes to avoid damage during shipment.

Associated USAID-approved implemented mitigation and monitoring measures

Positive direct and indirect impacts: Re-use of plastic boxes for shipping reduces solid waste and protects crop from damage.

Negative direct impacts: None.

Negative indirect impacts: None.

Introduce practices that mitigate effects of and support producers to adapt to climate change, such as soil and water conservation practices. Conversion to drip-irrigation.

Associated USAID-approved implemented mitigation and monitoring measures

Implementation and training in efficient use and maintenance of drip irrigation systems; monitoring of water quality and quantity; train in water conservation practices.

Positive direct and indirect impacts: Directly, proposed action is introducing concepts about climate change to local governments and farmers and providing them with tools and practices that can be applied in their production to adapt to the changes they are experiencing reducing potential losses in production and therefore incomes from extreme events such as drought, landslides or flooding. Indirectly, the process of identifying climate change related production challenges with farmers validates their observations of the impacts they are experiencing.

Negative direct impacts: None.

Negative indirect impacts: Indirectly, conversion of sprinkler systems to drip irrigation without irrigation management plan can unwittingly draw down local water supply/availability.

Implementation and monitoring of USAID-approved environmental mitigation measures:

Positive direct and indirect impacts: Macro-tunnels reduce pesticide use, conserve water, optimize fertilizers and improve production. PERSUAP trainings improve pesticide safe use practices. Drip irrigation systems conserve water. Bio-beds provide for a safe on minimally polluting way to dispose of pesticide residue after spraying. Pesticide containers collected by a competent disposal service reduce litter.

Negative direct impacts: Variations in some mitigation measure design and application has impacted their effectiveness, creating conditions for human health risks and water pollution such as from bio-beds and pesticide use; the placement of compost piles and latrines too close to waterways, and litter in the environment from plastics such as generated by macro-tunnels or irrigation tubes.

Negative indirect impacts: Producers are not fully learning how to implement mitigation measures that most effectively avoid, minimize or eliminate impacts.

Cardamom Value Chain - Summary of Impacts

The proposed action will work with one association of five producer groups. It fields 6 technicians and 10 para-technicians to provide technical assistance to 805 more producers (on 1,050 hectares) than the No Action, which does not work with any.

Positive Effects	Negative Effects	Mitigation Measures
<ul style="list-style-type: none"> • Pests (e.g. Thrips) are controlled with crop sanitation methods and shade management. • Cardamom producers increase production due to technical assistance. • Forest degradation is reduced as producers will continue planting native trees in cardamom agroecosystems, and drying equipment will be made more efficient. 	<ul style="list-style-type: none"> • Pesticide use (USAID unapproved) in <i>Zona Reina</i> can harm human health as well as contaminate waters and soils (in relatively pesticide-free area of Guatemala) with pesticides and plastic containers. • Firewood harvested illegally and unsustainably from local forests degrading forests and neighboring protected areas. • Burning firewood for cardamom drying emits GHGs into atmosphere. • Tree nurseries produce waste that litter the environment. • Potential land use change; conversion from natural forest to cardamom production systems. • Incomplete or variations in best management practices can result in the ineffective mitigation of potential impacts. • Insufficient data and methods of monitoring cardamom farms could indirectly result in unintended expansion of 	<ul style="list-style-type: none"> • <i>Cardamom activities were just starting in 2015. No mitigation measures had yet to be defined by the project. They are identified in Annex D, EMMP.</i>

Positive Effects	Negative Effects	Mitigation Measures
	cardamom parcels into forested land.	

Cumulative impacts (Past, present and future actions): Firewood harvesting for domestic cooking in the Zona Reina.

Cumulative effects: Firewood harvesting for domestic cook stoves and cardamom drying cumulatively degrades surrounding forests and can affect capacity to maintain shade in agroforestry systems.

Cardamom Value Chain Detail – Proposed Action Impacts

Cardamom value chain activities are just starting, therefore there are no associated USAID-approved mitigation measures.

Technical assistance and training in production topics to increase cardamom quality and yields and introduce best agricultural practices, such as crop sanitation, shade and pest and disease management (e.g. Thrips.)

Positive direct and indirect impacts: Crop sanitation methods as well as shade management can help control Thrips.

Negative direct impacts: Application of pesticides in a system that is de facto organic introduces toxic chemicals into the environment – soils, waters, and air. Unsafe application of pesticides harms human health. Potential use of pesticides may hurt the marketing/sale of their cardamom product if it was being sold as organic previously.

Negative indirect impacts: Increase in returns on production in cardamom risks expansion of this crop into otherwise forested parcels.

Improved technologies in post-harvest management, such as more efficient cardamom drying technologies and practices including dryers that recycle energy and maintenance and repair of existing dryers to increase their efficiency.

Positive direct and indirect impacts: More efficient cardamom drying technologies should reduce the amount of firewood consumed in the process thus decreasing degradation of surrounding forests, and minimize fuel wood costs to processor thus increase profits.

Negative direct impacts: Firewood used in cardamom drying technologies can be sourced from illegally harvested and unsustainable supplies contributing to the degradation of surrounding forests and protected areas.

Negative indirect impacts: Fuel wood demand and supply for the RVCP associations is unmeasured and not monitored. More efficient technologies may still not contribute to a more sustainable consumption/yield of firewood and will continue to degrade surrounding forests.

Incorporation of fuel wood and multi-use agroforestry species to provide shade in 324 ha of existing cardamom plantations; establish cardamom and tree nurseries.

Positive direct and indirect impacts: Increasing fuel wood trees in agroforestry systems decreases reliance on firewood harvested from surrounding natural forests or (illegally) from protected areas.

Negative direct impacts: Tree nurseries generate plastic waste that litters the environment when not properly disposed. While not specified in the proposed action, incorporation of non-native multi-use or fuel-wood species can change habitats and negatively impact biodiversity; some fast-growing, exotic fuel wood species can change soil chemistry.

Negative indirect impacts: None.

Introduce practices that mitigate effects of and support producers to adapt to climate change: implementation of nurseries with cardamom plants selected for their resilience to the effects of climate change, pest and disease; soil conservation practices that reduce erosion and improve soil stability; cardamom agroforestry systems with native fuelwood species and 5 climate change demonstration farms that put into practice up to 30 climate change practices proposed in the AGEXPORT climate change manual.

Positive direct and indirect impacts: Directly, it is expected that soil conservation practices will improve production and resilient cardamom plants with help to manage Thrips and other disease. Cardamom agroforestry systems will help stabilize soils, increase carbon capture and increase farm fuel wood supplies. Climate change demonstration farms will indirectly support the spread of climate change adaptation practices.

Negative direct impacts: At this time, measures are same as above, as are their impacts.

Negative indirect impacts: See above.

Environmental review of activities, and development and implementation of Environmental Mitigation and Monitoring Plan (EMMP)

Positive direct and indirect impacts: Identification of impacts and training in and application of measures that can be taken by producers to minimize impacts on their health and natural resources, indirectly improving environmental awareness and stewardship.

Negative direct impacts: None.

Negative indirect impacts: Incomplete application or variations in standards of mitigation measures decreases their effectiveness, such as in pesticide safe use and management.

Handicraft Value Chain - Summary of Impacts

The proposed action fields 18 technicians and 34 para-technicians to provide technical assistance to 38 producer groups with 2,241 producers. (The No Action can only provide 1 – 3 technicians for all COMART handicraft groups, nation-wide.)

Positive Effects	Negative Effects	Mitigation Measures
<ul style="list-style-type: none"> • AZO-free textiles protects human health and meets export market quality. • Artisans re-utilize remnants incorporating them into other products such as pin cushions, minimizing their solid waste. • Improved technologies reduce pressure on women's bodies. • Diversification of design opens up new market opportunities; • Women artisans of all age ranges will generate family income. 	<ul style="list-style-type: none"> • Toxic chemical in threads can harm weavers' health and handicrafts buyers. • Potential contamination of water resources by thread dyeing companies. • Handicraft raw materials such as wood or palm leaves may come from illegal supplies. • Potential impacts on human health from inadequate occupational health and safety conditions when implementing new production techniques. 	<ul style="list-style-type: none"> • Verify legal sources of wood per INAB certifications. • Verification of non-toxic threads • Improve the efficiency and effectiveness of machinery to conserve energy and reduce waste. • Promote the correct recollection and disposal of solid waste such as plastic bottles, glass, and re-use remnants of cloth and other raw materials. • Assess noise levels generated by machinery per municipal standards.

Cumulative impacts actions: Trash is not properly managed throughout communities and litter thrown onto roadsides, into arroyos and streams, or burned. Ineffective solid waste management systems in communities and at municipal levels.

Cumulative effects: Remnants of materials from handicraft production, or plastics generated during production, cumulatively add to community or municipal solid waste.

Handicraft Value Chain Detail – Proposed Action Impacts

Provide training and technical assistance to strengthen production of handicrafts: training in design, image, web page, markets; training in specific production lines as well as in the production of various items from palm trees.

Associated USAID-approved implemented mitigation and monitoring measures

Verify legal sources of wood per INAB certifications,

Positive direct and indirect impacts: Artisans are given the skills and tools to create export-quality products and to market their associations and products, thus accessing new markets and increasing incomes.

Negative direct impacts: Toxic chemicals in threads can harm human health of the weavers and artists, as well as the buyers of the product. Production of handicrafts can generate solid waste, which can litter the environment.

Negative indirect impacts: Illegally harvested wood or palm fronds used in handicraft production can contribute to their depletion, as well as harm soils, water and biodiversity from impactful harvesting practices. Unsustainable harvesting can put at risk the continued availability of the raw material and therefore the production of the handicraft. Water treatment practices of the only provider of export quality, AZO-free thread in Guatemala, can result in contamination of surface and groundwater around thread company production plant.

Assess incorporation of new production techniques develop products according to customer needs, such as new designs.

Associated USAID-approved implemented mitigation and monitoring measures

Verify legal sources of wood per INAB certifications.

Positive direct and indirect impacts: New production techniques can save time and costs of production and improve quality; new designs increase artisan's capacity to meet market demand and increase their profit margin.

Negative direct impacts: Potential impacts on human health from inadequate occupational health and safety conditions when implementing new production techniques.

Negative indirect impacts: Producers can be unfamiliar with the raw materials, equipment or processes required for new production techniques resulting in sourcing of unsafe or unsustainable materials, as well as potential impacts on human health from inadequate occupational health and safety conditions.

Improved technologies or production practices such as back-strap looms and inputs and modern looms tailored to the artisans, implementation of looms for bracelets, equipping workshops with treadle looms for weaving wool, carding machinery and machinery for thread spinning; sewing machines.

Associated USAID-approved implemented mitigation and monitoring measures

Improve the efficiency and effectiveness of machinery to conserve energy and reduce waste, promote the correct recollection and disposal of solid waste such as plastic bottles, glass, re-use remnant of cloth and other raw materials, assess noise levels generated by machinery per municipal standards.

Positive direct and indirect impacts: Improved technologies and production practices can decrease pressure on women's bodies such as on eyes or back during weaving, while also increasing the quality of the finished product, thus increasing profit margins. Remnants from cloth and threads are being re-utilized into other products decreasing litter and solid waste in the environment.

Negative direct impacts: Risk of impacts on human health from inadequate occupational health and safety or emergency management practices for new technologies and practices that might include chemicals.

Negative indirect impacts: None.

Opening of national and international markets and search for new markets.

Associated USAID-approved Implemented Mitigation and monitoring measures

None.

Positive direct and indirect impacts: Connections with new markets improve demand of artisan product resulting in an increase in production and indirectly in greater returns/income.

Negative direct impacts: None.

Negative indirect impacts: Expanding production can require more raw materials placing pressure on the ecosystem from which they are harvested/sourced.

Gender: women's empowerment in the value chains. Inclusion of women of all ages, particularly elderly and more knowledgeable, expert women in production of handicrafts.

Associated USAID-approved implemented mitigation and monitoring measures

None.

Positive direct and indirect impacts: Women of all age ranges earning income from their arts and skills, which will contribute to increase family income and thus contributing to improve health, nutrition and education of children. A range of ages of women participating in the handicraft production provides opportunities for learning to be exchanged along generations, thus conserving traditional knowledge as well as adding value to knowledge and skills of the elderly.

Negative direct impacts: None.

Negative indirect impacts: None.

Environmental Mitigation: implementation of USAID-approved mitigation measures.

Positive direct and indirect impacts: Verification of non-toxic threads⁵³, and sourcing of them from a Guatemalan thread company helps protect the health of weavers, and meet export market demand. Sourcing of legal wood reduces indirect impacts on forests and other ecosystems from their harvesting.

Negative direct impacts: None.

Negative indirect impacts: Unverified companies that dye threads with toxic chemicals can harm human health and pollute rivers and streams.

Food Security and Nutrition - Summary of Impacts

The proposed action fields 25 technicians to provide food security and nutrition technical assistance and training to 6,509 families. Under the No Action scenario, RVCP families would need to join or form a Ministry of Agriculture CADER, which are being developed in 114 municipalities of the Western Highlands. Each CADER learning center serves 25 families.

Positive Effects	Negative Effects	Mitigation Measures
<ul style="list-style-type: none"> • Irrigation systems can conserve water. • Soil conservation measures and composting improve home garden production. • Clean water avoids water-borne illness. • Improved cook stoves will save family money on the purchase of firewood and decrease forest degradation. 	<ul style="list-style-type: none"> • Compost piles may contaminate water bodies if they are set close by. • Plastic waste and litter generated from drip irrigation systems contaminate water bodies • Drip irrigation systems may unintentionally deplete domestic water supplies. 	<ul style="list-style-type: none"> • Analysis and monitoring of water supply and demand for home garden irrigation. • Rainwater harvesting in home gardens. Use drip irrigation from water storage tank when possible. • Soil conservation practices based on slope, terraces, incorporation of vegetable material into soil and minimum to no-till practices. • Teach families home-remedies for garden pests (natural pesticides). • Safe pesticide use per the PERSUAP. • Construction of bio-beds and training and use of PPE. • Small-scale construction best practices: selection of

⁵³ This mitigation measure replaced the various ones related to the dying of thread that were in the original USAID- approved project EMPRs, when the project decided threads would be bought instead of dyed by the participants.

Positive Effects	Negative Effects	Mitigation Measures
		<p>construction sites with less than 12% slope and deposit construction solid waste in official sanitary landfills and plan will be reviewed and approved by a certified engineer; construction will meet earthquake resistance standards.</p> <ul style="list-style-type: none"> • Construct improved latrines at CCDSANS. • Construct filtration pits to absorb grey-water generated in CCDSANS. • Designate a group of people to be in charge of CCDSAN maintenance and train them in maintenance

Cumulative actions: Community springs are principally tapped for domestic consumption.

Cumulative effects: Home gardens are mostly irrigated from community systems, which can contribute to scarcity in domestic supply.

Food Security and Nutrition Detail – Proposed Action Impacts

Establishment of home gardens/establishment of school gardens: micro-drip irrigation systems of 50 m² or less, establishment of raised fields for planting vegetables and soil conservation, provision of high nutrition seeds, training in nutritionally balanced recipes, increased soil fertility through application of organic fertilizers/composting.

Associated USAID-approved implemented mitigation and monitoring measures

Analysis and monitoring of water supply and demand for home garden irrigation. Rainwater harvesting in home gardens. Soil conservation practices based on slope: terraces, contour planting, live and dead barriers, incorporation of vegetable material into soil and minimum to no-till practices. Teach families home-remedies for garden pests (natural pesticides), safe pesticide use per the PERSUAP, construction of bio-beds and training and use of PPE.

Positive direct and indirect impacts: Drip irrigation systems can conserve water and are easy to install and decommission during times when they are not needed. Composting and soil conservation measures improve home garden production and improve nutritional value of vegetables.

Negative direct impacts: Compost piles located too closely to water bodies or sources or without adequate vegetative buffer zones contaminate them with nutrients from decomposing waste, including manure of livestock. Plastic waste and litter generated from installation and maintenance of drip irrigation systems.

Negative indirect impacts: Design and installation of micro-drip irrigation systems does not take into account availability of water for crops, nor water supply of the system and needs of other uses (i.e. horticulture production, tree nurseries, or domestic consumption.) (Depending on the irrigation source, which may be used by a community, a few families or just one.) PPE can be cost prohibitive and therefore not all farmers can afford to use them, potentially exposing themselves to pesticide related human health risks and harm. Introduced vegetable seeds can be expensive, and native seeds can be difficult to find as plants disappear.

Alternative methods for purification of water for human consumption. Provision of water filters and training in use and maintenance.

Positive direct and indirect impacts: Clean water avoids water-borne illness and disease improving child (and adult) health and nutrition.

Negative direct impacts: Depleted water filters can litter the environment when changed out of system.

Negative indirect impacts: None.

Improved, fuel-efficient stoves built in schools and homes. Establishment of stoves and training for use and maintenance.

Positive direct and indirect impacts: More fuel-efficient stoves directly can save families money on the purchase of firewood, decreases smoke inhalation in kitchens, and indirectly minimizes degradation of surrounding forests from firewood harvesting, as well as emission of GHGs.

Negative direct impacts: None.

Negative indirect impacts: None.

Construction of Community Demonstration Centers of Food Security and Nutrition (CCDSAN)

Associated USAID-approved Implemented Mitigation and monitoring measures

Small-scale construction best practices: selection of construction sites with less than 5% slope and deposit construction solid waste in official sanitary landfills and plan will be reviewed and approved by a certified engineer; construction will meet earthquake resistance standards. Construct improved latrines (maximum 2) at CCDSANS and construct filtration pits to absorb grey-water generated in CCDSANS. Designate a group of people to be in charge of CCDSAN maintenance and train them in maintenance.

Positive direct and indirect impacts: These centers for training and practice model SAN practices correctly, improving the knowledge and capacity of participating families, technicians and para-technicians. Model proper management of grey-water and latrine design that minimizes risks of the spread of pathogens or water pollution. Mitigation of soil erosion, solid waste generation, and litter from construction activities.

Negative direct impacts: Construction can cause injury to workers. Latrines can contaminate soils and spread pathogens.

Negative indirect impacts: Traffic to demonstration sites can increase, impacting roads or trails. Demonstration site location can alter run-off patterns creating flooding, or conditions for landslides.

Implementation of USAID-approved mitigation measures.

Positive direct and indirect impacts: Soil conservation and measures improve fertility, drip irrigation systems and water supply and demand assessment and monitoring can decrease pressures on domestic supplies. Risks of harm to human health from pesticide use decrease.

Negative direct impacts: None.

Negative indirect impacts: None.

9 ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVE C ACTIONS BY VALUE CHAIN

All of the Proposed Actions are carried over and are part of Alternative C, as are their positive and negative impacts, which are not repeated here. (Also, the number of technicians, para-technicians, master farmers, producer groups and producers and hectares affected by the proposed actions remains the same for Alternative C.) However, the summary tables do include additional or modified mitigation measures per the negative consequences described in the Proposed Actions that are carried over. *Those that carry over from the Proposed Action are italicized.* It is also organized by value chains; however, it starts with Alternative C Actions that are cross-cutting to the value chains - coffee, cardamom, horticulture and fruit orchards, handicrafts – and to food security and nutrition activities under component 5.

The complete description of mitigation measures is found in Annex D, the EMMP.

Cross-cutting Value Chains' Alternative Actions – Summary of Impacts

Positive Effects	Negative Effects	Mitigation Measures
<ul style="list-style-type: none"> • Successful RVCP models and best practices replicated /adopted (and standardized) across implementing partners and farmers. • Illiterate farmers have access to information. • Improved/informed land use data and monitoring. 	<ul style="list-style-type: none"> • Non-uniformity of data can impede analysis of RVCP land use. • Mapping compromises trust between project participants and technicians or para-technicians indirectly impacting the effectiveness of the RVCP intervention • When landfilling or recycling services are not available often the only 	<ul style="list-style-type: none"> • Ensure model farms (master farmers and farms) reflect the complete and correct application of the mitigation measures and best practices promoted by the project. • Ensure climate change demonstration sites and model farms reflect the complete and correct application of mitigation measures and best practices

Positive Effects	Negative Effects	Mitigation Measures
<ul style="list-style-type: none"> • Occupational health and safety improved. • Improved management of solid waste on farms and in communities. 	<p>option is to bury trash in pits on the farm and the farmer may be motivated to burn the trash, instead.</p>	<p>promoted by the project.</p> <ul style="list-style-type: none"> • Recruit/develop male and female master farmers from a range of age groups (e.g. youth, middle-age, elder) • Establish solid waste collection receptacles in nurseries

Mitigation measures from carried over Proposed Actions: *Train farmers to not burn solid waste. Develop solid waste management practices with producers or producer groups. Training in occupational health and safety.*

Cumulative Actions: Development of CADERs by MAGA; INAB forest incentive program – PINPEP – will prioritize farms in water recharge zones (headwaters).

Cumulative Effects: Overlap of Master Farmer and CADER in a community can consolidate resources into a few families causing jealousies. On the other hand, it provides opportunities to exchange best practices and technologies, potentially scaling up learning and results.

Cross-cutting Alternative Actions Detail – Alternative C Impacts

Issue 1- Technical assistance and training is not having the expected results (fully addressing environmental management needs) and may be limited by language and literacy barriers.

Alternative Action: Exchange of Experiences/Field Trips with Producers and Project Technicians

Positive direct and indirect impacts: Project technicians and para-technicians across implementing partners learn from successful models within the Western Highlands FTF target region. Best practices become more standardized across the RVCP. Indirectly, sharing experiences can also support innovations and coordination within market segments, such as the example of the Coffee “Mesa de Concertación” in the Ixil Region.

Negative direct impacts: None.

Negative indirect impacts: None.

Alternative Action: Publish extension materials in pictographs to reach illiterate producers.

Positive direct and indirect impacts: Extension materials will reach a wider audience, including the illiterate or those not literate in the Spanish language.

Negative direct impacts: None.

Negative indirect impacts: None.

Issue 2 - Land use monitoring: project baseline data (that of the RVCP or MEP) was not designed to collect, map or monitor land use information of participating farms in a way that facilitates the monitoring of land use change.

Alternative Action: Land Use Monitoring

Positive direct and indirect impacts: Land use data collection and monitoring will support the project to identify sustainable land use over the last two years of the project.

Negative direct impacts: Existing land use data collected by producer groups is not standardized impeding a more uniform understanding and analysis of land use within the RVCP.

Negative indirect impacts: Land tenure of most small farmers in the Western Highlands is not formal, and can be contested. Mapping of lands can generate suspicions and indirectly develop trust issues between the project and participants, impacting the effectiveness of the RVCP interventions.

Issue 3 - Inadequate occupational health and safety conditions impact air quality in the work environment, damage infrastructure and can pollute local soils and water.

Alternative Action: Develop a culture of occupational health and safety.

Positive direct and indirect impacts: Build internal capacity of producer groups to identify, plan and monitor occupational health and safety practices, decreasing occupational risks. Connections with collaborating municipal or national organizations help sustain the development of a culture of safety.

Negative direct impacts: None.

Negative indirect impacts: None.

Issue 4 - Litter and solid waste management: improper solid waste management in agricultural production and processing, handicraft production and in plant nurseries can contribute to the community-wide problem with inorganic litter and waste, a problem experienced throughout Guatemala.

Alternative Action: Training in Solid Waste Management practices

Positive direct and indirect impacts: Solid waste generated from enterprises will not pollute community environment. Producers have greater knowledge of how their activities can contribute to environmental problems and the cost-effective solutions available to them.

Negative direct impacts: None.

Negative indirect impacts: When waste landfilling or recycling services (such as provided by Agrequima) are not available to a producer, organization or community often the only option is to bury trash in pits on the farm and the farmer may be motivated to burn the trash, instead.

The following impacts analysis is specific to each value chain and component 5.

Coffee Value Chain – Summary of Impacts

Positive Effects	Negative Effects	Mitigation Measures
<ul style="list-style-type: none"> Nitrogen-fixing grasses provide greater slope stability and improve soil fertility. Coffee wastewater does not overflow from filter pits. Water better managed and 	<ul style="list-style-type: none"> PPE are cost prohibitive and therefore not all farmers can use them, potentially exposing themselves to related health risks. Incomplete application of 	<ul style="list-style-type: none"> Find cost-effective yet equally protective PPE options, such as devising eye protection and protecting clothing from plastic bottles and bags.

Positive Effects	Negative Effects	Mitigation Measures
conserved.	safe pesticide use practices can result in the application of unapproved pesticides, harm human health, and contaminate soils and water with highly toxic chemicals.	<ul style="list-style-type: none"> • Update all pesticide and IPM training and technical assistance to adhere to the findings of the January 2015 Programmatic PERSUAP for LAC (LAC-IEE-15-05)⁵⁴ • Provide farmers/ associations lists of approved pesticides. • Ensure that purchased motorized backpack sprayers meet FAO standards⁵⁵ and incorporate practices⁵⁶ that protect human health and the environment. • Select and plant shade trees based on the altitude, aspect and soils of a given site. • Train farmers to diversify shade trees planted in their shade grown coffee agroforestry systems per shade grown international standards⁵⁷

⁵⁴ <http://gemini.info.usaid.gov/egat/envcomp/repository/pdf/42611.pdf>

⁵⁵ <http://www.fao.org/docrep/006/Y2752S/Y2752S00.htm>

⁵⁶ Practices include: calibration of equipment, determining the proper application rate, pressure and speed of movement, determining the amount of chemicals to use and the safe application of pesticides. Information on these practices can be found in the Environmental Guidelines for Small-scale Agriculture in Africa, Chapter 13, p. 34 – 40

<http://www.encapafrika.org/sectors/saferpesticides.htm> and the APHIS USDA Job Hazard Analysis, https://www.aphis.usda.gov/emergency_response/downloads/health/JHA%2020%20Application%20of%20pesticides-herbicides%20by%20Hand%20apparatu.pdf

⁵⁷ While shade grown coffee agroforestry systems are necessarily designed per site-based characteristics (aspect, soils, climate, etc.) here are some common standards: AGEXPORT (2014b) recommends shade grown coffee systems have a minimum of 10 species of trees and a minimum density of 70 trees per hectare. July 2014 Rainforest Alliance standards (12 native species per hectare including fruit trees, at least 40% shade and at least two canopy strata) and in Bird Friendly standards which include 40% shade cover, a diversity of at least 10 woody species, and three stratum of structural diversity.

Positive Effects	Negative Effects	Mitigation Measures
		<ul style="list-style-type: none"> • Protect existing multi-use shade trees during renovation. • Locate plant nurseries on flat ground or construct erosion control devices and vegetative barriers on steep slopes. • Farmers must be trained to manage worms, being vigilant of their proper enclosure and not letting them escape into the environment. • Promote the re-conditioning of filter pits to contain coffee wastewater in small-scale mills. • Locate compost piles at least 20m from bodies of water and ensure they are protected from rain and strong winds, are not located in floodplains, nor will run-off contaminate crops or irrigation water

Mitigation measures carried over from Proposed Actions: *Annual training in the safe use of pesticides and IPMs per 2015 Programmatic PERSUAP. Promote and train farmers in the correct construction and use of biological beds. Train farmers to clean and dispose of empty pesticide containers according to Guatemalan norms. Manual weeding will be promoted to leave some 10 cm of the plants in their place instead of eliminating them. Train para-technicians and producers in the design and implementation of soil conservation standards and practices. Where applicable (per farm size/plan), rotate renovation of coffee groves (in blocks or in rows) to preserve the permanent shade plants, which mitigates alteration of the coffee tree's habitat, and staggering periods of non-productivity of young coffee plants on farms. Establish native vegetation barriers (such as with multi-use grasses) between coffee crops and the edges of streams and other bodies of water. Train farmers to reuse wet milling waste, such as pulp, by incorporating into compost and making fertilizers. Incorporate organic waste into worm and regular compost systems.*

Cumulative Actions: Aging coffee plantations are being abandoned. Twenty years of planting introduced species (Gravilea) into coffee agroforestry systems (and Inga). More frequent intense rainfalls and prolonged drought as a result of climate change. Decomposing livestock manure contributing GHGs together with the methane produced from the coffee waste water in the open pits.

http://nationalzoo.si.edu/scbi/migratorybirds/coffee/quick_reference_guide.cfm

Cumulative Effects: Coffee fields protected from grasses and shade trees while new plants mature and soils improved. More native species incorporated into coffee shade grown systems supporting biodiversity and family nutrition. Reduced impacts from coffee wet milling (filter pits) in watersheds from recondition pits.

Coffee Value Chain Detail – Alternative C Impacts

Issue 1 - Soil erosion: coffee field renovation and establishment can create conditions for soil erosion if soil management and conservation measures are not applied properly, and

Issue 2- Diversity of native species in agroforestry systems: the Proposed Action's selection of shade tree species, and that of non-native or invasive species, to be used in project agroforestry systems has the potential to affect biodiversity on farms.

Alternative Action: Plant nitrogen fixing, multi-use grasses (for mulch and livestock forage) during coffee field renovation, as well as native fuel wood/shade trees or fruit trees

Positive direct and indirect impacts: Grasses help to stabilize soils, and nitrogen-fixing grasses improve soil fertility. Multi-use grasses can be cut and fed to livestock (e.g. cattle, goats) as well as used as mulch, which improves their nutrition who, in turn serve as protein sources to the family, contributing to child nutrition. Internationally recognized standards, as identified in the associated mitigation measure, such as Rainforest Alliance, Smithsonian Bird-Friendly or exemplified in the AGEXPORT best practices manual provides benchmarks for diversification

Negative direct impacts: None.

Negative indirect impacts: None.

Issue 3- Water management and conservation: Water is being used for irrigation in some horticulture crops and for coffee processing without sufficient measurement and monitoring of water use, supply and demand.

Alternative Action: Water Management and Conservation

Positive direct and indirect impacts: Measurement and monitoring of water use during coffee processing, with and without conservation practices supports the analysis of water system requirements and capabilities; planning for the future and times of scarcity; and water conservation practices during wet milling.

Negative direct impacts: None.

Negative indirect impacts: None.

Issue 4 – Water pollution: a) Existing coffee waste water disposal systems using filter pits have the potential to overflow (such as in wet coffee processing at the Asociación Chajulense in Quiche and as identified in the July 2014 Audit, p. 24) and can cause surface and ground water contamination when water is not treated or filter pits not designed correctly, and b) Agriculture production actions such as pesticide application, fertilizer use, and composting can deteriorate water quality due to inappropriate location of the activities, lack of buffer zones, and when best management practices are not followed.

Alternative Action: Promote re-conditioning of “honey water” (coffee wastewater) treatment filter pits

Alternative Action: Development of instructional materials that give general recommendations to farmers, para-technicians and technicians on how to design a filter pit based on local conditions and volume of coffee wastewater generated.

Positive direct and indirect impacts: Filter pit designs and technical assistance is based on the measured volume of water used during micro-wet milling and the local soil type ensures the pit is large enough for coffee wastewater to fully infiltrate. This avoids waste-water overflow into the surrounding environment that can potentially contaminate surface waters, accumulating and effecting downstream water quality and users. Re-conditioning is also protecting filter pits from rainwater incursion by constructing roofs over them. Coffee pulp/residue left in filter pits is incorporated into compost once water filters and re-incorporated into soils thus improving soil fertility and structure.

Negative direct impacts: If pits are not redesigned or an alternative method not used for capturing waste honey water, then there exists the potential for ground water to be contaminated due to leaching of honey water nutrients.

Negative indirect impacts: None.

Issue 5 – Pest and disease management: Coffee rust, thrips, and other pests/diseases are impacting coffee, cardamom, and fruit tree production, as well as horticulture production. Pesticide use is seen as a solution to minimizing pest and disease in crop production but can negatively impact health and water quality, especially in areas under organic production such as on organic coffee farms in the Zona Reina, at the headwaters of the Chixoy River Basin.

The sub-issues are:

- 1) *Variations in pesticide use and safe use standards⁵⁸ and practices.*
- 2) *The appropriate coffee-rust resistant varieties to plant per local conditions and international markets.*
- 3) *The lack of standardized IPM practices in project value chains that can be applied in conventional and organic systems.*

Alternative Action: Training and implementation by the project technicians, para-technicians and farmers in the Programmatic Pesticide Evaluation Report and Safe Use Action Plan (PERSUAP) for Coffee, with Emphasis on Coffee Rust, approved January 2015. [Alternative C also incorporates the aforementioned successful models of technology transfer (e.g. Pesticide Brigades) to ensure the 2015 approved pesticides and safe use practices are being applied.]

⁵⁸ The July 2014 Audit cites various inconsistencies with pesticides being used by RVCP participants and the project PERSUAP. “Based on observations in the field and interviews with producers, the environmental audit results indicate that participants in the RVCP are not compliant with the PERSUAP. Based on active ingredients in commonly used pesticides such as Duett, the first active ingredient in epoxiconazole + carbendazim is listed as a fungicide not to be used on USAID projects. In addition, copper oxide and tea tree oil (*Melaleuca alternifolia*) are utilized by producers, but not included in the approved PERSUAP list” (Cadmus 2014, p.30).

Positive direct and indirect impacts: Technicians, para-technicians and farmers will have a greater and more updated set of knowledge, skills and awareness that will indirectly improve the selection, timing of application, and safe use of effective pesticides against coffee rust, as well as IPM practices. Directly, this will minimize their exposure to toxic chemicals, decreasing potential harm to human health and contamination of surrounding environment, including waters.

Negative direct impacts: Incomplete application of safe pesticide use practices can result in the application of unapproved pesticides, harm human health, and contaminate soils and water with highly toxic chemicals.

Negative indirect impacts: PPE are cost prohibitive and therefore not all farmers can use them, potentially exposing themselves to related health risks.

Cardamom Value Chain – Summary of Impacts

Positive Effects	Negative Effects	Mitigation Measures
<ul style="list-style-type: none"> • PERSUAP for cardamom will identify natural pesticides to be used for organic plantations. This will help to reduce the human exposure to toxic pesticides. • A decrease in and rational use of firewood, as well as fuelwood plantations will reduce forest degradation and deforestation in natural forests. 	<ul style="list-style-type: none"> • Organic practices might not adequately address the Thrips problem thus endangering farmer crop production. • Pesticide PPEs can be costs prohibitive exposing producers to health risks. • Soil erosion and damage to surrounding vegetation when fuel wood trees are harvested. • Potential human injury from harvesting fuelwood plantations. • Potential displacement of other land uses, from plantations. • Burning firewood for cardamom drying emits GHGs into atmosphere. 	<ul style="list-style-type: none"> • Train farmers with fuelwood plantations to harvest firewood in a way that minimizes risks to human health and impacts on soils and surrounding waters, trees or habitats. (Such as via pruning or when necessary, selective cutting and directional felling.) • Fuelwood plantations will be planted only in abandoned pasture or agricultural lands. (not in established forest.) • Only native trees will be used for reforestation. • Select and plant agroforestry trees based on the altitude, aspect and soils of a given site. • Update all training and technical assistance to adhere to the findings of the USAID- developed Pesticide Evaluation and Safe Use Action Plan for cardamom. • Pesticide PPE and safe use mitigation measures as identified in coffee value chain. • Locate plant nurseries on flat ground or construct terraces and erosion control devices on steep slopes; plant vegetative barriers to control erosion around nursery.

Mitigation measures carried over from Proposed Actions: *Construct on demonstration plots and train farmers in the correct and complete construction and use of pesticide mixing zones and bio-beds (Biodeps). Train cardamom farmers in IPM and PERSUAP recommended pesticides and safe use practices.*

Cumulative Actions: Other national (and internationally-funded) initiatives introducing pesticides to Zona Reina farmer to control Thrips. Firewood collection and harvesting for domestic use.

Cumulative Effects: Greater knowledge of IPM and organic practices to control Thrips thus reducing pesticide use at least on RCVP lands which would minimize the spread of Thrips and pesticide contamination in the Zona Reina. Greater knowledge of how to safely apply pesticides when needed. Reforestation of abandoned pastures with native species and improved dryers will decrease pressure on natural forests thus decreasing the cumulative negative impacts that were occurring previously.

Cardamom Value Chain Detail – Alternative C Impacts

Issue 1 – Pest and disease management: Coffee rust, thrips, and other pests/diseases are impacting coffee, cardamom, and fruit tree production, as well as horticulture production. Pesticide use is seen as a solution to minimizing pest and disease in crop production but can negatively impact health and water quality, especially in areas under organic production such as on organic coffee farms in the Zona Reina, at the headwaters of the Chixoy River Basin.

The sub-issues are:

- 1) *Variations in pesticide use and safe use standard⁵⁹ and practices.*
- 2) *The appropriate coffee-rust resistant varieties to plant per local conditions and international markets.*
- 3) *The lack of standardized IPM practices in project value chains that can be applied in conventional and organic systems*

Alternative Action: Train project technicians, para-technicians and farmers in the findings of the PERSUAP for cardamom production (as developed by USAID) in the Zona Reina.

Positive direct and indirect impacts: Integrated Pest Management practices will be prioritized to minimize farmer use and dependence on chemical products. The PERSUAP will also identify natural pesticides that can address the Thrips problem and how to safely use them. Technicians, para-technicians and farmers will have a greater set of skills, knowledge and awareness that will indirectly improve their selection, timing of application and safe use of effective pesticides against cardamom pest and disease, such as Thrips. Directly, this will minimize farmer exposure to toxic chemicals, decreasing potential harm to human health and contamination of surrounding environment, including waters.

⁵⁹ The July 2014 Audit cites various inconsistencies with pesticides being used by RVCP participants and the project PERSUAP. “Based on observations in the field and interviews with producers, the environmental audit results indicate that participants in the RVCP are not compliant with the PERSUAP. Based on active ingredients in commonly used pesticides such as Duett, the first active ingredient in epoxiconazole + carbendazim is listed as a fungicide not to be used on USAID projects. In addition, copper oxide and tea tree oil (*Melaleuca alternifolia*) are utilized by producers, but not included in the approved PERSUAP list” (Cadmus 2014, p.30).

Negative direct impacts: Incomplete application of safe pesticide use practices can result in the application of unapproved pesticides, harm human health, and contaminate soils and water with highly toxic chemicals.

Negative indirect impacts: PPE are cost prohibitive and therefore not all farmers can use them, potentially exposing themselves to related health risks.

Alternative Action: Promote Organic Standards to Cardamom Producers in Zona Reina.

Positive direct and indirect impacts: Directly, farmers are not exposed to toxic chemicals that can cause human health problems, nor applying chemicals that can contaminate soils, waters and air. Indirectly, organic practices save farmers money and may be more culturally acceptable as pesticide application is not very widely practiced by farmers in the Zona Reina.

Negative direct impacts: None

Negative indirect impacts: Organic practices might not adequately address the Thrips problem thus endangering farmer crop production.

Issue 2 - Forest degradation: forest habitats and associated biodiversity can be negatively impacted by the consumption of fuel wood for drying cardamom. Fuel wood purchased for cardamom drying may be illegally and unsustainably harvested, and;

Issue 3 - Diversity of native species in agroforestry systems: the Proposed Action's selection of shade tree species, and that of non-native or invasive species, to be used in project agroforestry systems has the potential to affect biodiversity on farms.

Alternative Action: Sustainable Fuel Wood Management Planning:

Positive direct and indirect impacts: The management plan will help cardamom producers of the five associations to assess firewood supply and demand, and to identify actions they can take to fill their firewood needs (via legal and more sustainable supplies), indirectly decreasing pressures on surrounding forests that are harvested illegally.

Negative direct impacts: None

Negative indirect impacts: None.

Alternative Action: Small-scale fuel wood plantations

Positive direct and indirect impacts: Farmers planting firewood for cardamom drying (and domestic needs) to sell to dryers help make up deficit of wood harvested legally, as well as provides additional income. Indirectly, decreases pressure on surrounding forests and protected areas from illegal or unsustainable harvesting. Demonstration of fuelwood plantations may encourage others to create their own plantation as a source of income.

Negative direct impacts: Soil erosion and damage to surrounding vegetation when fuel wood trees are harvested.

Negative indirect impacts: Potential displacement of mature, natural forest with fuel wood plantations.

Alternative action: Assess improved designs of present cardamom drying technologies.

Positive direct and indirect impacts: The efficiency of existing dryers and that achieved from preventative maintenance, repairs or improved designs will be measured with cardamom dryers, directly measuring the savings in firewood and indirectly in costs. This assessment will also inform the sustainable fuel wood management planning activity, helping farmers to project firewood consumption into the future.

Negative direct impacts: None

Negative indirect impacts: If efficiency and resulting cost savings is not attained, cardamom dryers might be less motivated to make improvements.

Horticulture and Fruit Orchards - Summary of Impacts

Positive Effects	Negative Effects	Mitigation Measures
<ul style="list-style-type: none"> • Irrigation management plan will help organizations identify opportunities and limits of irrigation production. • Water management practices will be more efficient. • Monitoring builds awareness and knowledge of benefits of soil and water conservation practices. • Technicians and farmers will be trained to improve their selection, timing of application and safe use of pesticides as well as IPM practices in all RVCP crops. 	<ul style="list-style-type: none"> • Ineffective implementation of irrigation management plans can reduce water conservation objective. • PPE can be cost prohibitive and therefore not all farmers can afford to use them. • Incomplete application of safe pesticide use practices can result in soil and water contamination and harm human health. 	<ul style="list-style-type: none"> • Strengthen existing or form an irrigation management committee. • Worm bins must have solid, enclosed sides and bottoms and farmers must be trained to manage worms, being vigilant of their proper enclosure and not letting them escape into the environment. • Locate latrines at least 30m from water bodies or sources. Ensure they are constructed above water table and downslope from any wells or water sources. • Locate compost piles at least 20m from bodies of water and ensure they are protected from rain and strong winds; are not located in floodplains, nor will run-off contaminate crops or irrigation water. • Pesticide PPE and safe use mitigation measures as identified in coffee value chain. • Nursery management as identified in coffee value

Positive Effects	Negative Effects	Mitigation Measures
		chains. <ul style="list-style-type: none"> • Locate macro-tunnels and greenhouses where they won't be damaged by high winds or intense rains. • Apply USAID Visual Field Guide: Construction⁶⁰ at all RVCP constructed small-scale infrastructure: macro-tunnels, greenhouses, and centros de acopio (product collection centers) to ensure they are not generating impacts. Take corrective actions when impacts identified.

Mitigation measures carried over from Proposed Actions: *Train producers in occupational health and safety. Train farmers in the amended RVCP PERSUAP to include fruit orchards, green and jalapeño peppers. Train farmers in integrated pest management practices to control pests in their horticulture crops per the project PERSUAP, and as amended for new crops. Construct and train farmers in the correct and complete construction and use of pesticide mixing zones and bio-beds (Biodeps) on demonstration plots. Incorporate organic waste into worm and regular compost systems. Train farmers in irrigation best management and water conservation methods.*

Cumulative Actions: Community springs are tapped for domestic water, first. Other sources (streams, non-community springs) can be tapped for multiple-uses. Multi type agriculture dominates within all of the project area and use of irrigation vs. rainwater is increasing and putting additional pressure on existing water sources. Rain water is seldom captured and stored for irrigation use. Project promoting drip irrigation and capture/storage of rain water where possible (small gardens near homes) to conserve water.

Cumulative Effects: The positive impacts of water conservation from the project activities (monitoring water use, plans, and drip irrigation) minimize the negative cumulative impacts of inefficient water use for agriculture within the project area. The overall amount of need with drip systems, combined with macro tunnels and water storage, is anticipated to be lower than previous sprinkler systems while producing similar or increased crop production on the same amount or less land. This will have a decreased negative impact within the project area.

Horticulture Value Chain Detail – Alternative C Impacts

⁶⁰ http://www.usaidgems.org/Documents/VisualFieldGuides/ENCAP_VsIFldGuide--Construction_22Dec2011.pdf

Issue 1 - Water management and conservation: Water is being used for irrigation in some horticulture crops and for coffee processing without sufficient measurement and monitoring of water use, supply and demand.

Alternative action: Irrigation Management Plan and Implementation, and Alternative action: Compare volume of water used (per cuerda or square meter per crop) by the two systems – sprinkler systems and RVCP-installed drip irrigation systems with management (including soil conservation practices) in demonstration sites.

Positive direct and indirect impacts: Irrigation management plan will help producer organizations identify opportunities and limits of irrigated production, more efficient irrigation practices, and actions that contribute to the more sustainable use of water. Comparison of soil and water conservation under different irrigation systems will help demonstrate the benefits to farmers. Indirectly, irrigation management planning conserves surface and ground water and both actions contribute to climate change adaptation.

Negative direct impacts: None.

Negative indirect impacts: Absence of or poorly trained irrigation management committees can influence the effective implementation of the plan.

Issue 2 – Pest and disease management: Coffee rust, thrips, and other pests/diseases are impacting coffee, cardamom, and fruit tree production, as well as horticulture production. Pesticide use is seen as a solution to minimizing pest and disease in crop production but can negatively impact health and water quality, especially in areas under organic production such as on organic coffee farms in the Zona Reina, at the headwaters of the Chixoy River Basin.

The sub-issues are:

- 1) *Variations in pesticide use and safe use standards⁶¹ and practices.*
- 2) *The appropriate coffee-rust resistant varieties to plant per local conditions and international markets.*
- 3) *The lack of standardized IPM practices in project value chains that can be applied in conventional and organic systems*

Alternative Actions: Training of project technicians, para-technicians and farmers in PERSUAP as amended by the MEP to include crops and pesticides not reviewed such as apples, peaches, green peppers and jalapeño peppers.

Positive direct and indirect impacts: Technicians, para-technicians and farmers will have the set of skills, knowledge and awareness specific to the crops they are growing that will indirectly improve their selection, timing of application and safe use of effective pesticides, as well as IPM practices. Directly, this will minimize their exposure to toxic chemicals, decreasing potential harm to human health and contamination of surrounding environment, including waters.

⁶¹ The July 2014 Audit cites various inconsistencies with pesticides being used by RVCP participants and the project PERSUAP. “Based on observations in the field and interviews with producers, the environmental audit results indicate that participants in the RVCP are not compliant with the PERSUAP. Based on active ingredients in commonly used pesticides such as Duett, the first active ingredient in epoxiconazole + carbendazim is listed as a fungicide not to be used on USAID projects. In addition, copper oxide and tea tree oil (*Melaleuca alternifolia*) are utilized by producers, but not included in the approved PERSUAP list” (Cadmus 2014, p.30).

Negative direct impacts: Incomplete application of safe pesticide use practices can result in the application of unapproved pesticides, harm human health, and contaminate soils and water with highly toxic chemicals.

Negative indirect impacts: PPE are cost prohibitive and therefore not all farmers can use them, potentially exposing themselves to related health risks.

Alternative Action: Exchange of Experiences/Field Trips with Master Farmers, Producer Groups, Para-technicians and Project Technicians, sharing and promoting the adoption of successful models, such as the **Pesticide Brigades**, in other producer groups.

Positive and negative impacts as described in cross-cutting alternatives.

Handicraft Value Chains – Summary of Impacts

Positive Effects	Negative Effects	Mitigation Measures
<ul style="list-style-type: none"> Raw materials are not illegally harvested. Identification of non-toxic supplier of thread with verified wastewater treatment improves handicraft environmental “footprint”. 	<ul style="list-style-type: none"> High cost of non-toxic, “environmentally friendly” threads might increase costs of production. 	<ul style="list-style-type: none"> Train handicraft organizations to verify if raw materials meet market requirements, are legal and non-toxic.

Cumulative Actions: Trash is not properly managed throughout communities and litter thrown onto roadsides, into arroyos and streams, or burned. Ineffective solid waste management systems in communities and at municipal levels.

Cumulative effects: Remnants of materials from handicraft production, or plastics generated during production are reduced, re-used or recycled, or disposed of properly in an official landfill or a properly designed one at the workshop.

Handicraft Value Chain Detail – Alternative C Impacts

Issue 1 - If handicraft raw materials are bought from unsafe and unsustainable sources, they could impact human health, place indirect pressures on a natural resource, and negatively impact handicraft production.

Alternative Action: Source verification of raw materials.

Positive direct and indirect impacts: Raw materials supplied to handicraft producers are not illegally harvested and meet export market quality standards. This decreases impacts on forests, and the ecosystems and habitats from which the product is derived as well as improves incomes.

Negative direct impacts: None.

Negative indirect impacts: Some raw materials may be difficult to verify and confirm its legal and sustained yield, resulting in unintended impacts.

Alternative Action: Identify other providers of non-toxic thread (in Guatemala or regionally) that treat wastewater and meet export market requirements.

Positive direct and indirect: Threads used in handicraft production do not generate water pollution or toxic contaminants.

Negative direct: None.

Negative indirect: Cost of non-toxic, non-polluting threads can be higher potentially limiting capacity to produce product affordably.

Food Security and Nutrition Activities – Summary of Impacts

Positive Effects	Negative Effects	Mitigation Measures
<ul style="list-style-type: none"> • Water conservation in cash crops and home gardens. • The selection of crops promoted in home gardens is done by participants including native nutritional plants. • Food sovereignty approach helps to recognize, adopt and protect local agro biodiversity. 	<ul style="list-style-type: none"> • Stored water in rainwater barrels can breed vectors, microorganism and algae when left exposed to sunlight and not drained. 	<ul style="list-style-type: none"> • Train families at demonstration sites in rainwater harvesting best practices. • Locate compost piles at least 20m from bodies of water and ensure they are protected from rain and strong winds, are not located in floodplains, nor will run-off contaminate crops or irrigation water. (e.g. where necessary, plant vegetative strips to help capture potential run-off from compost piles.) • Locate , latrines at least 30m from water bodies or sources. Ensure they are constructed above water table and downslope from any wells or water sources or crops. • Monitor compliance with small- scale construction best practices by applying the USAID ENCAP Visual Field Guide for Construction⁶².

⁶² http://www.usaidgems.org/Documents/VisualFieldGuides/ENCAP_VisFldGuide--Construction_22Dec2011.pdf

Mitigation measures carried over from Proposed Actions: *Train families in organic, home remedy and integrated pest management practices to control pests in home gardens. Train families in the project PERSUAP when using pesticides. Teach soil conservation measures in home gardens including minimal to no till techniques and incorporation of compost to improve soil humidity. Train families in best management practices for water conservation in irrigation. Train families in solid waste management practices (cross-cutting with other value chains). Implement infiltration pits (soakaways) in the CCDSAN so that the gray water can be filtered or processed. Develop a CCDSAN maintenance plan with responsible maintenance committee. Deposit solid waste generated by CCDSAN construction in an official sanitary landfill, where one exists. (Re- use/recycle waste first.) All CCDSAN designs will be reviewed by a certified civil engineer.*

Cumulative actions: Community springs are tapped for domestic consumption.

Cumulative effects: Home gardens are mostly irrigated from community systems, which can contribute to scarcity in domestic supply. Home gardens may be replicated on other non-member farms or in more member farms putting additional stress on water supplies within the project area when combined with non-member farmers using less efficient irrigation systems. The capture and use of rainwater as promoted by the project would minimize the cumulative impacts of water availability.

Food Security and Nutrition Detail – Alternative C Impacts

Issue 1- Water management and conservation: Water is being used for irrigation in some horticulture crops and for coffee processing without sufficient measurement and monitoring of water use, supply and demand.

Alternative Action: Demonstrate the harvesting of rainwater for vegetable gardens in master farms.

Positive direct and indirect impacts: Harvesting rainwater offsets the use of domestic supplies, for a limited time, during the dry season.

Negative direct impacts: None.

Negative indirect impacts: Rainwater run-off can collect feces from birds, other contaminants or heavy metals. Stored water can also breed mosquitos and other vectors if design and management of the stored water are not done as per the demonstrations.

Alternative Action: Apply mulch to home gardens to conserve soil moisture.

Positive direct and indirect impacts: Mulching and cover crops help to maintain soil moisture thus decreasing need for irrigation. Green manures increase soil fertility and soil structure while reducing costs of inorganic fertilizers and pesticides (creating stronger plants due to the mulch properties/benefits are more resistant to pests and disease) as well as improve health of family members from no or less pesticides

Negative direct impacts: None.

Negative indirect impacts: None.

Issue 2 - Conservation of local agrobiodiversity: Crops promoted in home gardens do not reflect the full range of medicinal and other vegetables that participants like to eat or use, potentially limiting the benefits of local agrobiodiversity that has traditionally been conserved in home gardens, and their benefits to food security and nutrition.

Alternative Action: Exchange of experiences between AGEXPORT/INCAP and ANACAFE/FUNCAFE to learn successful approaches to food sovereignty of participating families.

Positive direct and indirect impacts: Crops promoted for home garden are selected by participants, including the local and native plants that they are familiar with, thus indirectly improving their acceptance and utilization. The food sovereignty approach supports the recognition and conservation of some local agrobiodiversity and the importance of native species as well as a diversity of vegetables in family nutrition.

Negative direct impacts: None

Negative indirect impacts: None.

10 COMPARISON OF IMPACTS OF ALTERNATIVES CHART

	No Action	Proposed Action	Alternative C
<i>Issue 1- Forest degradation: forest habitats and associated biodiversity can be negatively impacted by the consumption of fuel wood for drying cardamom. Fuel wood purchased for cardamom drying may be illegally and unsustainably harvested.</i>			
+ impacts	<ul style="list-style-type: none"> Under the No Action alternative, producers will continue to plant species native to the Zona Reina in cardamom agro-ecosystems, thus supporting local biodiversity. 	<ul style="list-style-type: none"> Increasing fuel wood trees in agroforestry systems decreases reliance on firewood harvested from surrounding natural forests or (illegally) from protected areas. More efficient cardamom drying technologies should reduce the amount of firewood consumed in the process thus decreasing degradation of surrounding forests, and minimize fuel wood costs to processor thus increasing profits. 	<ul style="list-style-type: none"> Sustainable fuelwood management: measurement of use/need per improved technologies and monitoring of fuel wood demand and supply (and resulting management plan) supports farmers to meet fuel wood needs for cardamom drying, without degrading forest. Farmers planting small-scale firewood plantations for cardamom drying (and domestic needs) to sell to dryers help make up deficit of wood harvested legally, as well as provides additional income. Indirectly, decreases pressure on surrounding forests and protected areas from illegal or unsustainable harvesting. Demonstration of fuelwood plantations may encourage others to create their own plantation as a source of income. Same additional positive impacts as identified in Proposed Action.
- impacts	<ul style="list-style-type: none"> Zona Reina is at risk of converting natural forest into cardamom Unsustainable extraction and illegal purchase of fuel wood to dry cardamom which can degrade 	<ul style="list-style-type: none"> Fuel wood demand and supply for the RVCP associations is unmeasured and not monitored. Firewood used in cardamom drying technologies can be sourced from 	<ul style="list-style-type: none"> Soil erosion and damage to surrounding vegetation when fuel wood trees are harvested. Potential human injury from harvesting fuel wood plantations.

	No Action	Proposed Action	Alternative C
	<p>natural forest around cardamom plantations</p> <ul style="list-style-type: none"> • According to AGEXPORT and USAID, cardamom producers utilize between 8.8 m³ and 13.5 m³ of fuel wood to dry one tonne of cardamom. • Forest degradation affects the integrity and health of ecosystems, threatened and endangered species and their habitats, and promotes erosion, and run-off that affects water resources. • Burning firewood under existing old technology to dry cardamom emits GHGs (carbon dioxide) is inefficient. 	<p>illegally harvested and unsustainable supplies .</p> <ul style="list-style-type: none"> • More efficient technologies may still not contribute to a more sustainable consumption/yield of firewood and will continue to degrade surrounding forests. • Burning firewood to dry cardamom emits GHGs (carbon dioxide). 	<ul style="list-style-type: none"> • Potential displacement of other land uses, including forests, from plantations. • Burning firewood to dry cardamom emits GHGs (carbon dioxide).

Issue 2 - Diversity of native species in agroforestry systems: the Proposed Action's selection of shade tree species, and that of non-native or invasive species, to be used in project agroforestry systems has the potential to affect biodiversity on farms.

+ impacts	<ul style="list-style-type: none"> • The use of native and non-native species in coffee agro forestry systems provide shade cover that helps to protect soils from erosion, to regulate the hydrological cycle at local or regional level (e.g. recharge water sites), to provide mulch to coffee plants by fallen shade tree leaves which helps to keep moisture and enrich soils with organic matter (e.g. leaves from the Guama.) 	<ul style="list-style-type: none"> • The proposed action only plants native species in cardamom agroforestry systems reducing potential impacts to biodiversity. • No invasive species are being introduced. • Both native and non-native leguminous shade species can fix nitrogen in soil improving its availability to coffee plants. • Shade species introduced into coffee agroforestry systems, such as Gravilea and some Ingas, provide shade cover during the dry months when native shade species shed their leaves. • The leaf litter of Guama (local name for Inga sp.) has demonstrated to improve soil quality, are fast-growing and can be 	<ul style="list-style-type: none"> • Same additional positive impacts as Proposed Action.
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	No Action	Proposed Action	Alternative C
		<p>pruned for firewood.</p> <ul style="list-style-type: none"> Incorporation of more native shade species that also provide food for both families and local wildlife will result in multiple positive impacts: protect soils and improve their fertility from fallen leaves (and even fruit), greater slope stability, diversification of the family “fruit basket” improving their nutrition, and food and habitat for local wildlife including migratory birds and important local pollinators. 	
- impacts	<ul style="list-style-type: none"> Coffee agro forestry systems will continue to be dominated by introduced Gravilea, and Inga species, and limited overall diversity within the agroforestry system (six species observed during scoping; 69% Inga and Gravilea; 30% others.). Limited understanding of the potential impacts on wildlife, especially effects on threatened and endangered species, in large agroforestry landscapes dominated by introduced Gravilea and Inga. 	<ul style="list-style-type: none"> Current reliance on introduced shade species (Gravilea) reduces incorporation of a more diverse array of native species that can be associated with coffee in agroforestry systems. This minimizes benefits to biodiversity (e.g. native threatened and endangered trees) at local and landscape levels, as well as food security and nutrition of families when more fruit trees can be incorporated. 	<ul style="list-style-type: none"> Mitigation measures address potential negative impacts of carried over proposed actions, such as selecting and planting shade trees based on the altitude, aspect and soils of a given site and training in diversification based on internationally recognized standards, such as Rainforest Alliance, Smithsonian Bird-Friendly or exemplified in the AGEXPORT best practices manual provides benchmarks for diversification and shade systems structures.

Issue 3 - Soil erosion: coffee field renovation and establishment can create conditions for soil erosion if soil management and conservation measures are not applied properly.

+ impacts	<ul style="list-style-type: none"> In less than half of RVCP target associations, in certified organizations, soil conservation measures protect farms from erosion and improve soil fertility, help soil carbon sequestration, improving crop health and indirectly watershed conditions. 	<ul style="list-style-type: none"> Establishment of coffee agroforestry systems in previously degraded or abandoned fields creates ground and canopy cover that directly protects soils, helping maintain their humidity, fertility and structure. Indirectly, coffee agroforestry systems improve watershed conditions and provide 	<ul style="list-style-type: none"> Grasses planted during renovation help to stabilize soils, and nitrogen-fixing grasses improve soil fertility. Multi-use grasses can be cut and fed to livestock (e.g. cattle, goats) as well as used as mulch, which improves livestock nutrition who, in turn serve as protein sources to the family,
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	No Action	Proposed Action	Alternative C
		habitat for migratory and resident birds, pollinators and other fauna. <ul style="list-style-type: none"> Use of resistant coffee varieties and cultural management practices in renewed plantations would minimize rust and spreading of rust for improved yields. 	contributing to child nutrition. <ul style="list-style-type: none"> Additional positive impacts per Proposed Action.
- impacts	<ul style="list-style-type: none"> 60% of Guatemala's coffee farms need to be renovated and renewed. With limited technical assistance, soils will be exposed to erosion, compaction and degradation, even renovating coffee plantations. Restricted technical assistance will result in a persistence of coffee rust, decreasing production Reduced income can encourage land use conversion into other short-term cash crops. Eroded soils will prevail on steep terrains, especially on farms that were not part of previous projects. Uncertified organizations will not take actions to improve soil fertility, organic matter or humidity, thus increasing vulnerability to climate change. 	<ul style="list-style-type: none"> During plantation establishment or renovation and periods of pruning, soils can be exposed and vulnerable to erosion, when soil conservation measures are not adequately applied, nor the appropriate measure for slope of the land and soil depth is applied. (e.g. space between live barriers on steep slopes.) Renovation of parcels reduces farmer production in the short-term, taking land out of production for 2-3 years while coffee plants get established and grow. Climate change adaptation practices such as soil conservation methods not designed per farm soils, soil depth and slope can cause unintended soil erosion. 	<ul style="list-style-type: none"> <i>Mitigation measures effectively avoid or minimize potential negative consequences of carried over proposed actions, such as training in soil conservation practices per USAID Environmental Guidelines for Agriculture, rotation of renovated areas (in blocks or by rows), and protection of existing multi-use shade trees.</i>
<i>Issue 4 - Water management and conservation: Water is being used for irrigation in some horticulture crops and for coffee processing without sufficient measurement and monitoring of water use, supply and demand.</i>			
+ impacts	<ul style="list-style-type: none"> Where drip irrigation or macro-tunnels are adopted, water resources may be better conserved. 	<ul style="list-style-type: none"> Drip irrigation systems more efficiently use water and are easier to install and decommission during times when they are not needed. Use of macro-tunnels also minimize water use. Eco-friendly (coffee) wet milling 	<ul style="list-style-type: none"> Measurement and monitoring of water use during coffee processing, with and without conservation practices, supports the analysis of water system requirements and capabilities; planning for the future and times of scarcity; and water

	No Action	Proposed Action	Alternative C
		technologies more efficiently use water. (Est.50 - 200 liters of water/qq; or a savings of est.1,300 – 2,700 liters/qq.).	conservation practices during wet milling. <ul style="list-style-type: none"> • Irrigation management plan will help organizations identify opportunities and limits of irrigation production. • Water management practices will be more efficient. • Monitoring builds awareness and knowledge of benefits of soil and water conservation practices. • Additional positive impacts per Proposed Action.
- impacts	<ul style="list-style-type: none"> • AGEXPORT will have limited funds to support the conversion of irrigation and production systems under controlled conditions such as macro-tunnels or greenhouses. • Inefficient irrigation systems will continue to draw down community water supplies (e.g. domestic water supplies), especially during drought. • Horticulture producers will not reach expected yields and will not manage their water efficiently. 	<ul style="list-style-type: none"> • Water is being used for coffee processing is not adequately measured or monitored to help farmers assess and manage water, potentially contributing to community scarcity and limiting climate change adaptation knowledge and practice. • While drip irrigation systems can be more efficient, conversion of sprinkler systems to drip irrigation without measurement and monitoring of supply and demand can unwittingly draw down local water supply/availability. • Design and installation of micro-drip irrigation systems does not take into account availability of water for crops, nor water supply of the system and needs of other uses (i.e. horticulture production, tree nurseries, or domestic consumption.) (Depending on the irrigation source, which may be used by a community, a few families or just one.). 	<ul style="list-style-type: none"> • <i>Mitigation measures effectively avoid or minimize potential negative consequences of carried over proposed actions, such as training farmers in irrigation best management practices and water conservation methods, strengthening irrigation management committees</i>

Issue 5 – Water pollution: a) Existing coffee waste water disposal systems using filter pits have the potential to overflow (such as in wet coffee processing at the Asociación Chajulense in Quiché and as identified in the July 2014 Audit, p. 24) and can cause surface and ground water

	No Action	Proposed Action	Alternative C
<i>contamination when water is not treated or filter pits not designed correctly, and b) Agriculture production actions such as pesticide application, fertilizer use, and composting can deteriorate water quality due to inappropriate location of the activities, lack of buffer zones, and when best management practices are not followed.</i>			
+ impacts	<ul style="list-style-type: none"> Organic producers will not use pesticides. Water resources better protected from pesticide residue from practices applied by certified organizations and those receiving limited technical assistance. 	<ul style="list-style-type: none"> Eco-friendly coffee wet milling technologies generate less wastewater (honey water) reducing potential contamination. (Est.50 - 200 liters of water/qq; or a savings of est.1,300 – 2,700 liters/qq.) Organic practices and pesticides as well as IPM eliminates or reduces risk of toxic contamination of soils and water. Composting and fertilization plans improves soil fertility, increasing yields and farmers income. Pesticides are more efficiently applied. Triple wash in bio-beds of pesticide containers and their burying in appropriately designed and managed trash pits (where Agrequima doesn't serve) reduces potential contamination. 	<ul style="list-style-type: none"> Filter pit re-conditioning: design and technical assistance, including written instructional recommendations, based on the measured volume of water used during micro-wet milling and the local soil types ensures the pit is large enough for coffee wastewater to fully infiltrate. This avoids waste-water overflow into the surrounding environment that can potentially contaminate surface waters, accumulating and effecting downstream water quality and users. Re-conditioning is also protecting filter pits from rainwater incursion. Left over coffee pulp from filter treatment incorporated into compost and therefore improves soil fertility and structure. Additional positive impacts as described in Proposed Action.
- impacts	<ul style="list-style-type: none"> RVCP small producers will continue to use the filter pit method to capture artisanal waste water. They are often incorrectly designed, and overflow into rivers, streams or arroyos. Coffee waste water increases biological oxygen demand (BOD) 6 kg for each 100 pounds of coffee milled. Small producers mill approximately 6,000 pounds a season and an estimated 200 – 300 liters of water per 100 	<ul style="list-style-type: none"> Incorrectly constructed filter pits allow coffee wastewater to overflow and run- off into nearby arroyos or streams contaminating surface waters as well as leaching and contaminating ground water. Compost piles located near waterways and without appropriate vegetative buffer zones allow nutrients to run-off into surface waters. Run-off can carry fertilizer into 	<ul style="list-style-type: none"> Mitigation measures effectively avoid or minimize potential negative consequences of carried over proposed actions, such as incorporation of coffee pulp into compost, train farmers to establish native vegetation barriers between fields and water bodies, correct design of biobeds, and locating compost piles at least 20m from waters.

	No Action	Proposed Action	Alternative C
	<p>pounds processed. That means that approximately 18 m³ of water can be discharged over several days and a total BOD of 360 kg potentially discharged directly into surface waters (streams and rivers.)</p> <ul style="list-style-type: none"> • Decomposing coffee waste will pollute local waters and emits GHGs, mainly methane. • Over application of pesticides can result in toxicity, contamination of soils and waters and harm to human health. • The water contamination arising from overflow of filter pits and resulting water pollution can generate local disagreements especially with downstream villages that receive upstream water contamination. 	<p>surface waters causing nutrient build up in waters.</p> <ul style="list-style-type: none"> • Variations in pesticide safe use practices can contaminate soils and water with toxic chemicals and can harm human health. 	

Issue 6 – Pest and disease management: Coffee rust, thrips, and other pests/diseases are impacting coffee, cardamom, and fruit tree production, as well as horticulture production. Pesticide use is seen as a solution to minimizing pest and disease in crop production but can negatively impact health and water quality, especially in areas under organic production such as on organic coffee farms in the Zona Reina, at the headwaters of the Chixoy River Basin.

The sub-issues are:

- 1) Variations in pesticide use and safe use standards⁶³ and practices.

⁶³ The July 2014 Audit cites various inconsistencies with pesticides being used by RVCP participants and the project PERSUAP. “Based on observations in the field and interviews with producers, the environmental audit results indicate that participants in the RVCP are not compliant with the PERSUAP. Based on active ingredients in commonly used pesticides such as Duett, the first active ingredient in epoxiconazole + carbendazim is listed as a fungicide not to be used on USAID projects. In addition, copper oxide and tea tree oil (*Melaleuca alternifolia*) are utilized by producers, but not included in the approved PERSUAP list” (Cadmus 2014, p.30).

	No Action	Proposed Action	Alternative C
	2) <i>The appropriate coffee-rust resistant varieties to plant per local conditions and international markets.</i>		
	3) <i>The lack of standardized IPM practices in project value chains that can be applied in conventional and organic systems</i>		
+ impacts	<ul style="list-style-type: none"> Organic certification directly helps to reduce risks to human health and the environment from the use of toxic pesticides. Rain Forest Alliance, Fair Trade, TESCO, Maya Cert/USDA, UTZ certification provide standards to protect worker health and that of the environment. These standards help to protect natural resources such as water bodies and soil from toxicity from the over use of pesticides and fertilizers; and to preserve local and regional biodiversity indexes. 	<ul style="list-style-type: none"> Compliance with organic certification standards decreases risks to human health and to the environment from toxic pesticides. The rational use of pesticides, the generation of composting material, and the implementation of technical fertilization plans will help horticulture associations to have healthy crops, fertile soil, and pests and diseases controlled. Therefore, yields and family income will increase. Indirectly, PERSUAP trainings will result in a reduced and safer application of pesticides decreasing costs and potential negative impacts on the environment and human health. The motorized sprinkler more evenly sprays pesticides onto plants, controls its application, and covers more area. Macro-tunnels help to control pests and diseases and increase yields per unit area, Proposed action includes the development of a strategy and training to producers in managing coffee rust on their farms. This will reduce infestation and improve plant production and the volume harvested by the producers, thus improving their returns. Bio-beds provide for a safe, minimally polluting way to dispose of pesticide residue after spraying Crop sanitation methods as well as shade 	<ul style="list-style-type: none"> Continued training in pesticide use and IPM per the guidance and standards of the LAC Regional PERSUAP with emphasis on coffee rust re-inforce best and safe practices. Learning and adoption of other successful models, such as the Pesticides Brigades, can improve safe use practices minimizing risks to human health. Promoting organic practices and standards in cardamom production eliminates need for pesticides. Amended PERSUAPS to include new crops such as jalapenos, apples and cardamom will provide crop- specific guidance selection, timing of application and safe use of pesticides as well as IPM practices in all RVCP crops minimizing or eliminating potential toxicity to environment and human health.

	No Action	Proposed Action	Alternative C
- impacts	<ul style="list-style-type: none"> • Non-certified coffee farmers may apply highly toxic pesticides (unapproved by USAID) and will apply them ineffectively and without personal protection equipment which can cause burns and harm health. • Pests and diseases may increase due to the lack of integrated pest management methods and improper pesticides use on uncertified farms. • Build-up of toxic chemicals in soils and water poisoning beneficial microorganisms in the soil as well as downstream aquatic fauna and flora. • Limited financial support and training can result in the unsafe and ineffective use of sprayer pumps by farmers who afford to purchase them. • Pesticide use can also continue with manual sprayer pumps, which present risks to human health. • Producers will continue washing the pesticide containers and pumps in water bodies spilling agrochemicals into streams or rivers pollute surface waters and can contaminate drinking water downstream. • Petroleum sub-products like fuel and oil can spill and/or leak into the soil, waters and also affect human 	<p>management can help control Thrips.</p> <ul style="list-style-type: none"> • When motorized sprayers are not designed, calibrated, maintained or used correctly they can over-apply pesticides potentially harming the crop, as well as contaminating soils and water. Farmers not trained in their safe use can experience burns or intoxication. • Farmers stop using motorized sprayers due to fuel and maintenance costs and go back to their traditional method of application which is more harmful. • When bio-beds are not adequately designed and constructed, pesticides can spill into the environment contaminating soils, waters and impacting human health. • PPE can be cost prohibitive and therefore not all farmers can afford to use them, potentially exposing themselves to pesticide related human health risks and harm. • Human health effects from variations in safe use and storage of pesticides. • Reliance on and over application of pesticides can reduce effectiveness of pesticides against coffee rust and create resistance. • PPE can be cost prohibitive and therefore not all farmers can afford to use them, potentially exposing themselves to pesticide related human health risks and harm. • Application of pesticides on fruit crops risks human health and pollutes soils and surface waters from under used or 	<ul style="list-style-type: none"> • PPE are cost prohibitive and therefore not all farmers can use them, potentially exposing themselves to related health risks. <p><i>Mitigation measures avoid or eliminate potential negative consequences of carried over proposed action and of Alternative C actions, such as, updating PERSUAP training materials to most current guidance, emphasis on IPM, training in the complete and correct construction of biobeds, training in the triple-wash and disposal of pesticide containers, provide associations with updated lists of approved pesticides, manual weeding instead of the use of herbicides, training in the safe use of pesticides sprayers per FAO standards.</i></p>

	No Action	Proposed Action	Alternative C
	<p>health.</p> <ul style="list-style-type: none"> Without personal protection equipment, pesticide application affects skin and respiratory organs as pesticides are sprayed out under more pressure than manual pumps. Non-certified and producers not served by AGEXPORT in six municipalities will not be able to implement sanitary practices such as hand washing stations nor pesticide mitigation measures (e.g. bio-beds.) 	<p>variations in pesticide safe use practices, as well as their over application and/or use of un-approved highly toxic pesticides.</p> <ul style="list-style-type: none"> Application of pesticides in a system that is de facto organic introduces toxic chemicals into the environment – soils, waters, and air. Unsafe application of pesticides harms human health. Potential use of pesticides may hurt the marketing/sale of their cardamom product if it was being sold as organic previously. 	
<p><i>Issue 7 - Litter and solid waste management: improper solid waste management in agricultural production and processing, handicraft production and in plant nurseries can contribute to the community-wide problem with inorganic litter and waste, a problem experienced throughout Guatemala.</i></p>			
+ impacts	<ul style="list-style-type: none"> Agrequima's⁶⁴ Campo Limpio program helps establish used pesticide container collection sites in communities. Collected plastics are sent to be recycled. Under the No Action alternative 31 coffee and 3 horticulture certified organizations are expected to continue to carry out solid waste management practices to meet certification standards and do not contribute to the issue. 	<ul style="list-style-type: none"> In communities served by Agrequima, pesticide containers are removed from the community environment, thus reducing litter and potential contamination by toxic chemicals. The triple wash of pesticide containers in bio-beds and their burial in appropriately designed and managed trash pits eliminate potential contamination. Re-use of plastic boxes for shipping reduces solid waste and protects crop from damage. Remnants from cloth and threads are being re-utilized into other products 	<ul style="list-style-type: none"> Training in solid waste management practices will result in producers with greater knowledge of how their activities can contribute to this environmental problem and the cost-effective solutions available to them. Solid waste generated from enterprises will not pollute community environment.

⁶⁴ Agrequima is a guild of associated agrochemical companies (multi-nationals and manufacturers, formulators and distributors) with the mission of being a model in the industry of crop nutrition and protection that promotes innovative, sustainable and environmentally-responsible agriculture, contributing to the improvement of Guatemalan livelihoods.

http://www.agrequima.com.gt/index.php?option=com_content&view=article&id=112&Itemid=268

	No Action	Proposed Action	Alternative C
- impacts	<ul style="list-style-type: none"> Poor solid waste management systems or practices at community and municipal levels results in a littered landscape, and pollution from residues left in pesticide containers. 	<p>decreasing litter and solid waste in the environment in handicraft associations.</p> <ul style="list-style-type: none"> Small-scale construction (e.g. of greenhouses, macro-tunnels or collection sites) can generate waste and soil erosion. Tree nurseries generate plastic waste that litters the environment when not properly disposed. Accumulation of plastic waste and litter from drip irrigation systems, installation, maintenance and when the structure is decommissioned. Used plastic pesticide containers can litter the environment, contaminate waters and soils, and harm human health, especially where Agrequima service is not available. 	<ul style="list-style-type: none"> When waste landfilling or recycling services (such as provided by Agrequima) are not available to a producer, organization or community often the only option is to bury trash in pits on the farm and the farmer may be motivated to burn the trash, instead. <p><i>Mitigation measures will address impacts from carried over proposed actions or that of Alternative C, such as, coordinating container collection and disposal services (e.g Agrequima collection where the service is available) or establish properly designed solid waste (inorganic) disposal/burial pits on farms, also education farmers to not burn waste.</i></p>
<i>Issue 8 - If handicraft raw materials are bought from unsafe and unsustainable sources, they could impact human health, place indirect pressures on a natural resource, and negatively impact handicraft production.</i>			
+ impacts	<ul style="list-style-type: none"> Export market seeks AZO-free textile products, thus it is expected the potential impacts on human health from handling this product will be reduced, if not eliminated in target exporting associations. A limited number of handcrafters have skills to produce high quality of handicrafts and connections to help them be exported. Women already participating in COMART-supported handicrafts will meet export market 	<ul style="list-style-type: none"> Verification of non-toxic threads, and sourcing of them from a Guatemalan thread company helps protect the health of weavers, and meet export market demand. 	<ul style="list-style-type: none"> Raw materials supplied to handicraft producers, such as wood, are not illegally harvested and meet export market quality standards. This decreases impacts on forests, and the ecosystems and habitats from which the product is derived as well as improves incomes.

	No Action	Proposed Action	Alternative C
	requirements and earn income from their arts and skills contributing to family incomes.		
- impacts	<ul style="list-style-type: none"> • Solid and liquid waste generated by handicraft production (e.g. where thread is dyed by the artisan) can pollute water bodies. • Water treatment of the only provider of export quality AZO-free thread in Guatemala can result in contamination of surface water around the thread company production plant. • Handcrafters will empirically continue producing the same types of handicrafts that can generate liquid and solid waste, and occupational health and safety effects harming their health. • Returns on production will not increase, nor time invested in manufacture of a product decrease, thus income will remain the same. 	<ul style="list-style-type: none"> • Toxic chemicals in threads can harm human health of the weavers and artists, as well as the buyers of the product. • Illegally harvested wood used in handicraft production can contribute to their depletion, as well as harm soils, water and biodiversity from impactful harvesting practices. • Unsustainable harvesting can put at risk the continued availability of the raw material and therefore the production of the handicraft. • Water treatment practices of the only provider of export quality, AZO-free thread in Guatemala, can result in contamination of surface and groundwater around thread company production plant. 	<ul style="list-style-type: none"> • Some raw materials may be difficult to verify and confirm its legal and sustained yield, resulting in unintended impacts. <p><i>Mitigation measures – no additional measures.</i></p>
<i>Issue 9 - Inadequate occupational health and safety conditions impact air quality in the work environment, damage infrastructure and can pollute local soils and water.</i>			
+ impacts	<ul style="list-style-type: none"> • Certified organizations will be periodically audited for occupational health and safety practices. 	<ul style="list-style-type: none"> • Improved drying technologies results in higher quality coffee, use of less energy (fuel wood derived from the pruned trees of the shade grown systems, in a few instances), and creates improved work conditions. • Training in occupational health and safety indirectly supports workers to protect their health on the job. 	<ul style="list-style-type: none"> • The internal capacity of producer groups and a culture of occupational health and safety is strengthened by identifying, planning, provide incentives for, and practicing occupational health and safety practices, decreasing occupational risks. Connections with collaborating municipal or national organizations

	No Action	Proposed Action	Alternative C
- impacts	<ul style="list-style-type: none"> Occupational health, safety and hygiene standards will affect product quality and work health and safety. Human health can be affected when coffee drying equipment is poorly installed. For instance, the generation of dust, smoke and vibration may have long term health effects, and damage infrastructure. 	<ul style="list-style-type: none"> Potential impacts on human health from inadequate occupational health and safety conditions when implementing new production techniques or using new technologies in coffee, horticulture, cardamom or handicraft processing. Old and poorly installed coffee drying equipment (not installed by project) emitting smoke inhaled by workers and creating vibrations that damages infrastructure. 	<p>help sustain the development of a culture of safety.</p> <ul style="list-style-type: none"> As identified in Proposed Action. <p><i>Mitigation measures will continue training in occupational health and safety along all value chains.</i></p>
<p><i>Issue 10: Conservation of local agrobiodiversity: Crops promoted in home gardens do not reflect the full range of medicinal and other vegetables that participants like to eat or use, potentially limiting the benefits of local agrobiodiversity, that has traditionally been conserved in home gardens and their benefits to food security and nutrition.</i></p>			
+ impacts	<ul style="list-style-type: none"> Home gardens traditionally been space for cultivation of wild and native vegetables, herbs or medicinal plants. Primitive cultivars and wild relatives of cultivated plants found in Cuchumatanes region. CADERS provide training to up to 25 families in a community in establishment of raised fields for planting vegetables and soil conservation, training in nutritionally balanced recipes, and increased soil fertility through application of organic fertilizers/composting, resulting in more productive home gardens and improved family nutrition. 	<ul style="list-style-type: none"> FUNCAFE model: crops promoted for home garden are selected by participants, including the local and native plants that they are familiar with, thus indirectly improving their cultivation, acceptance and utilization. Composting and soil conservation measures improve home garden production improving nutritional value of vegetables. 	<ul style="list-style-type: none"> Exchange of experiences between implementing partners, technicians, para-technicians and families to learn successful approaches to food sovereignty of participating families which supports the recognition and conservation of native species, sharing of recipes that use native plants, as well as a diversity of vegetables in family nutrition.

	No Action	Proposed Action	Alternative C
- impacts	<ul style="list-style-type: none"> Local diets and dietary practices resulting in high malnutrition rates (55% and greater) in target RVCP departments. Knowledge of native plant cultivation and use being lost. Limited provision of vegetable seeds by CADER program (due to limited government resources) reduces nutritional value of home gardens. Cultivation of native plants can be difficult to continue as they disappear. 	<ul style="list-style-type: none"> Donated high-nutrition vegetable seeds can be expensive. 	<p><i>Mitigation measures carried over from proposed action improve soil conservation, fertility and humidity indirectly improving the nutritional value of plants.</i></p>

Issue 11 - Differing and competing agricultural practices between RVCP participating members and non-members can indirectly limit the effectiveness, replication and sustainability of the agricultural and environmental best management practices and technologies promoted by the project.

+ impacts	<ul style="list-style-type: none"> Agrequima's⁶⁵ CampoLimpio program helps establish used pesticide container collection sites in communities, to be used by everyone. 	<ul style="list-style-type: none"> RVCP master farmers share practices and experiences with members and non-members alike. Agrequima pesticides waste receptacles available for everyone in the community to use. "Mesa de Concertacion de Café" in Ixil provides opportunity for coffee producers throughout the area to come together and organize. (Members and non-members.). RVCP coffee, cardamom and tree seedlings raised in nurseries at member 	<ul style="list-style-type: none"> Exchange of Experiences shares successful approaches such as exemplified by the <i>Mesa de Concertacion de Café</i> in Ixil that brings together coffee producers in a particular geographic area to address specific issues together. Additional positive impacts (and experiences to share) as identified in proposed action.
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⁶⁵ Agrequima is a guild of associated agrochemical companies (multi-nationals and manufacturers, formulators and distributors) with the mission of being a model in the industry of crop nutrition and protection that promotes innovative, sustainable and environmentally-responsible agriculture, contributing to the improvement of Guatemalan livelihoods.

http://www.agrequima.com.gt/index.php?option=com_content&view=article&id=112&Itemid=268

	No Action	Proposed Action	Alternative C
		farms. Some farmers selling to producers in their community.	
- impacts	<ul style="list-style-type: none"> • “Coyote” buyers do not request produce per Global Gap standards; farmers do not see value in adopting practices especially when no market demand. • Coffee wastewater not managed sufficiently and effecting downstream users. • Untreated coffee-rust infecting neighbor’s farms. • Organic organizations challenged to maintain certification because of pesticide use on non-organic neighbor’s farm, and uncontrolled coffee rust. 	<ul style="list-style-type: none"> • “Coyote” buyers do not request produce per Global Gap (or other) standards; therefore, farmers do not see value in adopting practices especially when no market demand. • Differing and competing practices that endanger sustainability and replicability of BMPs include: pesticide use and practices (especially between organic producers and non-organic neighbors), members implementing practices to control coffee rust next to non-members who do not, differing soil conservation methods between members and non-members which impact their downhill neighbor (e.g. via erosion), non-members contaminating rivers with coffee processing waste water, and solid waste management practices between the two groups. 	<p><i>Mitigation measures from carried over proposed actions that support the improvement of the existing condition and issue include, recruitment and development of male and female master farmers, from a range of age groups (e.g. including youth) and ensuring the master farms demonstrate the BMPs completely and correctly, and their benefits. (Such as, also, Alternative C actions that compare the efficiency of drip to sprinkler irrigation, or water conservation and monitoring, or improved technologies such as reconditioned filter pits).</i></p>
<p><i>Issue 12 - Land use monitoring: project baseline data (that of the RVCP or MEP) was not designed to collect, map or monitor land use information of participating farms in a way that facilitates the monitoring of land use change.</i></p>			
+ impacts	<ul style="list-style-type: none"> • Three horticulture and thirty-one coffee certified organizations (Organic, RA-cert, etc.) maintain records of member productive units, production, other land uses on the farm, and best management practices to meet certification standards. Some include farm sketches/plans. This facilitates monitoring of land uses and sustainable practices. 	<ul style="list-style-type: none"> • At least eighteen organically certified coffee organizations maintain records of member productive units, production, other land uses on the farm, and best management practices to meet certification standards and facilitate land use monitoring. (Some include farm sketches/plans.) 	<ul style="list-style-type: none"> • Land use data collection and monitoring will support the project to identify sustainable land use over the last two years of the project.
- impacts	<ul style="list-style-type: none"> • Land use (and tenure) poorly 	<ul style="list-style-type: none"> • The exact locations and extension of land 	<ul style="list-style-type: none"> • Existing land use data collected by

	No Action	Proposed Action	Alternative C
	documented or mapped throughout the Western Highlands resulting in overlapping and sometimes conflicted land tenure.	<p>area under RVCP coffee, horticulture, cardamom, coffee or other crops, including fallow land into which future agricultural production may expand, or areas under irrigation, needs to be collected in a standardized way to facilitate monitoring of sustainable land use⁶⁶.</p> <ul style="list-style-type: none"> No farm planning or land use mapping or monitoring risks the expansion of coffee, cardamom, horticulture or fruit production into unsuitable lands. 	<p>producer groups is not standardized impeding a more uniform understanding and analysis of land use within the RVCP.</p> <ul style="list-style-type: none"> Mapping of lands can generate suspicions and indirectly develop trust issues between the project and participants, impacting the effectiveness of the RVCP interventions. <p><i>Mitigation measures consolidate project land use information into a standard RVCP land use data collection form.</i></p>
Issue 13 - Technical assistance and training is not having the expected results (fully addressing environmental management needs) and may be limited by language and literacy barriers.			
+ impacts	<ul style="list-style-type: none"> 16 ANACAFE and FEDECOCAGUA technical assistance help a limited number (compared to proposed action) of coffee farmers improve production and implement BMPs. One AGEXPORT technician to every 6 – 8 horticulture groups will be available to provide technical assistance and training in Good Agricultural Practices. 	<ul style="list-style-type: none"> Proposed action fields 127 technicians and 174 para-technicians to provide technical assistance and training to 11,157 households in coffee, horticulture, fruit orchard, cardamom, handicraft and health and nutrition improved technologies and BMPs. Para-technicians trained and paid by the project, and speak the local language, to promote best management practices. (Reaching up to 100 producers per promotor.). 	<ul style="list-style-type: none"> Publication of learning materials in pictographs to reach illiterate audiences should improve farmer capacity to implement BMPs and address their environmental management needs. Previously mentioned alternative actions such as exchange of experiences and training in BMPs, especially PERSUAPs and other pesticide safe use practices, will support greater learning between

⁶⁶ In the approved Scoping Statement (LAC-SS-15-03), the USAID BEO identifies the contribution land use information makes to “monitoring potential environmental impacts and implementation of mitigation measures” as well as performance monitoring and reporting of RVCP results (p.1). The BEO condition states, “Therefore, the Environmental Assessment (EA) should explicitly include in one of its alternatives the mapping of farmer landholdings and land use as well as monitoring of land use change in the project area.” (p. 2)

	No Action	Proposed Action	Alternative C
		<ul style="list-style-type: none"> At least 33 model farms have been developed where best practices are shared with farmers in communities. Extension materials printed in Spanish. 	technicians, para-technicians and master farmers of best practices and reinforce them.
- impacts	<ul style="list-style-type: none"> No technical assistance will be available from AGEXPORT to cardamom producers or fruit orchards. Limited technical assistance and training in coffee, horticulture, handicrafts and SAN results in a continuation of polluting and unsafe practices such as mentioned above. Limited reproduction of coffee rust tolerant plants throughout the RVCP intervention areas, and organic producers might decide to switch to inorganic and start applying pesticides (unapproved by USAID.) 	<ul style="list-style-type: none"> Producers are not fully learning how to implement mitigation measures that most effectively avoid, minimize or eliminate impacts. Negative impacts as identified in issues 2 - 7 and 10 are indirect consequences of this issue. 	<i>Mitigation measures, such as ensuring BMPs promoted by the project are fully and correctly demonstrated on master farms. Other mitigation measures as previously stated, such as the correct and complete design of biobeds diversification of agroforestry systems per internationally recognized standards, irrigation besta management practice, etcetera, also help to address this issue and improve existing conditions.</i>
<i>Issue 14 - Sustainability of environmental best management practices - economic and socio-cultural factors: 1) Will associations be profitable enough to afford and encourage their members (producers) to adopt practices such as the macro tunnels, latrines and hand washing stations, or metal fencing? (The July 2014 Audit points to existing challenges with investing in equipment such as the Personal Protective Equipment used during pesticide spraying), and 2) limited youth involvement in activities and decision-making, experienced during scoping, including that of young women, can limit the capacity of new generations to carry forward best management practices.</i>			
+ impacts	<ul style="list-style-type: none"> 34 certified coffee and horticulture associations have developed organizational capacities to attain certification standards and access to market niches thus achieving a premium (or secure buyer) that facilitates investment in BMPs. Three Global Gap-certified horticulture organizations with initial investment in macro-tunnels, 	<ul style="list-style-type: none"> Sanitary practices improve quality and meet Global Gap certification requirements, thus opening markets to producers and improving environmental health conditions. Proposed action develops association capacity to meet Global Gap and Tesco certification standards thus securing their access to certified markets, and in some cases receiving a premium on their 	<ul style="list-style-type: none"> Positive impacts as identified in the Proposed Action.

	No Action	Proposed Action	Alternative C
	<p>latrines, hand-washing stations or metal fencing.</p> <ul style="list-style-type: none"> Indirectly, AGEXPORT supports a reduced number of organizations to implement best management practices and maintain or achieve environmental management certification standards. 	<p>production and increasing incomes. Compliance with certification standards decreases risks to human health and the environment from pesticides, and improves occupational health conditions, as well as the environmental management of vegetable farms which decreases, if not eliminates, potential contamination of waters from eroding soils and litter in the environment, and supports an increase in biodiversity.</p>	
- impacts	<ul style="list-style-type: none"> Soil conservation, crop sanitation and pesticide safe use practices can be too expensive or socio-culturally unacceptable and not adopted. Farms that have not been in the certification program but could have been with the RVCP would have less opportunity to participate in certification and thus potentially reduce their income. Also, the more farms involved in certification would yield greater volume of products and thus the opportunity for increased markets due to increased volume is lost Certification is not a guarantee for continued application of best practices, especially in category B or C organizations, that are just initiating and organizational development is weak. (Yet, most likely category C organizations would not be able to qualify for certification in the first place.) 	<ul style="list-style-type: none"> Expensive best practices required for certifications, such as metal fencing, field latrines and PPEs, will be difficult to replicate by producers, thus reducing the sustainability of the environmental or human health benefits of these measures over time. Macro-tunnels can be blown away by strong winds or be undermined during heavy rains. Limited participation in RVCP activities by youth and women can threaten the sustainability of practices learned. 	<p><i>Mitigation measures of carried over proposed actions incorporate more women and age groups into the project, as well as protect farmer assets such as macro-tunnels and latrines from adverse events such as flooding, landslides or winds.</i></p>

	No Action	Proposed Action	Alternative C
	<ul style="list-style-type: none"> • Non-certified farmer selling produce to “coyotes” who buy at lower prices. • Youth migration from community and farm to urban areas, other parts of Guatemala and the United States. 		

11 CONCLUSIONS AND RECOMMENDATIONS

Recommendation: Alternative C actions as the Preferred Alternative

The Recommended Alternative – the actions of Alternative C – goes the furthest to address the issues with the Proposed Action and improve existing conditions. (See Table 1 in Executive Summary) Alternative C continues with Proposed Action activities that will meet the project’s purpose and need:

- Facilitate and support value chain activities that encourage agricultural growth, private investment, and expanded value chain participation by poor rural households, and
- Increase the productivity of food crops grown by poor households for their own consumption, and improve crop storage and food utilization practices to reduce beneficiary household levels of chronic child under-nutrition.

The Recommended Alternative does not deviate from the project’s purpose and need (as described in Section 3) and helps the RVCP meet the above-mentioned value chain development and food security objectives in more environmentally sustainable ways. The Recommended Alternative also ensures no irreversible or irretrievable commitment of resources.

First of all, the Recommended Alternative creates opportunities for best practices and models to be shared and learned across project implementers – technicians and para-technicians, producer groups and farmers. Many are already being implemented within the RVCP consortium. This will help standardize practices across the RVCP geographies, while also stimulating site-specific innovation. Alternative C actions are also strategies and measures that improve:

- **Site-specific soil conservation practices**, such as by incorporating multi-use grasses for mulch and livestock fodder during coffee plantation renewal, while plants mature and farmers wait for a return on their investment.
- **Safe and appropriate use of approved pesticides and agrochemicals.** Alternative C ensures farmers receive training in the most current thinking on the appropriate pesticides to use to combat coffee rust⁶⁷, and on the best safe use practices, across all agricultural value chains.
- **Greater knowledge and application of integrated pest management practices** that will help producers minimize dependence on pesticides. IPM practices to combat coffee-rust are emphasize and in the *Zona Reina*, pesticide the Recommended Alternative promotes organic and IPM methods first to control Thrips and other cardamom pests and disease.

Alternative C actions also evaluate and implement cleaner production.

- **Improving management of liquid and solid wastes in agricultural production and processing:** ensuring artisanal coffee waste processing is re-conditioned to avoid overflows and producers are trained in solid waste management practices.

⁶⁷ As presented in the USAID PERSUAP for Coffee, with Emphasis on Coffee Rust, approved January 2015

No irreversible or irretrievable commitments of resources: The Recommended Alternative assures that the RVCP is not an irreversible commitment of resources by incorporating land use monitoring and water and irrigation management planning activities into the agricultural value chains.

- **Technical assistance and training in water management and conservation** practices include irrigation management planning in the horticulture value chain and improved water conservation in coffee processing. First, irrigation systems will be designed based on a measured assessment of water availability and crop production needs. Farmers and water system managers will also be trained in water and irrigation management and monitoring, helping water users make more informed decisions into the future. Irrigation management planning helps those producers understand the opportunities (and limits) of irrigated production especially in the face of climate change-related variations in weather, such as prolonged drought. These types of actions benefit RVCP participants and non-participants alike, especially those sharing the same source water.
- The Proposed Action is **improving production on existing farmland and in agroforestry systems** to avoid conversion of forested land into agricultural or agroforestry use. Yet, Alternative C land use monitoring actions ensure that RVCP land uses, especially agricultural production, are documented in a standardized way. GPS points of productive units map the influence of RVCP best practices within micro-watersheds or forested areas. Land use monitoring activities help identify where and how much RVCP-supported sustainable production is taking place.

The Recommended Alternative also incorporates strategies and actions that:

- **Help protect the biodiversity and agro-biodiversity on which RVCP participant food security and health can depend**, such as incorporation of native multi-use tree species into cardamom systems, and the recognition and incorporation into family diets of native and wild herbs found in home gardens.
- **Diminish the pressures on Western Highlands forests** generated by RVCP activities including from firewood harvesting and consumption in cardamom production. Establishment of native species fuelwood plantations on abandoned agricultural lands. As recommended in alternative C would also reduce pressures on native forests and enhance local biodiversity, in addition to reducing GCC impacts.
- **Support farmers to apply practices that mitigate the potential impacts from climate change**, and adapt to it. Simple measures already carried out by the Proposed Action, such as mulching, cover crops, and the incorporation of organic compost into soils also help producers mitigate the impacts of climate change, retaining soil humidity during times of drought.

Alternative C actions also contribute to the **sustainability of project interventions beyond the life of the project**. Certain actions build institutional, organizational and individual capacity (and culture) to continue carrying out best practices, such as connections with local Guatemalan emergency response organizations that improve the sustained application of the practices taught by the project.

Cumulative effects: The Council on Environmental Quality (CEQ) regulations define cumulative impacts as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency

(Federal or non-Federal) or person undertakes such other action” (Title 40 of the Code of Federal Regulations Section 1508.7 [40 CFR 1508.7]). The Recommended Alternative addresses the following cumulative impacts identified in the environmental assessment:

- Irrigation and water management actions that address the incremental use of water for irrigation (such as conversion of sprinkler systems to efficient drip systems and water harvesting and storage) and water processing in catchments, and water systems that also provide water for domestic use.
- The combined impact of firewood harvesting on forests for domestic cooking as well as cardamom drying. Actions help reduce the amount of firewood burned, as well as its more sustainable (and legal) harvest.
- Aging coffee plantations, at risk of being abandoned, by helping them be renewed and in the process helping control the spread of coffee rust.
- The incremental effects of litter in communities by promoting solid waste management practices in RVCP agricultural enterprises.

Any adverse environmental effects that cannot be avoided during implementation of the Recommended Alternative are expected to be minor both individually and cumulatively and will be mitigated. The **mitigation plan described in Annex D** reduces impacts to zero or to an acceptable level.

12 RECOMMENDED ACTIONS FOR FUTURE INITIATIVES

In the process of this mid-project Environmental Assessment, many good actions were identified to improve the environmental sustainability of the activities being carried out by the project and the farmers they work with now and into the future. For timing, resources, and technical reasons, the following actions – although good - were determined by the implementing partners to be unimplementable within the remaining 1.5 years of the project. (The Recommended Alternative, Alternative C, focuses on those that are most implementable within the two years of the project.) In subsequent discussions between implementing partners and the EA team, it was agreed that these alternatives/actions are recommendable for future initiatives. (Some alternatives considered but dismissed, in Section 6.0, can also be considered for future activities especially those that offer alternative technologies to artisanal coffee wastewater treatment.)

- **Analysis of alternative-fuel cardamom drying technologies.** Existing cardamom drying methods that use alternative sources of energy from firewood, such as solar drying, electric or gas dryers, humidity-controlled dryers, and biomass gasifiers can be assessed. The analysis will identify options based on social, environmental and economic feasibility for cardamom producers in the Zona Reina region. New technologies can help reduce the emission of GHGs into the atmosphere by cardamom processing activities, as well as decrease the pressure firewood harvesting places on surrounding forests. This will allow cardamom producers to identify technology options that will decrease dependence on firewood, while producing cardamom with the color, flavor and aromatic characteristics and quality required by international market.
- **Incorporate into business plans the costs of updating and improving coffee processing (e.g. toasters) equipment to meet occupational health and safety standards.** Implementing partners felt this action would best take place at the start of the next USAID-funded initiative, to help producer groups financially plan for the repair and upgrade of old machinery or infrastructure.

- **Analysis of Options for Financing Best Practices:** Small producers have very limited access to credit or other financing sources to make investments into their production, nor in best practices. This action analyzes optional financing mechanisms, such as cooperative funds for good practices and sustainable agriculture, or other funding strategies and opportunities that associations can tap into. “Initially, this could be covered by a cost-shared scheme with the project implementing partners and the producers, followed by the establishment of group savings fund oriented specifically to this purpose and, in the case of more developed groups, cooperatives and associations, with availability of provide loans with payments tied to crop harvest, for example” (Cadmus 2014, p. 34). The analysis includes a plan for how the farmer association can connect with or develop these financing mechanisms.
- **Farm planning:** Per the FTF Acceso model in Honduras, develop farm plans with farmers and calculate costs and income from production arriving at net income, creating a plan to grow specific quantities of crops to meet a desired net income return. The farmer operations were monitored and incomes from the recommended crops were compared to the planned amount. Acceso had worked with buyers to set prices for a specified quality and quantity for each crop promoted. Very organized and systematic plans were created which resulted in farmers willing to invest because they knew that if they produced the quality and quantity that the buyers wanted they would receive the agreed price and thus could make other investments to improve production.
- **Smithsonian Bird Friendly certification** could be investigated for those coffee farms that meet the standards and are planting more native shade species beneficial to birds.

13 INSTITUTIONAL AND LEGAL FRAMEWORK

The following summarizes the relevant policies and institutions applicable to the implementation of the recommended alternative and mitigation measures.

Topic	Policies	Laws, Codes or Regulations	Institution
Forest resources	Forestry Policy	Forest Law (Decree 101-96) and its Regulation (Resolution 4.23.97) and PINFOR Regulation PINPEP LAW (Decree 51-2010) and its Regulation	MAGA INAB CONAP
Climate Change	National Policy of Climate Change (Government Agreement 329-2009)	Framework Law for the Reduction of Vulnerability, Adaptation Required to Climate Change Impact and Mitigation of the Effect of Greenhouse Gases - Climate Change Law.	MARN
Biodiversity	National Biodiversity Policy	Government Agreement 220-2011	CONAP
Environmental management	National Strategic Agenda for the Environment and Natural Resources	Law of protection and improvement of the environment (Decree 68-86 and its reforms Decree 75-91, 1-93, 90-2000), Law of Creation of the MARN	MARN

Topic	Policies	Laws, Codes or Regulations	Institution
		(Decree 90-2000) and its regulation.	
Pesticides		Law to Regulate Import, production, storage, transportation, selling and use of Pesticides (Decree 43-74) Regulations over registering, commercialization, use and control of pesticides and other substances (Government Agreement 377-90); Regulation of plant and animal sanitation (Decree 745-99.) COGUANOR standards NGO 44 001, NGO 44 002, NGO 44 044, NGO 44 045, NGO 44 046 NGO 44 050 NGO 44 087 NGO 44 086.	MAGA
Occupational Health and Safety		Código De Trabajo (Labor Law) De La República De Guatemala, Title 5, Only chapter. Higiene and safety in the workplace.	Ministry of Labor
Coffee		Coffe Law (Decree 19.69)	ANACAFE
Water		Regulations for waste water discharges on water bodies, reuse of waste waters and sludge (government Decree 236-2006)	MARN

Forestry Law (Decree 101-96)

This law supports the idea that forest resources can be sustainably managed as part of the social and economic development of the country. The law promotes increased productivity of forest goods and services (timber, firewood, biodiversity, water, soil, etc.), allowing the participation of communities and the general public, where the public sector should be a facilitator and guide for activities to be conducted with the vision of maximizing sustainable production, participation, transformation, manufacturing and marketing of various products.

The law created the National Forest Institute (INAB), forestry governing body in the country (outside the protected areas), in charge of designing, implementing, and monitoring policies that help develop the forest sector. INAB is comprised of a Board of Directors and Management. The Forestry Law also addresses topics such as forest protection, utilization, management, and industrialization and created the Forestry Incentive Program (PINFOR), and developed tax and statistical monitoring systems for forestry.

PINFOR Regulation

The regulations of the Forestry Incentives Program (PINFOR), a tool of Forest Policy, (valid for 20 years (expires in 2016), linked to the Forest Law, Title VII, Chapter I, Article 71, which refers to the Forestry Incentives), indicate that INAB, in coordination with the Ministry of Finance, will give an economic incentive to those who are engaged in forestry. The regulation sets all the parameters and technical requirements that must be completed to apply for this incentive. The objectives of this program are:

- Maintain and enhance sustainable forest production, incorporating natural forests to productive economic activity.
- Incorporate forestlands devoid of forest, through the establishment and maintenance of forest plantations or natural regeneration.
- Generate a critical mass of raw material produced by forests for the development of the forest industry.
- Encourage the establishment and conservation of forests for the generation of environmental services.

The expected results aim to increase the supply of competitive forest products, reduce deforestation, and generate environmental services and employment in the rural area.

PINPEP Law (Decree 51-2010) and Regulation

PINPEP was created responding to the shortcomings of the PINFOR, principally the limited access to incentives to small landholders and overlooking the opportunity to support areas with higher rates of population and poverty.

PINPEP objectives are:

- Encourage small landowners to get economic incentives.
 - Establish or maintain agroforestry systems.
 - Promote gender equality (especially women).
 - Generate employment in rural areas.
 - Promote biodiversity conservation.
 - Improve livelihood of communities.
 - Increase and ensure the provision of environmental goods and services.
- Contribute to the socio-environmental and territorial management for mitigation and adaptation of climate change, strengthening the resilience of forest ecosystems.

The amount of incentive awarded for each project depends on categories: production, conservation, agroforestry (see website). The following simple and practical requirements are required for a farmer/forest to be selected: develop a forest management plan (minimum area -0.10 ha) and show proof of possession of the land substantiated by local and appropriate community authorities, if communal property. (PINFOR requests a minimum area of 2 ha and land tenure certificate.)

The PINPEP Law has no termination date because the environmental management issues are considered a national priority⁶⁸.

National Climate Change Policy (Government Agreement 329-2009)

⁶⁸ INAB, <http://186.151.231.167/Paginas%20web/Pinpep.aspx>, Sept. 9, 2013

This policy was developed by a group of scientists, government officials, and civil society interested in positive changes for the country. The scope includes reducing the country's vulnerability to extreme climate events, strengthening adaptation capacity, and contributing the reduction in greenhouse gas emissions, as well as, evaluating the possibilities of accessing carbon markets and payment for environmental services.

The Ministry of the Environment and Natural Resources (MARN) is the competent authority and is responsible for promoting and ensuring its implementation. The MARN is the local coordinator and facilitator of the activities proposed by various sectors. (MARN, 2009).

Legal Framework for the Reduction of Vulnerability, Adaptation to Climate Change Impact and Mitigation of Greenhouse Gas Effects - Climate Change Law (2013)

After several years (since 2010) of discussions with the environment sector, the Climate Change Law was submitted for approval. In September 6, 2013, the law was approved.

One key amendment was the elimination of an article calling for the protection of water sources, creating uncertainty about the conservation and sustainable management of water basins, because a Water Law does not exist. Another amendment eliminated the proposal of the creation of a National Fund for Climate change. The objectives of this law will not be met without funds.

In general, the current Law establishes the necessary regulations to urgently mitigate, plan and respond in an adequate, coordinated and sustainable way to the impacts of climate change. The law establishes that the State of Guatemala, through the Central Government, decentralized entities, autonomous organizations, municipalities, civil society organizations, and the population, will adopt practices to promote reduction to vulnerability, improve capacities to adaptation, and allow the development of mitigation projects for climate change.

A relevant element of the law for the purpose of the environmental assessment is to involve MAGA in climate change issues since agriculture is one of the main activities of the country. Substantial changes can be made if best agricultural or agroforestry practices are implemented.

National Biodiversity Policy

The main areas of action are:

- Knowledge and appreciation of biodiversity
- Conservation and restoration of biodiversity
- Sustainable use of biodiversity and ecosystem services
- Mitigation and adaptation to climate change
- Policy coordination and implementation

Protection and Improvement of the Environment Law (Decree 68- 86)

The objectives of this law are the following:

- Protect, conserve and improve the country's natural resources and prevent its deterioration, misuse or destruction.
- The prevention, regulation and control of any of the causes or activities giving rise to environmental degradation and pollution of ecological systems. Exceptionally the prohibition of causes or activities in cases affecting quality of life and the common good and when

qualified and prior scientific and technical advice recommending prohibition is issued by competent bodies.

- Align education, environmental, and cultural systems, to train qualified human resources in environmental science and education, increasing awareness throughout the population.
- Design environmental policy and provide assistance in the proper use of land.
- Create incentives and promote programs and initiatives focused on environment protection and restoration.
- Comprehensive use and sound management of watersheds and water systems.
- Promote appropriate technology to obtain clean energy sources.
- Save and restore threatened and endangered bodies of water.

This law states that environment includes the following systems: a) atmospheric (air); b) water; c) lithic (rocks and minerals); d) edaphic (soil); e) biotic (animals and plants); f) audiovisual elements and natural and cultural resources.

Labor Code of The Republic of Guatemala, Title Five, Single Chapter. Occupational Health and Safety

Article 197. Employers are required to take preventive measures to effectively protect the life, health and moral of workers. For this purpose, the employer must, within the period of time determined by the General Labor Inspection entity and according to the regulation of this chapter, implement occupational health and safety measures in the workplace that serve to comply with this law.

Article 198. Employers must comply and enforce the measures indicated by the Guatemalan Institute of Social Security in order to prevent labor accidents and diseases.

Article 200. It is forbidden for employers of industrial or commercial companies to allow their workers to sleep or eat in the job place. Separated places must be established for these purposes.

Article 201. Unhealthy work facilities or industries are those that can cause threatening or damaging conditions to health of their workers due to the materials used, produced or released, or to the solid, liquid or gaseous waste.

Dangerous work, facilities or industries are those that can actually or potentially damage immediately and seriously the lives of the workers, by their nature or by the materials used, produced or released, or by the solid, liquid, or gaseous waste; or by the storage of toxic, corrosive, flammable or explosive substances.

The regulation determines the kind of jobs that are unhealthy, which are hazardous, the substances whose development is prohibited, restricted or is subject to certain requirements and in general, all the rules to which these activities are subject.

COFFEE LAW (Decree 19-69)

This law regulates, creates and defines ANACAFE, its duties, obligations, and benefits, as well as the amount received by ANACAFE for each “Quintal” exported to finance its activities.

Law to regulate import, production, storage, transportation, selling and use of Pesticides (Decree 43-74)

The main objective is to regulate the importation, production, storage, transportation, commercialization, and use of pesticides to minimize risk on public health, agriculture and livestock.

The authority is given to the Ministry of Agriculture, the Ministry of Public Health, the Ministry of Economy and the Ministry of Labor. The law describes standards, regulations, and penalties.

Regulation for the register, commercialization, use and control of pesticides and other substances (Government Agreement 377-90)

This regulation complements Decree 43-74. Defines the toxicity according to COGUANOR standards, indicates how to register pesticide producers, importers and suppliers. Regulates the places to store, pack and produce pesticides, as well as the advertisements, packing, collection of empty containers to avoid health risks. Includes BMP, such as collecting empty containers, include warning indications on toxicity, and the conditions required for storage, packing, and production.

Related standards that are part of this regulation are:

COGUANOR NGO 44 001 Pesticides, definitions and classification.
COGUANOR NGO 44 002 Pesticides, procedures to take and prepare samples.
COGUANOR NGO 44 044 Pesticides, storage and transportation.
COGUANOR NGO 44 045 Pesticide containers and packing. General parameters. COGUANOR NGO 44 046 Pesticide, Toxicity.
COGUANOR NGO 44 050 Pesticides, common and chemical names.
COGUANOR NGO 44 087 Pesticide, Active ingredient. Concentration and tolerance.
COGUANOR NGO 44 086:98 Pesticide, triple washing.

Regulation of plant and animal sanitation (Decree 745-99.)

The Ministry of Agriculture should implement and enforce flora and fauna protection including quarantines and other measures.

Law of Rural and Urban Development (Decree 11-002)

In accordance with Article 224 of the Guatemalan Constitution, development regions can be established based on economic, social and cultural criteria. Regions can be constituted of one or more departments.

For social and economic development, the Guatemalan territory is divided at different levels of “Urban and Rural Development Councils.” The Development Councils System (SISCODE) was developed in accordance with this law. The SISCODE has the following levels:

- 1) National council,
- 2) Regional councils,
- 3) Departmental councils,
- 4) Municipal councils (COMUDE), and,
- 5) Community councils (COCODE.)

The SISCODE is a dialogue space for multiethnic, multilingual and multicultural citizens that allows their participation in decision-making processes for the development of their community, municipalities, departments, regions and country.

The COCODE’s objective is to promote the participation of the community members in the development of policies, identification of priority projects, and the development of plans and programs to benefit their community. COCODES are formed by:

- 1) Community Assemblies formed by all members of a community.
- 2) Coordination Entities elected by the Assembly or with municipal rules if they are not elected.

The COCODE's functions are: 1) Elect the Coordination Entity and period of duties; 2) promote, facilitate, and support the organization and effective participation of the community, as well as identify the priority needs, problems and solutions for development; 3) coordinate with government institutions; 4) promote policies, plans and projects for the community development and proposed them to the next level (COMUDE); 5) Follow-up policies, plans and projects and corrective actions to COMUDE; 6) Ensure proper use of resources assigned to the community, as well as effectiveness and impact of projects and plans; 7) keep the community informed about the use of resources; 8) leverage financial resources for projects and plans.

Water

There is no Water Law or regulations, with the exception of the Constitution that states (Article 127) that water is of public domain and that right of use will be given by a specific law. Article 128 also states that productive water uses that contribute to national economy are to the common service, but the users should reforest the banks and river beds, as well as facilitate access.

The only relevant regulation related to water is:

Regulations for wastewater discharges on water bodies, reuse of waste waters and sludge (Government Decree 236-2006)

The objective is to establish the parameters and requirements to discharge and re-use waste waters to reduce the pollution of all water bodies. The Ministry of Environment and Natural Resources is in charge of enforcing this law. It requires a technical study that describes the wastewater produced, as well as the treatment required.

14 LIST OF PREPARERS

Team Leaders with experience in CFR 216 Environmental Assessment experience - Marsha Kellogg and Francisco Silva

Francisco Silva (Co-Team Leader/CFR 216 Environmental Assessment Specialist and Biodiversity Support): Mr. Silva is Sun Mountain's Senior Environmental Monitoring and Compliance Specialist and has worked in environmental assessment, auditing, monitoring and compliance for numerous projects developed in Ecuador, Peru, Colombia, Venezuela, Honduras, El Salvador, México, Puerto Rico, United States of America, Albania, Libya, Yemen, Mozambique, many of them in sensitive and protected areas. His environmental assessment experience includes occupational health and industrial safety in oil and gas projects. He graduated as a biologist in Quito-Ecuador, from the Pontificia Universidad Católica del Ecuador (PUCE). He has more than thirteen (13) years of experience in environmental consulting, management and coordination of projects, environmental monitoring and compliance, having completed more than 150 EAs, including more than 100 as project manager. He also has coordinated two USAID Tropical Forest and Biodiversity Assessments in Peru and Honduras, as well as a CFR 216 Workshop in El Salvador.

Marsha Kellogg (Co-Team Leader/CFR 216 EA and Training Specialist & Social Assessment):

Ms. Kellogg brings to the team significant experience leading multi-disciplinary teams in Central and South America to carry out activity-specific and programmatic 22 CFR 216 environmental assessments. Most recently, she applied her knowledge of internationally recognized best management practices, such as outlined in USAID Sector Environmental Guidelines, FAO Good Agricultural Practices (GAP) and Forest Stewardship Council (FSC) standards, to support the assessment of sustainable forest management and reforestation, small-scale agricultural production, and climate change adaptation activities in Guatemala. The Environmental Assessment of Climate, Nature and Communities of Guatemala, was considered by the USAID Regional Environmental Advisor one of the best he had reviewed.

Fernando García Barrios PhD/c (Biodiversity and Agricultural Production Specialist with Integrated Pest Management/Pesticide Experience):

Dr. Garcia-Barrios, PhD/c is an agricultural engineer with experience in agribusiness, carbon banking, protected areas, agriculture production systems, biodiversity conservation and sustainable management. Dr. Garcia Barrios' work builds on his personal experience helping operate the family coffee farm and more than eight years of professional experience supporting the interactions of agriculture, business, conservation and sustainable management. He has worked at AGEXPORT through Danida cooperation Aid to diagnose supply chains on Rosa de Jamaica in Guatemala, at the Norway Embassy in Nicaragua to assess Regional (Central America) biodiversity management projects, and at WWF to design stakeholder engagement strategies for coastal biodiversity in Guatemala, Belize and Honduras. He also served as the biodiversity specialist on the USAID-funded Environmental Assessment of the Climate, Nature, and Communities of Guatemala. Over the past 4 years, Fernando's PhD research has assessed a carbon banking approach to poverty reduction and income generation. The approach will allow small owners who still have forest cover and are interested to be involved with the banking sector to trade forest carbon in national and international carbon markets. Other international agencies where he has worked at are: Japanese Cooperation Aid (JICA), United Nations Development Programme (UNDP), and Austrian Cooperation Aid (HORIZONT 3000).

Carlos Roberto Cobos (Water Resources Specialist with experience in Environmental Impact Assessments and Agricultural Projects):

Mr. Cobos had worked in Water Resources for more than 25 years in Central America as hydrologist he had done water budgets for several projects funded by USAID, IDB, UICN, and WWF. Also he had been consultant in Climate Change for UNDP at the Guatemalan Climate Change program at the Ministry of Environment and Natural Resources. He had worked at Ministry of Agriculture of Guatemala on Integrated Water Management for an IDB project. His experience in agricultural projects and monitoring came when he worked for RUTA, a World Bank project based in Costa Rica, with a mission to give Technical Assistance to the Agricultural Sector in Central America, on areas as economics, irrigation, project preparation and monitoring and evaluation. He graduated as Civil Engineer in Guatemala from Universidad de San Carlos, and later he got a Master's degree on Water Resources at Oregon State University. He had been coordinator or project director in more than 25 projects, related to Water Resources, hydrology and hydraulics. For three years he worked preparing Environmental Impact Assessments at Asesoría Manuel Basterrechea in Guatemala.

Michelle Rodriguez (Climate Change and Agroforestry Specialist). Michelle Rodríguez: is Sun Mountain's Senior Climate Change and Agroforestry specialist. Mrs. Rodríguez is forestry engineer who holds a master's degree in Tropical Agroforestry from the Agronomic Research and Teaching Center (CATIE) in Costa Rica. She has more than seven years of experience in the implementation of

climate change adaptation and mitigation projects, as well as an intimate familiarity in ecosystem services and water harvesting projects in Central America and Ecuador. She has worked with IUCN, ACICAFOC, CATIE, and many other reputable organizations. During the past two years, Michelle has worked in the Ecuadorian Amazon, coordinating a project on climate change adaptation measures including carbon sequestration and forest cover rehabilitation in Sucumbíos. She also has extensive experience in environmental assessment, technology transfer, forest management, and developing and delivering programs to strengthen capacities in climate change adaptation for local authorities and other key stakeholders.

Timoteo Lopez (Social and Community Development Specialist): Mr. Lopez has a Master's degree in Political Sciences and Sociology and in Sustainable Agriculture and Natural Resources. He also has a Bachelor's degree in Economy. Mr. Lopez is a social and community development specialist with experience in rural development, environment and gender. He has worked for organizations such as: PNUF, BM, FIDA, USAID, RUTA, FAO, and has collaborated with many community organizations and environmental programs in the Western Highlands of Guatemala. He was a national advisor in gender and forestry development for a FAO project in Guatemala, a university professor in Micro-economy, Investigation and International Trade, and Financial Mathematics. Mr. Lopez has also worked in many rural development projects outside of Guatemala, in Uruguay, El Salvador, Honduras, Costa Rica, Venezuela and Dominican Republic.

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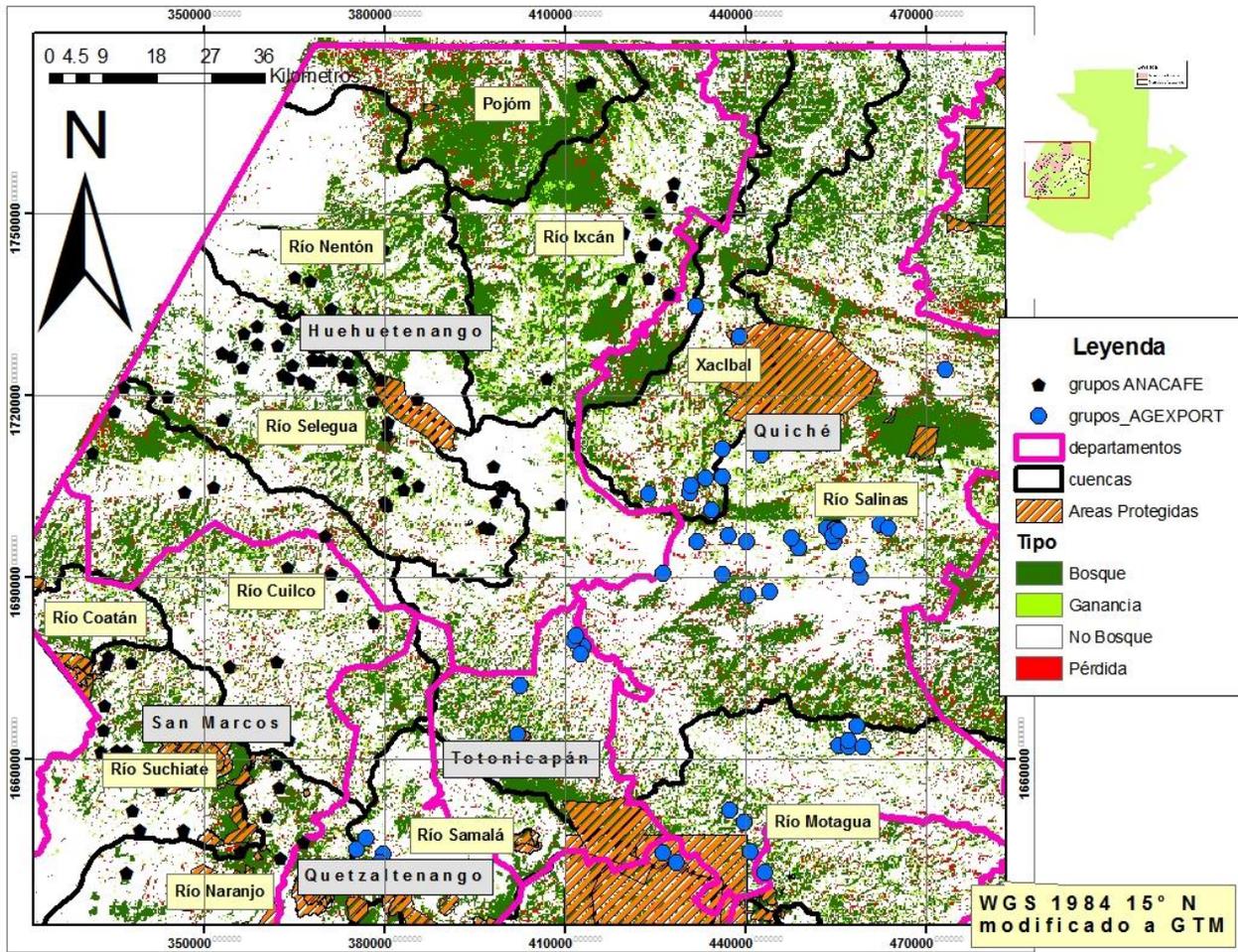
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ANNEX A: RVCP MUNICIPALITIES AND INDICES OF WATER SCARCITY

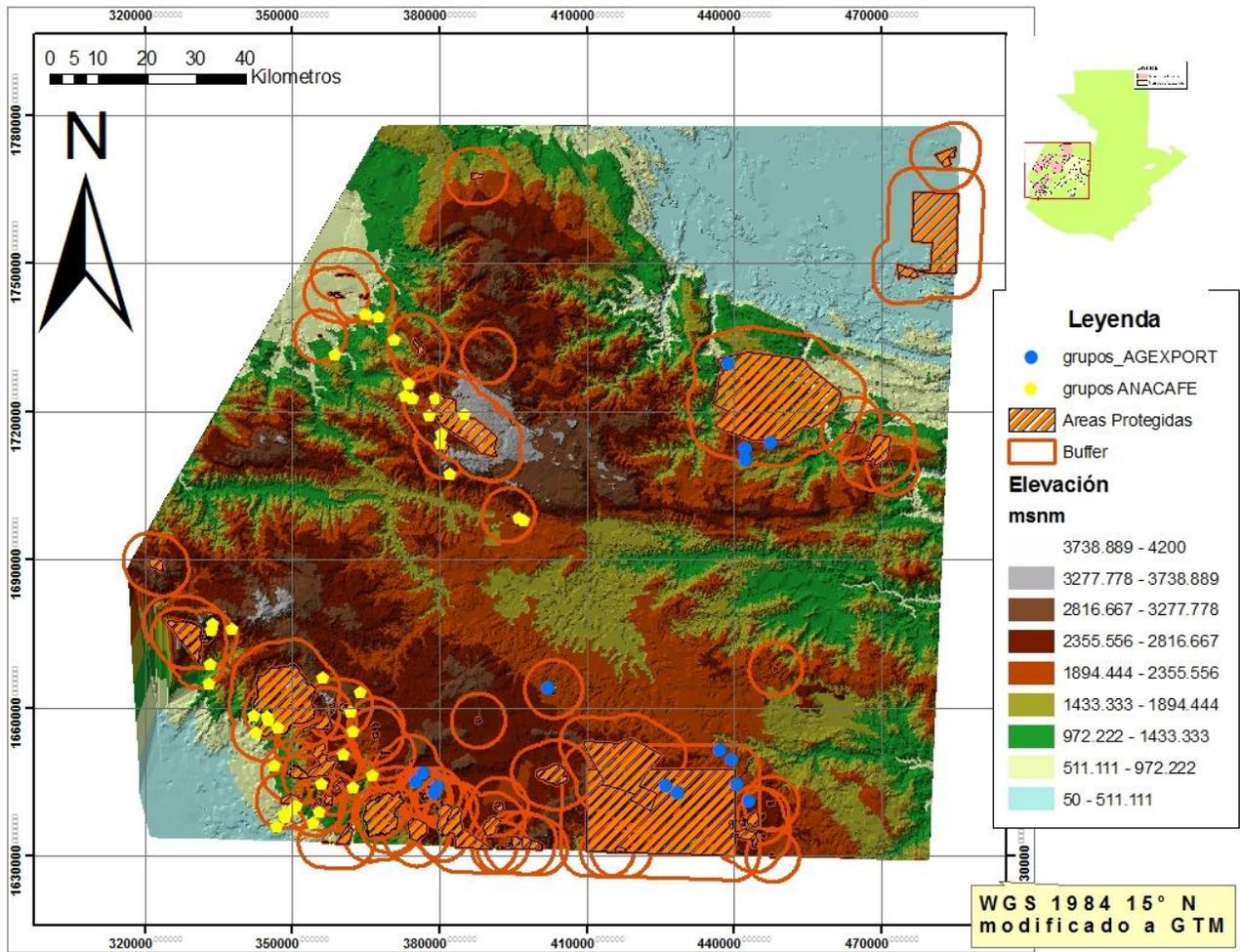
Water Scarcity Index 20111 Municipalities and Departments – Percentage by Department

Department	High	Moderate	Medium	Low
Huehuetenango	Aguacatán	Concepción Huista	San Sebastián Huehuetenango	Barillas
	Colotenango	San Miguel Acatán		Chiantla
	Huehuetenango			Cuilco
	Jacaltenango			Nentón
	La Democracia			San Juan Ixcoy
	La Libertad			San Mateo Ixtatán
	Malacatancito			San Rafael Independencia
	San Antonio Huista			San Sebastián Coatán
	San Gaspar Ixchil			Santa Eulalia
	San Idelfonso Ixtahuacán			Soloma
	San Juan Atitán			Todos Santos Cuchumatán
	San Pedro Necta			
	San Rafael Pétzal			
	Santa Ana Huista			
	Santa Bárbara			
	Santiago Chimaltenango			
	Tectitán			
Unión Cantinil				
Percentage	56.3	6.3	3.1	34.4
Quetzaltenango	Almolonga			Coatepeque
	Cabricán			Colomba
	Cajolá			El Palmar
	Cantel			Flores Costa Cuca
	Concepción Chiquirichapa			Génova

ANNEX B: MAP 1 RVCP BENEFICIARY ORGANIZATION LOCATIONS



MAP 2 RVCP BENEFICIARY ORGANIZATIONS WITHIN 5 KILOMETERS OF A PROTECTED AREA¹



¹ Organizations may appear to be inside a protected area due to scale of the map, while others are located inside multi-use protected areas or existed in their current location prior to the designation of protected area status.

Department	High	Moderate	Medium	Low
	Huitán			San Martín Sacatepéquez
	La Esperanza			Zunil
	Olintepeque			
	Palestina de los Altos			
	Quetzaltenango			
	Salcajá			
	San Carlos Sija			
	San Francisco La Unión			
	San Juan Ostuncalco			
	San Mateo			
	San Miguel Sigüilá			
Sibilia				
Percentage	70.8	0	0	29.2
Quiché	Canillá	Chinique		Chajul
	Chiché			Chicamán
	Chichicastenango			Cunén
	Joyabaj			Nebaj
	Pachalum			Playa Grande-Ixcán
	Patzité			San Juan Cotzal
	Sacapulas			Uspantán
	San Andrés Sajcabajá			
	San Antonio Ilotenango			
	San Bartolomé Jocotenango			
	San Pedro Jocopilas			
	Santa Cruz del Quiché			
	Zacualpa			
Percentage	61.9	4.8	0	33.3
SAN MARCOS	Comitancillo	Ayutla	San José Ojetenam	Catarina

Department	High	Moderate	Medium	Low
	Concepción Tutuapa	Tacaná		El Quetzal
	Ocos	Tejutla		El Rodeo
	Río Blanco			El Tumbador
	San Antonio Sacatepequez			Esquipulas Palo Gordo
	San Cristobal Cucho			Ixchiguán
	San Lorenzo			La Reforma
	San Miguel Ixtahuacan			Malacatán
	San Pedro Sacatepequez			Nuevo Progreso
	Sipacapa			Pajapita
				San Marcos
				San Pablo
				San Rafael Pie de la Cuesta
				Sibinal
			Tajumulco	
Percentage	34.5	10.3	3.4	51.7
Totonicapán	Momostenango			
	San Andres Xecul			
	San Bartolomé Jocotenango			
	San Cristóbal Totonicapán			
	San Francisco El Alto			
	Santa Lucía la Reforma			
	Santa María Chiquimula			
	Totonicapán			
Percentage	100			
AGEXPORT	ANACAFE			

SOURCE: TNC/CNCG, Análisis de la Vulnerabilidad ante el Cambio Climático en el Altiplano Occidental de Guatemala. [Analysis of Vulnerability in the face of Climate Change in the Western Highlands of Guatemala]. 2014.

ANNEX C: STAKEHOLDER CONSULTATION MATRIX

STAKEHOLDER IDENTIFICATION												RESULTS OF CONSULTATIONS – PERCEPTIONS EXPRESSED BY STAKEHOLDERS		
No	Date	Number and gender people consulted (#F, #M)	Type of stakeholder *	Time of participation in the Project Years (Y), Months (M)	Directly and Indirectly affected by the project? (D, I)	Name	Position	Organization Name	Site/Village/Municipality	Department	Product/Crop	Significant issues or concerns of the proposed action ²	Positive effects of the proposed action ³	Problems/conflicts with natural resources ⁴
1	16-feb	7F, 21M	Producers Cooperative	2 (A)	D	Pedro Demetrio Martínez	President	San José, El Obrero	La Libertad	Huehuetenango	Coffee	Non-members resist change (training). It is necessary to provide more information.	Certification, management and use of pesticides (rust control), training in the use of EPP, better product prices, less costs of intermediation, support community health and education.	External problems and conflicts: illegal hunting, deforestation, water contamination, garbage.
2	16-feb	1M	Representative of the Catholic Church	N/A	I	César Escalante	Member	Catholic Church	La Libertad	Huehuetenango	NA	Very few technical personnel in the field. Lack of awareness among those non associated with the project and the Catholic Church.	Practices implemented by the Cooperative, are good, performing properly and promoting the participation of more people	Waste that pollutes land, pollution of water bodies.
3	16-feb	1F	Community Leader	2 (A)	D	Leonarda Cobón	Secretary of Education Urban Area	Urban Area - San José El Obrero	La Libertad - Cantón Miramar	Huehuetenango	NA	Lack of Awareness among people	Encourages women's involvement.	Deforestation by nonmembers, forest fires, firewood consumption.
4	16-feb	1M	Local Government	N/A	I	Rodolfo De León	Síndico Primero	La Libertad Municipality	La Libertad	Huehuetenango	NA	External factors such as animals damaging coffee trees, theft of coffee tree stakes.	Reforestation and tree nurseries are implemented by the association; technical assistance is effective and timely to combat pests.	Excessive deforestation for timber production, especially on private land.
5	17-feb	12M	Association	2 (A)	D	Adrián Constanza	Legal Representative	Association of Small Coffee Farmers Union - UPC-	La Democracia - Village Camojallito	Huehuetenango	Coffee	Presence of rust, ojo de gallo, declining production, labor abuse by some members, child labor, resistance to change from non-members.	Good water and shade management, production of organic fertilizer from the pulp, coffee brand creation and promotion.	Firewood consumption by non-members (illegal logging).
6	17-feb	1M	Central Government	N/A	I	Rudy Tobar	Field Technician	Ministry of Agriculture, Livestock and Food	La Democracia - Village Camojallito	Huehuetenango	NA	Need to improve treatment of honey water. Coffee production of non-members is still only for subsistence.	Appropriate processes due to certifications. The project has managed to change the attitude of people regarding the organic association and the need for association.	Illegal logging by non-members, firewood consumption.
7	18-feb	16F, 1M	Cooperativa Integral de Producción Artesanal	2 (A)	D	Stephanie de Paz	General Manager	La Jacaltequita	Jacaltenango	Huehuetenango	Crafts	Orchards are insufficient. Medicinal herbs must be considered for traditional medicine and other species such as wormwood, artichoke, lemon tea..	Awareness raised among the artisans and training held. E.g. last year dyers were trained. The dyes are free of cancer azoamines and are certificated in Germany, the excess thread is collected and used in the manufacture of other products	Dyes are not provided by the project and could contaminate the water.

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8	18-feb	2F, 10M)	Cooperative	2 (A)	D	Ramon Delgado	General Manager	Cooperativa Río Azul	Jacaltenango	Huehuetenango	Coffee	Due to serious liquidity problems, incidence of pests and diseases, productivity decreased, causing internal conflicts for changing from organic to conventional coffee.	Function as an independent cooperative with 185 members, participate in fairs to improve commercialization, diversify livelihoods with home gardens.	Honey water deposited on the Blue River, creating downstream effects.
9	19-feb	17M, 1F	Cooperative	2 (A)	D	Luis López	President	Asociación de Caficultores Flor de Café. ASCAFCA-	La Unión Cantinil	Huehuetenango	Café	Non-members lack of environmental education. Lack of inorganic waste management, honey water contamination, limited access to credit. Reduced forest area in hydric charge zones (forests) is communal (neighboring communities cut trees).	Honey water management, improvement of coffee production techniques, layout area of pesticide water bottles (though not enough for the association).	Pollution of rivers (water) due to solid waste and honey water in river basin.
10	19-feb	1F, 14M	Cooperative	2	D	Felipe Pérez Pablo	Legal Representative	Cooperativa Todosantera, R.L.	Todos Santos Cuchumatan	Huehuetenango	Café	Conflicts with neighboring communities – Unión Cantinil- (honey water, environmental education, illegal logging, firewood)	Leadership of the cooperative authority on internal and external negotiations. Strong awareness of environmental protection and gender considerations focused on a gradual process of changing. Partnerships with the municipality to prohibit littering and cutting trees. Synergies / opening participation of authorities in the cooperative. Recycling program with the municipality. Renovation of coffee plantations with rust resistant varieties. Incorporation of technologies (eg GPS, the moisture content of parchment coffee). Dryer coffee-based fuel. Technician paid by the RVCP project. Agrequisa training in chemicals management with appropriate equipment. Credit portfolio management. Equipment and coffee tasters. 44 home gardens and 44 water filters. 13 improved stoves (food security). Soil conservation.	Deforestation, solid waste, hunting by neighboring communities.
11	19-feb	3M, 2F	Association	2 (A)	D	Adrián Constanza	Legal Representative	UPC –Café Teresa con Espíritu de Mujer-	La Democracia - Village Camojallito	Huehuetenango	Coffee	Improper installation of roasting (smoke emanation) and the high level of vibration affect facilities. Subsidized production, insufficient supply of packaged coffee, production of coffee husks.	Inclusion of women in the value chain (coffee), processing, elaboration and offered to the final consumer (value added), new packaging technologies (vacuum packaging), strategic business vision (adding value to the product).	Air quality and noise (emission of particles, gases - smoke-, vibration, noise).

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12	20-feb	7F, 11M	Association	1 (A)	D	Víctor Hugo López	General Manager	Farmers Association Tinecos -ADAT -	San Martin	Huehuetenango	Vegetables	Polluted rivers, reduced water flow, existence of intermediaries, lack of market for potatoes, non-members resist to change (some do not want to receive training)	Delivery of macro tunnels, implementation of home gardens (food security), good political relationship with the municipality (regulation to protect the forest), soil conservation, incentives for forest protection (PINPEP), forests are left in water recharge areas , biological beds, no hunting policy, organization for firefighting, protection of water sources –spring (fencing).	Overuse of water, pollution of rivers.
13	20-feb	6F, 8M	Cooperative	2 (A)	D	Tomas Figueroa	General Manager	Cooperativa Agroproductiva y de Servicios varios San Bartolo, R.L.	Village Regadillos, Chiantla	Huehuetenango	Vegetable	They do not consume what they produce (peas are not consumed), dependence on EU and US markets (captive market), pollution (waste and liquid) of Selegua river downstream and upstream , little space in the collection center for pea selection and packaging. Project actions not consistent with local reality.	Environmental awareness (e.g. reforest water sources, spring), food security (promote family gardens), surplus vegetable production is sold in local market, reforestation with native species, water management (e.g. drip irrigation), plot diversification (e.g. agroforestry species), profits are intended to: 1) education, 2) health and 3) debt payments.	Prohibition of private owners to reforest to protect water sources.
14	23-feb	10M, 2F	Association	2 (A)	D	Arnoldo Leonel Hernández	President	Asociación de Caficultores Miguelenses	San Miguel Ixtahuacan	San Marcos	Coffee	Lack of technical assistance to combat pests and diseases, cultural resistance to accept improved stoves,	Strategic alliances (e.g. Municipality, INAB-PINPEP, Ministry of Economy), 6 local promoters hired and trained, implementation of agroforestry accepted: forest recovery, CO2 capture, soil protection, etc . Own funds Q. 400,000.00 from various projects, members with tree and coffee nurseries, hunting prohibited, forest fire prevention activities, integrated coffee waste management (e.g. honey water in composting).	Logging in private property, upstream pollution, forest fires, climate change (e.g. increase of pests and diseases)
15	24-feb	17M, 4F	Asociación	4M	D	Alberto Patrocinio Barrios	Legal representative	Asociación San José Las Islas	San José Las Islas, San Marcos	San Marcos	Vegetables	Integration of other production systems to RVCP (e.g. tomato), buyers remove the product (e.g. Peas) locally to avoid mechanical damage.	Start introduction of drip irrigation systems; reduce mechanical damage caused by peas, booth to collect pesticides containers, integrated pest management (spraying equipment, training); demonstration plots of field management.	Pollution upstream, upper basin is used as a garbage dump, climate change effects (eg frost, drought), agrochemical pollution.

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16	25-feb		Association	21 (M)	D	Alonso Gómez	Legal Representative	Cooperativa Integral Agrícola Nuevo Porvenir	Nuevo Progreso, San Marcos	San Marcos	Coffee	The posters for training are in Spanish, beneficiaries speak Mam. It is necessary to elaborate the training materials in the local language. Coffee plantations have improved but still selling to intermediaries, therefore the price is not fair. They require more inputs to combat rust.	They have a local technician trained by RVCP, renovation of old coffee trees with new, increased income are invested in education.	Translate the posters into native language to improve understanding and replicate knowledge to non-members, export coffee to improve the price.
17	26-feb	19M, 32H	Cooperativa	2 (A)	D	Julio Joc Esteban	Legal Representative	Cooperativa Integral Agrícola 21 de Octubre	San Pablo, San Marcos	San Marcos	Coffee	Renew with coffee variety (Bourbon), taste this variety of coffee, it is more resistant to rust.	Some project activities are replicated by non members, they have a local promoter.	Changing coffee variety, nonmembers that are not trained can contaminate rivers and cut down the forest, accumulation of chemical containers
18	27-feb		Association	18 (M)	D	Eliut Santos Fuentes	Legal Representative	Asociación de agricultores El Esfuerzo	San Pedro Sacatepéquez	San Marcos	Potatoes	Tenant Farmers	Improved seed producers	Land prices, forest.
19	04-mar	1M	Government	N/A	I	Maynor Palacios	Region Director	Instituto Nacional de Bosques - INAB-	Santa Cruz Quiche	Quiche	NA	Indirect effect on illegal traffic of timber and firewood (deforestation and forest degradation).	Training for production chains, promotion of forestry and agroforestry p sustainability through sustainable certification.	Illicit market for timber and firewood.
20	04-mar	1M	Government	N/A	I	Sr. Rodríguez	Regio Director	Ministry of Agriculture, Livestock and Food MAGA	Santa Cruz Quiche	Quiche	NA	Indirect effect on pesticide management, water management and improper use.	Agricultural training, use and management of pesticides, improved food security, soil conservation, irrigation systems.	Mismanagement of water, firewood extraction, fertilizer subsidies not adapted to the reality of the soils of small landowners.
21	23-feb	F 59	Association		D	Juana Hu Mateo	Presidenta JD	Mujeres por la vida	Chajul	Quiché	Textiles, crafts, shop	Women's organization dedicated to the production of handicrafts and textiles are concerned about natural phenomena, the scarcity of firewood and forest loss leading to water shortages.	The importance of natural resources for the local economy and well-being of the population.	Food scarcity, poverty and increasing loss of quality of life of the rural population.

STAKEHOLDER IDENTIFICATION												RESULTS OF CONSULTATIONS – PERCEPTIONS EXPRESSED BY STAKEHOLDERS		
No	Date	Number and gender people consulted (#F, #M)	Type of stakeholder *	Time of participation in the Project Years (Y), Months (M)	Directly and Indirectly affected by the project? (D, I)	Name	Position	Organization Name	Site/Village/Municipality	Department	Product/Crop	Significant issues or concerns of the proposed action ²	Positive effects of the proposed action ³	Problems/conflicts with natural resources ⁴
22	23-feb	F 110 M 1272	Association	2 (A)	D	Marcelino Gaspar Laynes Caba	Vice President Board of Directors	Asociación Chajulense	Chajul	Quiché	Coffee	Coffee rust affects producers, Production has decreased, in 2011, there were 26,000 quintals parchment coffee; in 2014, 20 -15 thousand quintals. In this situation, the future in the production and marketing of coffee is uncertain. Water use at the individual level in the pulping of coffee requires more monitoring and improvement.	Social and productive process with environmental commitment, focused on the production of organic coffee with links to international markets.	Producers have limited knowledge of climate change and its negative impact on coffee production.
23	24-feb	M 1	Non Government Organization	2 (A)	D	Diego Bernal De León	Cordinator	Fundación Agros	Nebaj	Quiché	Coffee/Vegetable	Decline in coffee production, due to rust.	Producers have more and better knowledge about natural resources management and the effects of climate change.	They are not sustainably managing natural resources.
24	24-feb	M 1	Association	2 (A)	D	Tomas Tedillo Solis	Producer	APROCAFI	Nebaj	Quiché	Conventional Coffee	Members of producers organizations are concerned about the decline in coffee production.	Small producers are eager to renew coffee plantations with new rust resistant species, to overcome the current situation.	Weak public institutional presence and lack of social awareness on the use, access and control of natural resources.
25	25-feb	F 40	Association	2 (A)	D	Tomas Anai	Producer	APRODEFI	Chajul	Quiché	Vegetables	Test soil management and irrigation methods and errors in the early stages of reforestation, BPA	Soil protection, improved productivity, less pollution, currently three women are part of the JD	Little water monitoring, planting eucalyptus.
26	25-feb	M 1	Business	2 (A)	I	Luis García	Technician	AGROEXPORT	Guatemala City	Guatemala	Vegetables	They insist on good agricultural practices of farmers, lead production processes rigorously.	Technical strengthening to the producers and association for vegetables commercialization.	Suggested irrigation systems and water shortages.
27	25-feb	M 1	Producer	2 (A)	D	Humberto López	Producer	Coffee	Nebaj	Quiché	Coffee	Its main commitment is to the management of water for wet processing of coffee, which extends the protection of soil with organic fertilizer and forest management where the water comes.	The plantation is old and the use of organic fertilizer did not combat rust. It is considered responsible for managing the plantation with organic production techniques and management of honey water.	Limited knowledge of the importance of natural resources management and illegal timber extraction, no public institutional presence.

STAKEHOLDER IDENTIFICATION												RESULTS OF CONSULTATIONS – PERCEPTIONS EXPRESSED BY STAKEHOLDERS		
No	Date	Number and gender people consulted (#F, #M)	Type of stakeholder *	Time of participation in the Project Years (Y), Months (M)	Directly and Indirectly affected by the project? (D, I)	Name	Position	Organization Name	Site/Village/Municipality	Department	Product/Crop	Significant issues or concerns of the proposed action ²	Positive effects of the proposed action ³	Problems/conflicts with natural resources ⁴
28	26-feb	M 1	Local Government	NA	I	Eduardo Cruz Gómez Raymundo	First Trustee	Nebaj Municipality	Nebaj	Quiché	Environment and RNR	The municipality has been overrun with offer of chemicals.	Raise awareness and provide training to the population on climate change and environmental mitigation measures.	Increased social conflicts due to access and use of watersheds and the extraction of forest resources.
29	26-feb		Association		D	Pedro López Canto	President	APROCAFI	Nebaj	Quiché	Water/Vegetables	Achieve efficient water management, implement practices for soil conservation and sustainable use of forest resources.	Social and environmental focus on water management and conservation of soil and forest.	Legal or illegal access and use of natural resources.
30	26-feb	F 28 M 2	Association	2 (A)	D	Concepción Chonay	President	Artesanías Ixil	San Juan Cotzal	Quiché	crafts	The forest can be managed, not only cut the trees. People must learn natural resources management.	Generation of employment for women. Improved wood-saving stoves can be produced by the Association.	Community conflicts over water and firewood scarcity.
31	27-feb	F39/M 41	Association	2 (A)	D	Nicolas Us	President	ADPRA	Cunen	Quiché	vegetables (pee green beans)	Limited water available, lack of measurement, a variety of proposals on products to cultivate.	Pest and soil management. Best pesticide management and hygiene practices.	Water availability
32	27-feb	F11/M41	Association	2 (A)	D	José María Reyes	President	ADIP	Uspantan	Quiche	vegetables	Quality and quantity of water and energy	Improved irrigation system, storage of pesticides and fertilizers, improved health conditions due to water filters, soil management	Water availability
33	02-mar	F 1 M1	Association	0	D	Marco Tulio Tzimaj	President	ASIAPZR	Uspantan	Quiche	cardamom	Risk of deforestation due to the drying process, potential land use change for eventual extension of cultivation and consumption of wood for drying.	Population is aware of social and environmental management, with support of institutions	Forests lack of management plans and have strong pressure for productive uses (wood for drying).
34	03-mar	F 1 M 10	Association	2 (A)	D	Fredy Erasmo Gódinez	President of Board of Directors	Nueva Misión Santa Clara	Cunen	Quiché	French green beans and sweet peas	Responsible water management in the production process, soil protection and reforestation / forest conservation.	Social organizations have market-based approach and generate employment.	The community ensures the protection of these resources
35	03-mar	M 1	Local Government	NA	I	Víctor Hugo Figueroa	Municipality Major	Uspantán Municipality	Uspantán	Quiché	N/A	Irrational use and without economic cost of natural resources	Key player in sustainable management of natural resources	Water shortages, soil degradation and forest depletion.

STAKEHOLDER IDENTIFICATION												RESULTS OF CONSULTATIONS – PERCEPTIONS EXPRESSED BY STAKEHOLDERS		
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36	03-mar	20M, 75H	Association	20(M)	D	José Tiu	Legal Representative	Asociación Integral de Desarrollo Agrícola (AIDA) Comprehensive Agricultural Development Association (AIDA)	Quiche	Quiche	Green Beans	Association does not participate in the project and have not finalized the certification process.	Increased production, environmental practices implemented, best price of green beans (ejote).	Illegal logging in their forests.
37	03-mar		Association	2(M)	D	Arcadio Galindo	General Coordinator and Legal Representative	Chajulense Association	Chajul	Quiche	Coffee	Weak internal organization (conflicts), no industrial safety procedures for dry mill.	Organizational assessment and training conducted.	Unsustainable harvesting of firewood within the plots of the members, inappropriate pesticide spraying practices applied by some members.
38	03-mar	72M, 0H	Association	4 (M)	D	Ana Estallul Méndez	Legal Representative	Asociación para el Desarrollo Integral de las Mujeres de Uspantán	Uspantán	Quiché	Crafts	Increased water scarcity in the center of the town during the dry season.	Raised awareness about the importance of natural resources management.	Water scarcity
39	04-mar	F 1 M 10	National Association of Fruit and deciduous	2(M)	D	Santos A. Morales	Board of Directors President	ANAPDERCH	Los Encuentros, Chichicastenango, Quiché	Quiché	Fruits	Responsible social and environmental management. High quality products.	Reduce production costs and optimize existing services.	Water scarcity
40	05-mar	M 2	Export Company	2	I	José Álvarez y Enrique Ajquijay	Area supervisors	SIESA	Guatemala city	Guatemala	Vegetables	Empowerment to continue hiring local technicians.	RVCP support on environmental practices and training to beneficiaries	By improving the price, revenues increase, funds can be used to pay to the local technician.
41	05-mar	F 2	Voces Vitales		D	Dina de Dios Morales y Daniela Martínez	Dirección/Coordination	Voces Vitales, Capitulo Guatemala since 2,008	Guatemala City	Guatemala	N/A	Importance of forest management and the participation of women	Increased knowledge on climate change	Sensitize women on the best use of natural resources.
42	05-mar	F 1 M 1	Instituto de Nutrición para Centroamérica y Panamá	2	D	Vannesa Echeverría y Marlon Chávez	Cordinators	Institutional facing public Nutrition, with lines of action oriented to regional priorities.	Central America and Panama	Guatemala,	N/A	The low level of knowledge and increased deterioration of agricultural production due to stan.	Sensitize and train the population in efficient natural resources management.	There are social conflicts arising from the lack of water and extraction of the sobres.
43	05-mar	M 1	Non Government Organization	2	D	Jorge Mario Chiquin	Coordinator	Save The Children	Guatemala City	Quiché, Quetzaltenango	Vegetables, potatoes and apples	Originally, groups from Totonicapán were included, but they are not participating due to political issues, availability of land	Sustainable natural resources management and promotion of associative work	Focus on rational management.

STAKEHOLDER IDENTIFICATION												RESULTS OF CONSULTATIONS – PERCEPTIONS EXPRESSED BY STAKEHOLDERS		
No	Date	Number and gender people consulted (#F, #M)	Type of stakeholder *	Time of participation in the Project Years (Y), Months (M)	Directly and Indirectly affected by the project? (D, I)	Name	Position	Organization Name	Site/Village/Municipality	Department	Product/Crop	Significant issues or concerns of the proposed action ²	Positive effects of the proposed action ³	Problems/conflicts with natural resources ⁴
44	05-mar		ONG	NA	NA	Juan Carlos Godoy		TNC, Guatemala	Guatemala	Guatemala City	N/A	Concepts of adaptation to climate change are not clear, either the application of actions in territory. It is necessary to provide more information on climate.	Establishment of demonstration plots	Forest degradation due to fuelwood extraction.
45	20-mar	F 1	Association	NA	1	Claudia García de Bonilla	Executive Director	Asociación de reservas naturales privadas de Guatemala, ARNPG	Ciudad de Guatemala	Guatemala City	N/A	Clarify the concept of value chains within private PAs, since there is great potential for partnerships with private and community farms (tourism, crafts from coffee, etc.)	Environmental certifications of coffee production processes, training	Forest degradation, risk of invasions and forest thinning,

*Producers not in the project, community leader, indigenous association, producer, private sector, national authorities, local authority, water authority, protected areas, forests (INAB), wildlife protection, multilateral bodies / international program, NGOs and so on.

¹ Questions asked during consultation: after reviewing the Project activities that were being carried out with the stakeholders (or after the presentation of the Project activities by the Project implementers) stakeholders were asked: ¿Qué inquietudes o preocupaciones tiene usted y/o su organización sobre las actividades del proyecto?, ¿Qué problemas ambientales puede generar las actividades del proyecto? , ¿Cuáles podrían ser algunos efectos negativos a raíz de la intervención del proyecto?,

¹ Questions asked during consultations: ¿Qué beneficios ambientales genera el proyecto?

¹ Questions asked during consultations: ¿Qué problemas existen en relación a los recursos naturales? ¿Porque? Hay conflictos sobre agua? Tierra? Tala de bosque? Extracción de minerales, fauna, flora? Cacería? Problemas con sequia, terremotos, inundaciones, heladas, nieves, cambio climático?

ANNEX D: ENVIRONMENTAL MITIGATION AND MONITORING PLAN BY VALUE CHAIN

COFFEE VALUE CHAIN

#	Description of Mitigation Measure (Coffee)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
1	Update all pesticide and IPM training and technical assistance to adhere to the findings of the January 2015 Programmatic PERSUAP for LAC (LAC-IEE-15-05) ¹	ANACAFE, FEDECOCAGUA, AGEXPORT technicians	Training manuals/plans updated	Checklist review	One time per set of training manuals/ materials.	Hourly cost of staff person to review and update materials.				
2	Annual training in safe use and handling of agrochemicals, including the use of PPE, and Integrated Pest Management, per the January 2015 Programmatic PERSUAP for LAC (LAC-IEE-15-05) ² Emphasis needs to be placed on IPM and the identification of which pesticides are allowed and for which plants.	ANACAFE, FEDECOCAGUA, AGEXPORT technicians	# of producers trained implementing PERSUAP practices	PERSUAP Training participant lists. Technician/ para-technician reports of Practices implemented in the field (checklist) Annual verification by AGEXPORT & ANACAFE	Quarterly reports	\$200 per org.				
3	Provide	ANACAFE,	List of approved	Verify receipt	Annually	\$25 per org.				

¹ <http://gemini.info.usaid.gov/egat/envcomp/repository/pdf/42611.pdf>

² <http://gemini.info.usaid.gov/egat/envcomp/repository/pdf/42611.pdf>

#	Description of Mitigation Measure (Coffee)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	farmers/associations lists of approved pesticides from the January 2015 Programmatic PERSUAP for LAC (LAC-IEE-15-05) ³	FEDECOCAGUA, AGEXPORT technicians and para-technicians	pesticides per organization	of list by organization.						
4	Train farmers to use Personal Protection Equipment (PPE) while using pesticides. (When an official PPE suit is not available, identify with farmers ways to adapt common items as PPE, including plastic sheets to cover the torso and plastic beverage bottles for face protection, among others.)	ANACAFE, FEDECOCAGUA, AGEXPORT technicians and para-technicians	# farmers trained and using PPE	Review training records and verify in the field.	Quarterly	\$200 per org.				
5	Train associations to promote and communicate the list of permitted products in the PERSUAP.	Producer groups with ANACAFE, FEDECOCAGUA, AGEXPORT technicians and para-technicians	# of associations/ producer groups trained	Compare list of pesticides provided with those in use	Annually	None				
6	The use of herbicides will not be recommended but manual weeding will be promoted and the use of “chapeados” that leave some 10 cm of the plants in their place instead of eliminating them, in order to	ANACAFE, FEDECOCAGUA, AGEXPORT technicians and para-technicians	Percent producers using chaporro and not herbicides.	Field verification	Quarterly					

³ <http://gemini.info.usaid.gov/egat/envcomp/repository/pdf/42611.pdf>

#	Description of Mitigation Measure (Coffee)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	decrease erosion and favor the infiltration of rainwater.									
7	Construct on demonstration plots and train farmers in the correct and complete construction and use of pesticide mixing zones and bio-beds (Biodeps). Ensure there is water available for washing or rinsing, protective walls are constructed and it is located the correct distance from bodies of water.	ANACAFE, FEDECOCAGUA, AGEXPORT, SCF technicians and para-technicians	Percent farmers trained. # bio-beds constructed to standards.	Develop standards checklist Verify on a sampling of farms that construction meets standards per checklist.	Quarterly	\$200 per org. AGEXPORT: BAP Demonstrative plots implemented, including a biodep (\$100 each)				
8	Train farmers to practice cleaning and dispose of empty pesticide containers according to Guatemalan norms NGO 44 086-98, <i>Plaguicidas. Envases. Triple lavado</i> and COGUANOR NGO 44 086.	ANACAFE, FEDECOCAGUA, AGEXPORT technicians and para-technicians	Number of producers trained. Number of producers implementing practice.	Training lists. Verification of practices on the ground	Quarterly	None. Incorporated into project training and technical assistance. No additional materials required.				
9	Develop solid waste management practices with producers or producer groups. Such as, coordinate container collection and disposal services (e.g. Agrequima collection where they service) or establish properly designed solid waste (inorganic)	ANACAFE, FEDECOCAGUA, AGEXPORT technicians with coffee organization	Number of producers trained in solid waste mgmt practices.	Verification of practice with producer	Quarterly	AGEXPORT: \$14,000 Solid waste management pilot program implemented				

#	Description of Mitigation Measure (Coffee)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	disposal/burial pits on farms. (Do not burn waste.)									
10	Train farmers to establish native vegetation barriers (such as with multi-use grasses, trees or shrubs) where they do not exist between coffee crops and the edges of streams and other bodies of water (of at least 18m ⁴ as farm space permits) to capture run-off of chemicals and nutrients.	ANACAFE, FEDECOCAGUA, AGEXPORT technicians and para-technicians with coffee farmers	# producers trained.	Verify in training records	Annually	\$200 per org				
11	Train para-technicians and producers in the design and implementation of soil conservation standards and practices (e.g. the correct soil conservation measures and spacing between them for soil type, depth and slope ⁵ of the site).	ANACAFE, FEDECOCAGUA, AGEXPORT technicians and para-technicians	# para-technicians and producers trained. # of producers implementing correct soil conservation measure.	Training lists. Verification of practices on the ground	Annually, of a sampling of farmers	AGEXPORT: \$21,000 Demonstrative coffee plots implemented				
12	Protect existing multi- use shade trees during renovation.	Coffee farmer with ANACAFE, FEDECOCAGUA, AGEXPORT technicians and para-technicians	# of hectares with existing multi-use shade trees protected.	Count	Annually	None. (Incorporate into project activity monitoring.)				

⁴ Fleming and Henkel. (2001). <http://www.fao.org/forestry/12659-05d509078d5cbe3908cd6e891e808490d.pdf>

⁵ Based on Sheng's 1989 Soil Conservation for Small Farmers in the Humid Tropics as cited on p. 11 of the USAID (2014) Environmental Guidelines for Agriculture.

#	Description of Mitigation Measure (Coffee)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
13	Where applicable (per farm size/plan), rotate renovation of coffee groves (in blocks or by rows/intercropping) to preserve the permanent shade plants, which mitigates alteration of the coffee tree's habitat, and staggering periods of non-productivity of young coffee plants on farms.	Coffee farmer with ANACAFE, FEDECOCAGUA, AGEXPORT technicians and para-technicians	Renovation plans reflect rotation, when indicated.	Indicate rotation schedule in farm renovation plan, where there is one.	Annually	None. (Incorporate into project activity monitoring.)				
14	Locate nurseries on flat ground or construct terraces and erosion control devices when on slopes ⁶ .	Coffee farmer with ANACAFE, FEDECOCAGUA, AGEXPORT technicians and para-technicians	Nursery location and slope; measures applied.	Verify at site.	Once When the nurseries are established	None. (Where erosion control is cost prohibitive need to find a different site.)				
15	Establish solid waste collection receptacles (E.g re-use boxes, pails or other containers as trash management site) or waste burial practices (e.g. trash burial pits) at nurseries.	Coffee farmer with ANACAFE, FEDECOCAGUA, AGEXPORT technicians and para-technicians	At least on trash can or trash pit per nursery.	Verify at site.	Annually					
16	Train farmers to diversify shade trees planted in their	Technicians from ANACAFE,	# of farmers trained	List of farmers trained.	Annually	None. Included in technical				

⁶ Per USAID Environmental Guidelines for Agriculture, p. 10 – 11.

#	Description of Mitigation Measure (Coffee)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	shade grown coffee agroforestry systems ⁷	FEDCOCAGUA and AGEXPORT				assistance. Addition training \$200 per org				
17	Select and plant shade trees based on the altitude, aspect and soils of a given site.	ANACAFE, FEDECOCAGUA, AGEXPORT technicians and para-technicians with coffee farmers	# trees planted at site	Create checklist of trees per altitude, soils and aspect. Fill out checklist per renovation.	Annually	None.				
18	Promote the re-conditioning of “honey water” (coffee wastewater) treatment filter pits to avoid over-flows at demonstration plots. Re-conditioning is based on water volumes and site-based features.	Coffee farmer with ANACAFE, FEDECOCAGUA, AGEXPORT technicians	Number of filter pits re-conditioned	List of farmers with re-conditioned filter pits	Annually, at start of production season.	\$600 per org				
19	Train farmers to reuse wet milling waste, such as pulp, by incorporating into compost and making fertilizers.	ANACAFE, FEDECOCAGUA AGEXPORT technicians and para-technicians with coffee farmer	# coffee pulp compost piles implemented correctly on farms	Verify on a sampling of farms.	Annually	Included in technical assistance Materials provided by plot owners.				

⁷ While shade grown coffee agroforestry systems are necessarily designed per site-based characteristics (aspect, soils, climate, etc.) here are some common standards: AGEXPORT (2014b) recommends shade grown coffee systems have a minimum of 10 species of trees and a minimum density of 70 trees per hectare. July 2014 Rainforest Alliance standards (12 native species per hectare including fruit trees, at least 40% shade and at least two canopy strata) and in Bird Friendly standards which include 40% shade cover, a diversity of at least 10 woody species, and three stratum of structural diversity. http://nationalzoo.si.edu/scbi/migratorybirds/coffee/quick_reference_guide.cfm

#	Description of Mitigation Measure (Coffee)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	Apply Cal (calcium hydroxide) and biological agents (such as lombricompost) to compost to prevent odors and the proliferation of flies; applying it to the coffee pulp to stabilize the pH and to promote the development of micro-organisms that accelerate reduction of organic material, and so that the pulp can be reused as fertilizer.									
20	Locate compost piles at least 20m from bodies of water and ensure they are protected from rain and strong winds, are not located in floodplains, nor will run-off contaminate crops or irrigation water. (E.g. where necessary, plant vegetative strips to help capture potential run-off from compost piles.)	ANACAFE, FEDECOCAGUA, AGEXPORT technicians and para-technicians and coffee farmers.	# compost piles; location of compost pile per water body.	Create checklist of compost pile specifications. Apply checklist per farm visit.	Quarterly	Included in technical assistance				
21	Incorporate organic waste into worm and regular compost systems. Worm bins must have solid, enclosed sides and bottoms. Farmers must be trained to manage worms, being	ANACAFE, FEDECOCAGUA, AGEXPORT technicians and para-technicians with coffee organization.	# of producers with worm compost bins trained	Training records.	Quarterly	Implemented by producer Included in technical assistance				

#	Description of Mitigation Measure (Coffee)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	vigilant of their proper enclosure and not letting them escape into the environment.									
22	Train producers in occupational health and safety practices.	AGEXPORT, ANACAFE, FEDECOCAGUA technicians	# trained producers implementing practices	Review training lists and make site visit verifications. Site visits.	Annually	\$200 per org				
23	Develop a standardized RVCP land use registration form per agricultural value chain	ANACAFE and AGEXPORT and FEDECOCAGUA	Validated report form applied in mid-term land use data collection	Review reporting forms/data collection formats in use by certified organizations. Develop new form with all implementing partners.	Once.	Included in technical assistance				
24	Ensure model farms (master farmers and farms) reflect the complete and correct application of the mitigation measures and best practices promoted by the project.	ANACAFE, FEDECOCAGUA, AGEXPORT technicians and para-technicians.	Best practices modeled at each farm. Checklist of best practice design elements per farm. of design criteria.	Create best practices checklist. Verify on model farm.	Quarterly	AGEXPORT: \$13,000 as part of Master Farmer (Coffee)				
25	Recruit/develop male and female master farmers from a range of age groups (e.g.	ANACAFE, FEDECOCAGUA, AGEXPORT	Master farm gender and age	Register master farmer information	At master farmer "registration"	AGEXPORT: Included in #23				

#	Description of Mitigation Measure (Coffee)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	youth, middle-age, elder)	technicians and para-technicians.			(commitment to role)					
26	Ensure that purchased motorized backpack sprayers meet FAO standards ⁸ and incorporate practices ⁹ that protect human health and the environment into training in the use and maintenance of motorized pesticide sprayers.	ANACAFE, FEDECOCAGUA	Checklist of standards per purchased sprayer/brand. Producers with purchased sprayers trained. Verify training records against receipt of sprayer.	Verify against standards. Verify training records against receipt of sprayer.	Prior to receipt of motorized sprayer.	ANACAFE: Included in technical assistance				

⁸ <http://www.fao.org/docrep/006/Y2752S/Y2752S00.htm>

⁹ Practices include: calibration of equipment, determining the proper application rate, pressure and speed of movement, determining the amount of chemicals to use and the safe application of pesticides. Information on these practices can be found in the Environmental Guidelines for Small-scale Agriculture in Africa, Chapter 13, p. 34 – 40 <http://www.encapafrika.org/sectors/saferpesticides.htm> and the APHIS USDA Job Hazard Analysis, https://www.aphis.usda.gov/emergency_response/downloads/health/JHA%2020%20Application%20of%20pesticides-herbicides%20by%20Hand%20apparatu.pdf

HORTICULTURE AND FRUIT ORCHARDS

#	Description of Mitigation Measure (Horticulture and Fruit Orchards)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
1	Construct on demonstration plots and train farmers in the correct and complete construction and use of pesticide mixing zones and bio-beds (Biodeps). Ensure there is water available for washing or rinsing, protective walls are constructed and it is located the correct distance from bodies of water.	FEDECOAG, AGEXPORT, SCF technicians and para-technicians with horticulture organization.	# farmers trained. # bio-beds constructed to standards.	Develop standards checklist Verify on demonstration plots construction meets standards per checklist.	Quarterly	\$200 per org AGEXPORT: Demonstative plots implemented including a biodep (\$100 each)				
2	Train farmers in the RVCP PERSUAP and as amended for new crops (apple, pear, peach, green and jalapeño peppers). Special emphasis needs to be placed on IPM and the identification of which pesticides are allowed and for which plants.	FEDECOAG, AGEXPORT and SCF technicians	# farmers trained. # farmers implementing safe use practices.	Training lists. Technician/ para-technician reports of practices implemented in the field (checklist)	Quarterly reports	\$200 per org				
3	Train farmers in integrated pest management practices to control pests in their horticulture crops per the project PERSUAP, and as amended for new crops. (Until the PERSUAP for the new crops is approved,	FEDECOAG, AGEXPORT, SCF technicians	# farmers implementing IPM.	Training lists. Technician/ para-technician reports of practices implemented in the field	Quarterly reports	No additional cost. Incorporated into project and PERSUAP trainings.				

#	Description of Mitigation Measure (Horticulture and Fruit Orchards)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	the project will not promote pesticides in these crops however will continue with BMPs, GAPs, and IPM)			(checklist)						
4	Train farmers to use Personal Protection Equipment (PPE) while using pesticides. (When an official PPE suit is not available, identify with farmers ways to adaptation common items as PPE, including plastic sheets to cover the torso and plastic beverage bottles for face protection, among others.)	FEDECOAG, AGEXPORT, SCF technicians and para-technicians	# farmers trained and using PPE	Review training records and make site visits.	Annually before application of pesticides	\$200 per org				
5	Train associations to promote and communicate the list of permitted products in the PERSUAP.	FEDECOAG, AGEXPORT technicians & para-technicians with producer groups	# of Associations/ producer groups trained.	Compare list of pesticides provided with those in use.	Annually	\$25 per org				
6	Develop solid waste management practices with producers or producer groups. Such as, coordinate container collection and disposal services (e.g Agrequima collection where they service) or establish properly designed solid waste (inorganic) disposal/burial pits on farms. (Do not burn waste.)	FEDECOAG, AGEXPORT technicians with producer organization	Number of producers trained in solid waste mgmt practices.	Verification of practice with producer	Quarterly	AGEXPORT: \$14,000 Solid waste collection pilot plan implementation (for coffee and orchards)				

#	Description of Mitigation Measure (Horticulture and Fruit Orchards)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
7	Locate compost piles at least 20m from bodies of water and ensure they are protected from rain and strong winds, are not located in floodplains, nor will run-off contaminate crops or irrigation water. (E.g. where necessary, plant vegetative strips to help capture potential run-off from compost piles.)	FEDECOAG, AGEXPORT, SCF technicians and para-technicians with master farmers and farmers.	# of meters between compost piles and bodies or sources of water.	Create checklist of compost pile specification. Apply checklist per farm visit.	Quarterly	No additional cost				
8	Locate latrines at least 30m ¹⁰ from water bodies or sources of drinking water. Ensure they are constructed above the water table and downslope from wells or water sources. Ensure latrine construction and location meet USAID ENCAP standards ¹¹	FEDECOAG, AGEXPORT, SCF technicians and para-technicians	# latrines constructed that meet USAID ENCAP Visual Field Guide standards	Technicians and Para-technicians apply USAID ENCAP Visual Field Guide at each constructed latrine.	Apply Visual Field Guide checklist, during design and at completion of latrine.	No additional cost.				
9	Train farmers in best management practices for water conservation in irrigation, such as best timing of irrigation (e.g. in early morning or late afternoon), to identify and	FEDECOAG, AGEXPORT, SCF technicians	# farmers with irrigation trained. # irrigated parcels with soil conservation methods.	Training lists. Technician/para-technician verify practices	Quarterly and during irrigation.	AGEXPORT: \$7,800 Irrigation water management for 16 organizations				

¹⁰ USAID ENCAP Visual Field Guides: Toilets/Latrines, December 2009. http://www.usaidgems.org/Documents/VisualFieldGuides/ENCAPVslFldGuide--Sanitation_1Dec09.pdf

¹¹ USAID ENCAP Visual Field Guides: Toilets/Latrines, December 2009.

http://www.usaidgems.org/Documents/VisualFieldGuides/ENCAPVslFldGuide--Sanitation_1Dec09.pdf

#	Description of Mitigation Measure (Horticulture and Fruit Orchards)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	immediately repair leaks, to identify signs of over or under watering, and soil conservation methods to apply in the irrigated parcel that help retain soil humidity (mulch, green manures, incorporation of organic matter, etc.).			implemented in the field						
10	Strengthen (via training) irrigation management committee or form a new one when one doesn't exist.	Technical staff from project where applicable	Committee (or appropriate organization) formed. Number of irrigation managers trained.	List of irrigation managers trained	Annually	Included in #9				
11	Locate macro-tunnels and greenhouses where they won't be damaged by high winds or intense rains. Locate macro-tunnels and greenhouses on level ground, with slopes less than 12% taking soil conservation measures appropriate to the characteristics of the soil where they are located. The amount of leveling required should be minimal. These areas should be located away from water flow areas to prevent soil movement	FEDECOAG, AGEXPORT, SCF technicians and para-technicians with horticulture farmer.	# of macro-tunnels constructed on slopes less than 12% # macro-tunnels with signs of erosion	Site verification	Quarterly	Included in technical assistance				

#	Description of Mitigation Measure (Horticulture and Fruit Orchards)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	and erosion.									
12	Apply USAID Visual Field Guide: Construction ¹² at all RVCP constructed small-scale infrastructure: <i>centros de acopio</i> (storage centers), macro-tunnels and greenhouses to ensure they are not generating impacts. Take corrective actions when impacts identified.	FEDECOAG, AGEXPORT, SCF technicians and para-technicians	# of no answers per site. # of yes answers per site. Yes answer corrective mitigation measures implemented.	Technicians and Para-technicians apply USAID ENCAP Visual Field Guide: Construction	Annually	Unforeseen costs of corrective actions.				
13	Train producers in occupational health and safety practices.	FEDECOAG, AGEXPORT, SCF technicians	# trained producers implementing practices	Review training lists and make site visit verifications.	Site visits.	\$200 per org				
14	Develop a standardized RVCP land use registration form per agricultural value chain	FEDECOAG and AGEXPORT	Validated report form applied in mid-term land use data collection	Review reporting forms/data collection formats in use by certified organizations. Develop new form with all implementing partners.	Once.	No additional cost				
15	Ensure model farms (master farmers and farms) reflect	FEDECOAG, AGEXPORT,	Best practices modeled at each	Create best practices	Quarterly	AGEXPORT \$30,000				

¹² http://www.usaidgems.org/Documents/VisualFieldGuides/ENCAP_VsFldGuide--Construction_22Dec2011.pdf

#	Description of Mitigation Measure (Horticulture and Fruit Orchards)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	the complete and correct application of soil conservation practices in horticultural crops (e.g. contour planting, construction of ditches, live and dead barriers, mulching, cover crops) and the mitigation measures and best practices promoted by the project.	SCF technicians and para-technicians	farm. Checklist of best practice design elements per farm.	checklist of design criteria. Verify on model farm. Include photos in field visit reports.		Master Farmer project				
16	Recruit/develop male and female master farmers from a range of age groups (e.g. youth, middle-age, elder)	FEDECOAG, AGEXPORT technicians and para-technicians.	Master farm gender and age	Register master farmer information	At master farmer commitment to role	Included in #5				
17	Publish project instructional materials with sufficient pictographs to support learning by illiterate farmers.	FEDECOAG, AGEXPORT	# of organizations with materials	Material published	Annually	\$\$2,000 total				
18	Incorporate organic waste into worm and regular compost systems. Worm bins must have solid, enclosed sides and bottoms. Farmers must be trained to manage worms, being vigilant of their proper enclosure and not letting them escape into the environment.	ANACAFE, FEDECOAG, AGEXPORT technicians and para-technicians	# of producers with worm compost bins trained	Training records.	Quarterly	Included in technical assistance Materials provided by owners				

CARDAMOM

#	Description of Mitigation Measure (Cardamom)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
1	Update all pesticide and IPM training and technical assistance to adhere to the findings of the Pesticide Evaluation and Safe Use Action Plan for cardamom (Until the cardamom-specific PERSUAP is approved, the project will not promote pesticides with cardamom producers. However, it will continue to promote BMPs, GAPs, IPM and organic practices.)	AGEXPORT technicians	Training manuals/ plans updated	Checklist review	One time per set of training manuals/ materials.	\$400 per org				
2	Train cardamom farmers in IPM and PERSUAP recommended pesticides and safe use practices. (Until the cardamom-specific PERSUAP is approved, the project will not promote pesticides with cardamom producers. However, it will continue to promote BMPs and organic practices.)	AGEXPORT technicians	# trained farmers implementing IPM/organic practices # trained farmers safely using approved pesticides.	Training lists. Technician/ para-technician reports of practices implemented in the field (checklist based on PERSUAP.)	Quarterly reports	\$200 per org				
3	Train farmers to use Personal Protection Equipment (PPE) while using pesticides. (When an official PPE suit is not	AGEXPORT technicians & para-technicians	# farmers trained and using PPE	Review training records and make site visits.	Quarterly	\$200 per org				

#	Description of Mitigation Measure (Cardamom)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	available, identify with farmers ways to adaptation common items as PPE, including plastic sheets to cover the torso and plastic beverage bottles for face protection, among others.)									
4	Train associations to promote and communicate the list of permitted products in the PERSUAP.	AGEXPORT technicians and para-technicians with producer groups	# of associations/ producer groups trained	Compare list of pesticides provided with those in use.	Annually	\$50 per org (once)				
5	Construct and train farmers in the correct and complete construction and use of pesticide mixing zones and bio-beds (Biodeps). Ensure there is water available for washing or rinsing, protective walls are constructed and it is located the correct distance from bodies of water.	AGEXPORT, technicians and para-technicians with cardamom organization.	# farmers trained. # bio-beds constructed to standards.	Develop standards checklist Verify on farms construction meets standards per checklist	Quarterly	\$200 per org \$100 per demonstrative biodep				
6	Develop solid waste management practices with producers or producer groups. Such as, coordinate container collection and disposal services (e.g Agrequima collection where they service) or establish properly designed	AGEXPORT technicians with producer organization	Number of producers trained in solid waste mgmt practices.	Verification of practice with producer	Quarterly	\$300 per org				

#	Description of Mitigation Measure (Cardamom)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	solid waste (inorganic) disposal/burial pits on farms. (Do not burn waste.)									
7	When applicable, provide farmers/ associations lists of approved pesticides from the new cardamom PERSUAP.	AGEXPORT technicians	Lists of approved pesticides per organization	Verify receipt	Per pesticide application period	\$\$ Costs of pesticides \$25 per org				
8	Select and plant shade trees based on the altitude, aspect and soils of a given site.	Cardamom producers and AGEXPORT technicians	# trees planted at site; site altitude, soils and aspect.	Create checklist of trees per altitude, soils and aspect. Fill out checklist per reforestation	Per reforestation; quarterly	None.				
9	Train cardamom dryers in occupational health and safety practices.	AGEXPORT technicians	# trained producers implementing practices	Review training lists and make site visit verifications.	Workshop/ site visits.	Per occupational health and safety plan. At least annually \$200 per org				
10	Promote only native trees to be used for reforestation	Cardamom farmers and AGEXPORT technicians	# of participating farmers reforesting with native species	List of participants reforesting with native species.	Annually	None. Included in technical assistance				
11	Locate nurseries on flat ground or construct terraces	Cardamom farmers/association	Nursery location and slope; measures	Record and verify at site.	At nursery construction	Included in technical assistance				

#	Description of Mitigation Measure (Cardamom)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	and erosion control devices when on slopes ¹³	and AGEXPORT technicians and para-technicians	applied.							
12	Establish solid waste collection receptacles (for collection and transport to another appropriate waste management site) or waste burial practices (e.g. trash burial pits) at nurseries.	Cardamom farmers/associations and AGEXPORT technicians and para-technicians	At least one receptacle or trash pit per nursery.	Verify at site.	Annually	None. (Re-use existing containers or boxes where trash will be collected and transported to another appropriate disposal site.)				
13	Train farmers with fuelwood plantations in plantation management and reduced impact harvesting practices ¹⁴ to minimize effects on soils and surrounding waters, trees or habitats, and reduces risks to human health and bodily harm. Such as via pruning, the proper collection of dead and down wood, and when necessary, selective cutting and directional felling. (Link with CNCG implementers for guidance	AGEXPORT technicians	# farmers with fuelwood plantations trained. # farmers with written/pictorial guidance on fuelwood harvesting best practices ¹⁵ # farmers implementing plantation management best practices.	Develop checklist of plantation management best practices. Develop written guidance of fuelwood harvesting best practices.	Annually	\$35,000 All the cardamom organizations will include implementing nurseries and technical assistance to identify planting and monitoring areas.				

¹³ Per USAID Environmental Guidelines for Agriculture, p. 10 – 11.

¹⁴ Reduced impact practices can be found in the USAID Sector Environmental Guidelines on Forestry, p. 23 and guidance on reforestation and plantation management on p.27. http://www.usaidgems.org/Documents/SectorGuidelines/SectorEnvironmentalGuidelines_Forestry_2015.pdf

¹⁵ It is understood that fuelwood harvesting in planted plantations will occur beyond the life of the project.

#	Description of Mitigation Measure (Cardamom)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	and training.)									
14	Fuelwood plantations will be planted only in abandoned agricultural or pasture land. (Ergo, not in established forest.) Fuelwood plantations will not be planted in riparian zones (within 20m on either side of the edge of a bankfull stream or river) or in wetlands.	Cardamom farmers with AGEXPORT technicians	Location and # square meters on farm of abandoned (unused) land. Location and # square meters fuelwood plantation.	Verify on farm plan/sketch, the locations and features. Verify on farm.	Prior to and during planting.	None. Location of plantations does not generate additional costs. Included in #13.				
15	Develop a standardized RVCP land use registration form per agricultural value chain	AGEXPORT	Validated report form applied in mid-term land use data collection	Review reporting forms/data collection formats in use by certified organizations. Develop new form with all implementing partners.	Once.	Included in technical assistance				
16	Recruit/develop male and female master farmers from a range of age groups (e.g. youth, middle-age, elder)	AGEXPORT technicians and para-technicians.	Master farm gender and age	Register master farmer information	At master farmer commitment to role	Included in #17				
17	Ensure model farms (master farmers and farms) and climate change demonstration sites reflect	AGEXPORT, technicians and para-technicians	Best practices modeled at each farm.	Create best practices checklist of design criteria.	Quarterly	\$15,000 Master Farmer Project (Cardamom)				

#	Description of Mitigation Measure (Cardamom)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	the complete and correct application the mitigation measures and best practices promoted by the project.		Checklist of best practice design elements per farm.	Verify on model farm. Include photos in field visit reports.						

HANDICRAFTS

#	Description of Mitigation Measure (Same as in Table 2)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
1	Train handicraft organizations to verify if raw materials meet market requirements, are legal and non toxic.	Handicraft organization, COMART, ARTEXCO technicians	# of organizations trained	Training lists.	Annually	\$2,000 per org				
2	Train artisans in occupational health and safety practices as identified in plans	COMART, ARTEXCO technicians	# trained artisans implementing practices	Workshop site visits.	Per occupational health and safety plan. At least annually	\$2,000 per org				

Component 5: FOOD SECURITY AND NUTRITION

#	Description of Mitigation Measure (Same as in Table 2)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
1	Train families in organic pesticides and integrated pest management practices to control pests in home gardens, per the project PERSUAP.	INCAP/FUNCAFE technicians and para-technicians	#families trained. #families using organic pesticides	Training reports Verify at homes	Quarterly	\$4,000				
2	Train families in pesticide safe use practices per the project PERSUAP when using pesticides.	INCAP/FUNCAFE technicians and para-technicians	# farmers and families trained	Training lists. Verify practices with farmer	Quarterly	\$4,000				
3	Apply soil conservation practices based on slope: terracing contour planting, or live and dead barriers. (When available, locate home gardens on low-grade slopes, less than 12%).	SAN families with INCAP/FUNCAFE technicians and para-technicians	Slope of home garden Erosion control practices per slope.	Verify with farmer	Upon construction of home garden (as applicable and annually)					
4	Train farmers/families in efficient irrigation practices (e.g. timing of irrigation, how to fix leaks, and maintenance and cleaning of tubes).	INCAP/FUNCAFE technicians and para-technicians	#families trained. #families implementing irrigation best management practices	Verify training lists and implementation in home gardens	Quarterly	\$4,000				
5	Train families at demonstration sites rainwater harvesting best practices: such as to collect rainwater off metal roofs that are not rusting and	INCAP/FUNCAFE technicians and para-technicians	#families with rainwater harvesting system trained	Verify status of roof	Upon design of system and annually (at start of rainy season)	\$2,000				

#	Description of Mitigation Measure (Same as in Table 2)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	without overhanging branches, and to place screens in rainwater storage containers to keep out debris, mosquitos and other insects.									
6	Teach soil conservation measures in home gardens including minimal to no till techniques and incorporation of compost to improve soil humidity.	INCAP/FUNCAFE technicians and para-technicians	#families applying soil conservation techniques	Verify in home garden	Quarterly	Included in technical assistance				
7	Locate compost piles at least 20m from bodies of water and ensure they are protected from rain and strong winds, are not located in flood plains, nor will run-off contaminate crops or irrigation water. (E.g. where necessary, plant vegetative strips to help capture potential run-off from compost piles.)	SAN families with INCAP/FUNCAFE technicians and para-technicians	#meters compost pile from body of water #compost piles protected from the elements and run-off	Verify on farm Include photos in report	Quarterly	Included in technical assistance				

COMPONENT 5: CCDSAN - ADDITIONAL MITIGATION MEASURES IF AND WHEN COMMUNITY CENTERS FOR FOOD SECURITY AND NUTRITION ARE CONSTRUCTED¹⁶

#	Description of Mitigation Measure (same as in Table 2)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
1	<p>Ensure the implementation and use of improved latrines in the construction of CCDSAN and of a number according to the capacity of the center.</p> <p>Located latrines at least 30m from water bodies or sources. Ensure they are constructed above water table and downslope from any wells or water sources, and ensure latrine construction and location meet USAID ENCAP Standards¹⁷</p>	INCAP/AGEXPORT technicians and para-technicians	# latrines constructed that meet USAID ENCAP Visual Field Guide standards	Technicians and para-technicians apply USAID ENCAP Visual Field Guide at each constructed latrine.	During construction of latrine and quarterly	No additional cost				
2	Implement infiltration pits (soakaways) in the CCDSAN so that the graywater can be filtered or processed.	INCAP/AGEXPORT technicians	# properly constructed infiltration pits per CCDSAN	Verify in center	Annually	\$1,500				
3	Develop a CCDSAN maintenance plan with designated responsible group. Train them in	INCAP/AGEXPORT	Designated and trained maintenance group per center	Maintenance group names and signatures of	Upon planning of CCDSAN and annually	\$8,000 for training				

¹⁶ At the time of the writing of this EMMP, the RVCP was not certain the planned CCDSAN's would be constructed. When the decision has been made to continue with their construction, they will implement the following mitigation and monitoring activities.

¹⁷ http://www.usaidgems.org/Documents/VisualFieldGuides/ENCAP_VsFldGuide--Construction_22Dec2011.pdf

#	Description of Mitigation Measure (same as in Table 2)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation and effectiveness	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	maintenance activities including identifying and correcting any erosion or drainage issues.			commitment. Training records						
4	Deposit solid waste generated by CCDSAN construction in an official sanitary landfill, where one exists. (Re-use/recycle waste first)	INCAP/AGEXPORT technicians and para-technicians	Site of CCDSAN construction and nearest sanitary and landfill where they exist. Construction site free of solid waste	Verify dates and times of collection and deposit of construction waste at landfill	At the start of construction, and during construction as needed, and at its end.	\$8,000 (for what?)				
5	All CCDSAN designs will be reviewed by a certified civil engineer, and monitor compliance with small scale construction best practices by applying the USAID ENCAP Visual Field Guide for Construction	INCAP/AGEXPORT technicians	Certified engineer approved plan #of USAID Field Guide “no” answers per site. #of USAID Field Guide “yes” answers per site. Corrective actions taken	Plan reviewed, improved, and signed by engineers. Technician application of ENCAP Visual Field Guide for Construction	Design should be certified before starting construction. Apply visual field guide at design of CCDSAN during construction, and at end. Also annually.	\$10,000				

ANNEX E: COMPARISON TABLE OF THE ACTIONS OF THE THREE ALTERNATIVES

No Action	Proposed Action	Alternative C
<p>Activities expected to continue in the absence of USAID funding.</p>	<p><i>RVCP activities that may contribute to the issue or can address it.</i></p>	<p><i>Alternative C actions address the issue. Alternative C includes all of the Proposed Actions in addition to the actions listed in this column below.</i></p>
<p><i>Issue 1- Forest degradation: forest habitats and associated biodiversity can be negatively impacted by the consumption of fuel wood for drying cardamom. Fuel wood purchased for cardamom drying may be illegally and unsustainably harvested.</i></p>		
<ul style="list-style-type: none"> ● 805 cardamom producers in the <i>Zona Reina</i> will burn between 8.8 m³ and 13.514 m³ of firewood to dry one ton of cardamom. ● Firewood harvested and bought via legal and illegal means. ● Cardamom dried using inefficient, firewood burning stoves. ● Producers slowly incorporating trees into cardamom fields 	<ul style="list-style-type: none"> ● Technical assistance and training in crop sanitation, shade management and control of Thrips to increase cardamom quality and yields of 805 producers working 1,050 ha. ● Improved technologies in post-harvest management will be introduced, such as more efficient cardamom drying technologies and practices including dryers preventive maintenance and repair of existing dryers to increase their efficiency. ● Incorporation of fuel wood and multi-use agroforestry species into cardamom agroforestry systems to provide shade in 324 ha of existing cardamom plantations. ● Establish cardamom and tree nurseries. ● Practices that mitigate the effect of and 	<ul style="list-style-type: none"> ● Sustainable fuel wood management planning. Sustainable management planning of firewood will identify the current demand for firewood of the RVCP cardamom associations, and inventory/assess existing legal supply. It will forecast firewood consumption and yield into the future, helping the cardamom producers identify management actions they can take to develop their farms and forests for a sustained yield. ● Small-scale Fuel wood Plantations: to fill legal firewood supply deficits and reduce ecosystem degradation in natural forests. Alternative C works with the cardamom producers to identify degraded areas to plant with firewood species on their farm, and trains them to

<p style="text-align: center;">No Action</p> <p style="text-align: center;">Activities expected to continue in the absence of USAID funding.</p>	<p style="text-align: center;">Proposed Action</p> <p style="text-align: center;"><i>RVCP activities that may contribute to the issue or can address it.</i></p>	<p style="text-align: center;">Alternative C</p> <p style="text-align: center;"><i>Alternative C actions address the issue. Alternative C includes all of the Proposed Actions in addition to the actions listed in this column below.</i></p>
	<p>support producers to adapt to climate change will be promoted. For instance, implementation of nurseries with cardamom plants selected for their resilience to the effects of climate change, pest and disease; soil conservation practices that reduce erosion and improve soil stability; cardamom agroforestry systems with native fuelwood species and 5 climate change demonstration farms that put into practice up to 30 climate change practices proposed in the AGEXPORT climate change manual.</p>	<p>maintain these plantations for the medium- and long-term.</p> <ul style="list-style-type: none"> • Assess improved designs of present cardamom drying technologies. Assess efficiency of the cardamom-drying technologies and methods the Proposed Action will implement that modify present systems and reduce firewood use. It will be done at pilot sites, comparing efficiency of the current cardamom dryers with the efficiency of the new proposed dryer design.
<p><i>Issue 2- Diversity of native species in agroforestry systems: the Proposed Action’s selection of shade tree species, and that of non-native or invasive species, to be used in project agroforestry systems has the potential to affect biodiversity on farms.</i></p>		
<p>Coffee value chain:</p> <ul style="list-style-type: none"> • Inga and introduced sp., Gravilea, are planted in and dominate Guatemala’s shade coffee agroforestry systems. (Gravilea is not an invasive specie.) • Some producers are decreasing shade cover in response to coffee rust 	<p>Coffee value chain:</p> <ul style="list-style-type: none"> • Diversification with native species promotes native and fruit trees not only to help coffee with shade but also for domestic consumption. Also, plants leguminous species to fix nitrogen. • Non-native species, Gravilea, will be 	<p>No Alternative Actions to the Proposed Action</p> <p><i>Proposed action includes following mitigation measure:</i></p> <ul style="list-style-type: none"> • <i>Train farmers to diversify shade trees planted in their shade grown coffee agroforestry</i>

<p style="text-align: center;">No Action</p> <p style="text-align: center;">Activities expected to continue in the absence of USAID funding.</p>	<p style="text-align: center;">Proposed Action</p> <p style="text-align: center;"><i>RVCP activities that may contribute to the issue or can address it.</i></p>	<p style="text-align: center;">Alternative C</p> <p style="text-align: center;"><i>Alternative C actions address the issue. Alternative C includes all of the Proposed Actions in addition to the actions listed in this column below.</i></p>
<p>epidemic, thus decreasing density and possibly diversity of shade trees on farm.</p> <ul style="list-style-type: none"> Shade grown practices and standards expected to continue on 6,130.30 ha of certified coffee producers. <p>Cardamom value chain:</p> <ul style="list-style-type: none"> 31% of <i>Zona Reina</i> in cardamom production; 51.7% in forest; 9.7% <i>guamil</i> (abandoned, secondary growth fields) Cardamom farmers slowly incorporating native multi-use shade trees into agroforestry systems. 	<p>planted within coffee parcels and around fields as windbreaks where agro-climatic conditions permit.</p> <ul style="list-style-type: none"> Promotion of and technical assistance in shade tree management on 9,866.71 ha. Identification and diversification of native and non-native shade species for coffee crops (majority Ingas and Gravilea). <p>Cardamom value chain:</p> <ul style="list-style-type: none"> Locally collected seeds of native shade tree species will be cultivated in RVCP nurseries and used for reforestation/enrichment of 324 ha of agroforestry systems. 	<p><i>systems¹</i></p>
<p><i>Issue 3 - Soil erosion: coffee field renovation and establishment can create conditions for soil erosion if soil management and conservation measures are not applied properly.</i></p>		

¹ While shade grown coffee agroforestry systems are necessarily designed per site-based characteristics (aspect, soils, climate, etc.) here are some common standards: AGEXPORT (2014b) recommends shade grown coffee systems have a minimum of 10 species of trees and a minimum density of 70 trees per hectare. July 2014 Rainforest Alliance standards (12 native species per hectare including fruit trees, at least 40% shade and at least two canopy strata) and in Bird Friendly standards which include 40% shade cover, a diversity of at least 10 woody species, and three stratum of structural diversity. http://nationalzoo.si.edu/scbi/migratorybirds/coffee/quick_reference_guide.cfm

<p style="text-align: center;">No Action</p> <p style="text-align: center;">Activities expected to continue in the absence of USAID funding.</p>	<p style="text-align: center;">Proposed Action</p> <p style="text-align: center;"><i>RVCP activities that may contribute to the issue or can address it.</i></p>	<p style="text-align: center;">Alternative C</p> <p style="text-align: center;"><i>Alternative C actions address the issue. Alternative C includes all of the Proposed Actions in addition to the actions listed in this column below.</i></p>
<ul style="list-style-type: none"> ● 60% of coffee plantations are aging and less productive. ● Aging coffee plantations can be infected with coffee rust; older plants cannot resist coffee rust very well. ● Aging (unproductive) coffee plantations are being abandoned or changed to other agricultural uses, such as annual crops (corn, beans). ● Farmers reducing shade to try to address coffee rust. ● Thirty-one certified coffee organizations managing shade correctly. 	<ul style="list-style-type: none"> ● Renewal of plantations: improvement and recovery of degraded and eroded soil areas through establishment of new coffee plantations and shade species, soil improvement and fertilization plans, establishment of coffee rust and other disease resistant coffee seedlings, nursery establishment, irrigation and management for nurseries; establishment of agro forestry systems. To maintain soil cover during renovation practices include: cutting back plants at their stem to maintain soil cover and planting other crops. ● Technical assistance to promote improved technologies or practices: shade management, soil conservation measures such as live barriers, individual terraces, amongst others. ● 	<ul style="list-style-type: none"> ● Plant nitrogen fixing, multi-use grasses (for mulch and livestock forage) and green manures at coffee field renovation demonstration sites, as well as native fuel wood/shade trees or fruit trees to protect soils from erosion and improve fertility.
<p><i>Issue 4- Water management and conservation: Water is being used for irrigation in some horticulture crops and for coffee processing without sufficient measurement and monitoring of water use, supply and demand.</i></p>		

<p style="text-align: center;">No Action</p> <p style="text-align: center;">Activities expected to continue in the absence of USAID funding.</p>	<p style="text-align: center;">Proposed Action</p> <p style="text-align: center;"><i>RVCP activities that may contribute to the issue or can address it.</i></p>	<p style="text-align: center;">Alternative C</p> <p style="text-align: center;"><i>Alternative C actions address the issue. Alternative C includes all of the Proposed Actions in addition to the actions listed in this column below.</i></p>
<ul style="list-style-type: none"> ● Inefficient irrigation systems in use, such as sprinkler technology. ● Irrigation systems tap community-managed springs sharing source water with domestic uses. ● In general, throughout Guatemala, empirical, unmeasured, management of irrigation systems and water. ● In community water systems, irrigation water available where there is surplus. ● Wet milling of coffee is done with limited knowledge of amounts of water used creating inefficiencies and waste. 	<ul style="list-style-type: none"> ● Conversion of sprinkler irrigation systems to drip irrigation systems introduce more efficient irrigation technology to farmers and conserve water. ● Improvement in post-harvest management and processing, including wet milling (new and remodeled), “beneficios ecologicos” or eco-friendly wet milling technologies, new and remodeled artisanal processing, improved (filter pits) technologies and treatment of coffee wastewater. 	<ul style="list-style-type: none"> ● Irrigation Management Plan and Implementation: Conversion of established irrigation systems as it is being done by Agexport should include an overall diagnosis and plan of the system, as well as measurement of water supply and demand of the irrigation system according to crop type and areas subject to irrigation. An irrigation management plan includes not only maintenance and operation, but also the management of water and the irrigation system as a whole, including water measurement and monitoring and how to change the operation when drought or other problems and needs arise. ● Compare volume of water used (per cuerda or square meter per crop) by the two systems – sprinkler systems and RVCP-installed drip irrigation systems with management (including soil conservation practices) <u>in demonstration sites</u> ● Water Management and Conservation

<p style="text-align: center;">No Action</p> <p style="text-align: center;">Activities expected to continue in the absence of USAID funding.</p>	<p style="text-align: center;">Proposed Action</p> <p style="text-align: center;"><i>RVCP activities that may contribute to the issue or can address it.</i></p>	<p style="text-align: center;">Alternative C</p> <p style="text-align: center;"><i>Alternative C actions address the issue. Alternative C includes all of the Proposed Actions in addition to the actions listed in this column below.</i></p>
		<p>in coffee wet milling processes trains farmers in measurement and monitoring of water use and practices that support its conservation, and climate change adaptation measures.</p> <ul style="list-style-type: none"> ● Demonstrate the Harvesting of Rainwater for Vegetable Gardens in master farms. ● Promote the utilization of mulch in home gardens to conserve soil moisture.
<p><i>Issue 5 – Water pollution: a) Existing coffee waste water disposal systems using filter pits have the potential to overflow (such as in wet coffee processing at the Asociación Chajulense in Quiche and as identified in the July 2014 Audit, p. 24) and can cause surface and ground water contamination when water is not treated or filter pits not designed correctly, and b) Agriculture production actions such as pesticide application, fertilizer use, and composting can deteriorate water quality due to inappropriate location of the activities, lack of buffer zones, and when best management practices are not followed..</i></p>		
<p>Coffee value chain:</p> <ul style="list-style-type: none"> ● “Agua mieles” dumped directly into surrounding environment, including arroyos or streams. 	<p>Coffee value chain:</p> <ul style="list-style-type: none"> ● Improvement in post-harvest management and processing, including new and remodeled artisanal processing², improved 	<ul style="list-style-type: none"> ● Promote re-conditioning of “honey water” (coffee wastewater) treatment filter pits to avoid over-flows based on water volumes and site-based features and conditions.

² such as ,“beneficios ecologicos” or eco-friendly wet milling technologies, coffee pulping manual machines (brand Servicios Integrados Industriales with 20qq capacity) and modules of semi-integrated coffee pulping machines (brand Jota Gallo).

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<ul style="list-style-type: none"> ● Artisanal filter pits overflowing “aguas mieles” into surrounding environment including arroyos or streams. ● Thirty-one certified coffee organizations with improved wastewater practices or systems. <p>All agricultural value chains:</p> <ul style="list-style-type: none"> ● Pesticide and fertilizer use (over-application and incorrect timing) runs off into nearby waterways or builds up in soils. 	<p>technologies and treatment of coffee wastewater and improvements/repairs to mechanical pulping equipment.</p> <p>Horticulture value chain:</p> <ul style="list-style-type: none"> ● Technical assistance and implementation of Best Agricultural Practices (e.g. safe use of pesticides, fertilizer planning and use, management of pesticide waste containers, soil conservation.) 	<ul style="list-style-type: none"> ● Alternative Action: Development of instructional materials that give general recommendations to farmers, para-technicians and technicians on how to design a filter pit based on local conditions and volume of coffee wastewater generated. ● Exchange of Experiences/Field Trips with Master Farmers, Producer Groups, Promoters and Project Technicians, promoting successful models and best management practices across implementers and producer groups, such as Pesticide Brigades.
<p><i>Issue 6 – Pest and disease management: Coffee rust, thrips, and other pests/diseases are impacting coffee, cardamom, and fruit tree production, as well as horticulture production. Pesticide use is seen as a solution to minimizing pest and disease in crop production but can negatively impact health and water quality, especially in areas under organic production such as on organic coffee farms in the Zona Reina, at the headwaters of the Chixoy River Basin.</i></p>		

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<p><i>The sub-issues are:</i></p> <ol style="list-style-type: none"> 1) <i>Variations in pesticide use and safe use standards³ and practices.</i> 2) <i>The appropriate coffee-rust resistant varieties to plant per local conditions and international markets.</i> 3) <i>The lack of standardized IPM practices in project value chains that can be applied in conventional and organic systems</i> 		
<ul style="list-style-type: none"> ● Aging coffee plantations can be infected with coffee rust; older plants cannot resist coffee rust very well. ● No access to credit and a three-year return on the new plants severely limits farmer’s capacity to renew plantations. ● Limited to no use of Personal Protective Equipment by farmers when spraying pesticides; inappropriate dosages and highly toxic pesticides applied. 	<p>Coffee value chain:</p> <ul style="list-style-type: none"> ● Technical assistance and training in production issues for organic, conventional and mixed coffee crops. ● Training and implementation of PERSUAP (10-01-2010), for Coffee and horticulture. ● Training and implementation of Programmatic PERSUAP with emphasis on coffee rust (Jan 2015). ● Purchase, training in use and maintenance of motorized sprinkler pumps with a two-stroke engine, and 	<p>Coffee value chain:</p> <ul style="list-style-type: none"> ● Train project technicians, para-technicians and farmers in the Integrated Pest Management practices of the Programmatic Pesticide Evaluation Report and Safe Use Action Plan (PERSUAP) for Coffee, with Emphasis on Coffee Rust, approved January 2015. Alternative C also incorporates the aforementioned successful models of technology transfer (e.g. Pesticide Brigades) to ensure the 2015

³ The July 2014 Audit cites various inconsistencies with pesticides being used by RVCP participants and the project PERSUAP. “Based on observations in the field and interviews with producers, the environmental audit results indicate that participants in the RVCP are not compliant with the PERSUAP. Based on active ingredients in commonly used pesticides such as Duett, the first active ingredient in epoxiconazole + carbendazim is listed as a fungicide not to be used on USAID projects. In addition, copper oxide and tea tree oil (*Melaleuca alternifolia*) are utilized by producers, but not included in the approved PERSUAP list” (Cadmus 2014, p.30).

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<ul style="list-style-type: none"> ● Producers decreasing shade to try to address rust in plantations. ● IPM and/or organic practices in 31 certified organic coffee organizations. ● Limited technical assistance will be available to cardamom producers to improve crop sanitation practices and increase quality and yields. ● De facto pesticide-free production in Zona Reina will continue; however, with the threat of Thrips crossing into the area from Coban, pesticides are being used. 	<p>handling and storing of petroleum products.</p> <ul style="list-style-type: none"> ● Analysis of the effect of coffee rust in coffee cultivation and management design for the small farmer. Includes the approximation of area affected; restoration of plantations, planting of coffee varieties resistant to coffee rust, pesticides to control pests and diseases in conventional and organic coffee <p>Horticulture and fruit orchards value chain:</p> <ul style="list-style-type: none"> ● Technical assistance and training in production topics to increase horticultural production quality and yields, including pesticide use and management, hand-washing stations and bio-beds. ● Producer adoption of production systems under controlled conditions (e.g. macro-tunnels). 	<p>approved pesticides and safe use practices are being applied.</p> <ul style="list-style-type: none"> ● Exchange of Experiences/Field Trips with Master Farmers, Producer Groups, Para-technicians and Project Technicians, sharing and promoting the adoption of successful models, such as the Pesticide Brigades, in other producer groups. <p>Horticulture and fruit orchards value chain:</p> <ul style="list-style-type: none"> ● Training of project technicians, para-technicians and farmers in the PERSUAP as amended by the USAID to include crops and pesticides not reviewed such as apples, peaches, green peppers and jalapeño peppers. ● Exchange of Experiences/Field Trips with Master Farmers, Producer Groups, Para-technicians and Project Technicians, sharing and promoting the adoption of successful models, such as the Pesticide Brigades, in other producer groups.

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	<p>Cardamom value chain:</p> <ul style="list-style-type: none"> • Technical assistance and training in production topics to increase cardamom quality and yields such as crop sanitation and management and pest and disease management such as that of Thrips. 	<p>Cardamom value chain:</p> <ul style="list-style-type: none"> • Promote Organic Standards to Cardamom Producers in Zona Reina. • Train project technicians, para-technicians and farmers in the findings of the PERSUAP for cardamom production (as developed by the USAID) in the Zona Reina. • Exchange of Experiences/Field Trips with Master Farmers, Producer Groups, Para-technicians and Project Technicians, sharing and promoting the adoption of successful models, such as the Pesticide Brigades, in other producer groups.
<p><i>Issue 7 - Litter and solid waste management: improper solid waste management in agricultural production and processing, handicraft production and in plant nurseries can contribute to the community-wide problem with inorganic litter and waste, a problem experienced throughout Guatemala.</i></p>		
<ul style="list-style-type: none"> • Poor solid waste management systems or practices at community and municipal levels. 	<p>All agricultural value chains using pesticides:</p> <ul style="list-style-type: none"> • The management of chemical product 	<p>Horticulture, fruit, coffee, cardamom and handicraft value chains:</p>

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<ul style="list-style-type: none"> ● Agrequima’s⁴ CampoLimpio program helps establish used pesticide container collection sites in communities. Collected plastics are sent to be recycled. ● Under the No Action alternative 31 coffee and 3 horticulture certified organizations are expected to continue to carry out solid waste management practices to meet certification standards and do not contribute to the issue. ● Solid waste generated at nurseries would litter the environment. 	<p>residuals according to chapter CB 8.9 de Global GAP including Agrequima collection of pesticides container from Agrequima collection sites</p> <p>Coffee value chain:</p> <ul style="list-style-type: none"> ● Renewal of plantations: establishment of coffee rust and other disease resistant coffee seedlings, nursery establishment, irrigation and management for nurseries. <p>Horticulture value chain:</p> <ul style="list-style-type: none"> ● Conversion of sprinklers to drip irrigation systems with plastic tubing. ● Production systems under controlled conditions, such as macro-tunnels and plastic sheets. <p>Cardamom value chain:</p> <ul style="list-style-type: none"> ● Establish cardamom and tree nurseries. 	<ul style="list-style-type: none"> ● Training in Solid Waste Management: Horticulture, fruit, coffee, cardamom and handicraft technicians, para-technicians and organizations will be trained to identify and manage inorganic and organic solid waste.

⁴ Agrequima is a guild of associated agrochemical companies (multi-nationals and manufacturers, formulators and distributors) with the mission of being a model in the industry of crop nutrition and protection that promotes innovative, sustainable and environmentally-responsible agriculture, contributing to the improvement of Guatemalan livelihoods. http://www.agrequima.com.gt/index.php?option=com_content&view=article&id=112&Itemid=268

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	<p>Handicraft value chain:</p> <ul style="list-style-type: none"> Artisans continue to re-utilize remnants incorporating them into other product, such as pin cushions. 	
<p><i>Issue 8 - If handicraft raw materials are bought from unsafe and unsustainable sources, they could impact human health, place indirect pressures on a natural resource, and negatively impact handicraft production.</i></p>		
<ul style="list-style-type: none"> Handicraft products sold for export not made with toxic materials. Handicraft products with toxic threads produced. Do not meet some export market standards therefore products not exported. Thread dyers in Guatemala, do not treat wastewater generated by dying and it is released into environment (streams, rivers, and other bodies of water). 	<ul style="list-style-type: none"> RVCP asks for a certificate from thread providers that they are AZO-free threads, per export market requirements. 	<ul style="list-style-type: none"> Train handicraft organizations to verify if raw materials meet market requirements, are legal and non toxic. Identify other providers of non-toxic thread in Guatemala or regionally to meet export market requirements: Identify other companies that will or can provide non-toxic thread.
<p><i>Issue 9 - Inadequate occupational health and safety conditions impact air quality in the work environment, damage infrastructure and can pollute local soils and water.</i></p>		
<ul style="list-style-type: none"> Old and improperly installed equipment (smoking, vibrating, leaking gas and oil.) 	<p>Horticulture, Cardamom, Coffee, Handicraft</p>	<p>Across all value chains:</p> <ul style="list-style-type: none"> Promote a culture of occupational health and safety. Develop organizational capacity to develop and

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<ul style="list-style-type: none"> Limited oversight of industrial safety and occupational health compliance by Guatemalan authorities (per Guatemalan Labor Code, Title 5, chapter Hygiene and safety in the workplace.) 	<ul style="list-style-type: none"> Training in occupational health and safety measures. <p>Coffee value chain:</p> <ul style="list-style-type: none"> Improvement in post-harvest management and processing. <p>Cardamom value chain:</p> <ul style="list-style-type: none"> Improved technologies in post-harvest management, such as more efficient cardamom drying technologies and practices including dryers that recycle energy and maintenance and repair of existing dryers to increase their efficiency <p>Handicraft value chain:</p> <ul style="list-style-type: none"> Improved technologies or production practices such as back-strap looms and inputs and modern looms tailored to the artisans, implementation of looms for bracelets, equipping workshops with treadle looms for weaving wool, carding machinery and machinery for thread spinning; sewing machines. 	<p>monitor the implementation of occupational health and safety plans. Create alliances with local public and private organizations dedicated to occupational health and safety, emergency response and related practices.</p>
<p><i>Issue 10: Conservation of local agrobiodiversity: Crops promoted in home gardens do not reflect the full range of medicinal and other vegetables that participants like to eat or use, potentially limiting the benefits of local agrobiodiversity, that has traditionally been</i></p>		

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<p><i>conserved in home gardens and their benefits to food security and nutrition.</i></p>		
<ul style="list-style-type: none"> ● Local diets and dietary practices resulting in high malnutrition rates (55% and greater) in target RVCP departments. ● Via the CADER, MAGA is training up to 25 families per community in food security practices. ● Primitive cultivars and wild relatives of cultivated plants found in Cuchamatanes region. ● Knowledge of native plant cultivation and use being lost. 	<ul style="list-style-type: none"> ● Training in nutritionally balanced recipes that incorporate native herbs. ● Establishment of home gardens with micro-dip irrigation scheme of 50 m² or less, and provision of vegetable seeds for home gardens. 	<ul style="list-style-type: none"> ● Exchange of Experiences between AGEXPORT and ANACAFE/FUNCAFE to learn successful approaches to food sovereignty of participating families.
<p><i>Issue 11 - Differing and competing agricultural practices between RVCP participating members and non-members can indirectly limit the effectiveness, replication and sustainability of the agricultural and environmental best management practices and technologies promoted by the project.</i></p>		
<ul style="list-style-type: none"> ● No export market-led horticulture development in six (of the twelve) highly malnourished municipalities. ● “Coyote” buyers do not request produce per Global Gap standards; farmers do not see value in adopting practices especially when no market demand. 	<ul style="list-style-type: none"> ● RVCP exclusively works with the members of the producer associations, cooperatives and organizations attended by the AGEXPORT and ANACAFE implementing partners. ● RVCP master farmers share practices and experiences with members and non-members alike. 	<ul style="list-style-type: none"> ● Exchange of Experiences/Field Trips with Producers and Project Technicians: to learn successful approaches such as exemplified by the <i>Mesa de Concertacion de Café in Ixil</i> that brings together coffee producers in a particular geographic area to address specific issues together.

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<ul style="list-style-type: none"> ● Soil conservation, crop sanitation and pesticide safe use practices can be too expensive or socio-culturally unacceptable and not adopted. ● Coffee wastewater not managed sufficiently and effecting downstream users. ● Untreated coffee-rust infecting neighbor’s farms. ● Organic organizations challenged to maintain certification because of pesticide use on non-organic neighbor’s farm, and uncontrolled coffee rust. 	<ul style="list-style-type: none"> ● RVCP coffee, cardamom and tree seedlings raised in nurseries at member farms. Some farmers selling to producers in their community. ● Agrequima pesticides waste receptacles available for everyone in the community to use. ● “Mesa de Concertacion de Café” in Ixil provides opportunity for coffee producers throughout the area to come together and organize. (Members and non- members.) 	
<p><i>Issue 12 - Land use monitoring: project baseline data (that of the RVCP or MEP) was not designed to collect, map or monitor land use information of participating farms in a way that facilitates the monitoring of land use change.</i></p>		
<ul style="list-style-type: none"> ● Land use (and tenure) poorly documented or mapped throughout the Western Highlands. ● Three horticulture and thirty-one coffee certified organizations (Organic, RA-cert, etc.) maintain 	<p>Coffee and horticulture value chain:</p> <ul style="list-style-type: none"> ● Support quality certifications where the market requires them, including training for maintenance of certifications, training for tracking of 	<ul style="list-style-type: none"> ● Land Use Monitoring: aims to identify (by taking GPS points) on a GIS map the locations of the productive units of RVCP farmers. This information will contribute to the MEP project mapping, monitoring and evaluation.⁵ ,

⁵ It requires an agreement between MEP and RVCP

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<p>records of member productive units, production, other land uses on the farm, and best management practices to meet certification standards. Some include farm sketches/plans.</p>	<p>certification rules, elaboration of regulations within the organization for compliance with certification rules. Eighteen organically certified coffee organizations maintain records of member productive units, production, other land uses on the farm, and best management practices to meet certification standards. Some include farm sketches/plans.</p>	<ul style="list-style-type: none"> ● Introduce producer groups or individual farmers with forest they want to protect to forest protection incentive programs (INAB PINPEP or PINFOR.)
<p><i>Issue 13 - Technical assistance and training is not having the expected results (fully addressing environmental management needs) and may be limited by language and literacy barriers.</i></p>		
<ul style="list-style-type: none"> ● AGEXPORT technical assistance and training to horticulture producers in six (of the target twelve) RVCP municipalities. ● Sixteen ANACAFE and FEDECOAGUA technicians available to all coffee producers in Huehuetenango, San Marcos, Quiche and Quetzaltenango. ● Three COMART technicians available to established handicraft organizations in 	<p>All RVCP value chains and component 5:</p> <ul style="list-style-type: none"> ● Cumulatively, 132 technicians available to provide technical assistance and training in the coffee, horticulture, fruit orchard, cardamom, handicraft and food security and nutrition activities. ● 178 para-technicians trained and paid by the project, and speak the local language, to promote best management practices. (Reaching up to 100 producers per <i>promotor</i>.) 	<p>All RVCP value chains and component 5:</p> <ul style="list-style-type: none"> ● Exchange of Experiences/Field Trips with Producers and Project Technicians: includes workshops, field trips/exchanges, or co-implementation of field activities to cross-fertilize experience and knowledge between technical assistance staff of ANACAFE and AGEXPORT, producer groups and master farmers. Master farmers continue to share experiences with

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<p>target RVCP departments.</p>	<ul style="list-style-type: none"> ● 33 master (model) farmers demonstrating best practices on their farms in their communities. ● Extension materials printed in Spanish. 	<p>non-member farmers on their farms or on the master farm.</p> <ul style="list-style-type: none"> ● Extension materials published in pictographs to reach illiterate producers.
<p><i>Issue 14 - Sustainability of environmental best management practices - economic and socio-cultural factors: 1) Will associations be profitable enough to afford and encourage their members (producers) to adopt practices such as the macro tunnels, latrines and hand washing stations, or metal fencing? (The July 2014 Audit points to existing challenges with investing in equipment such as the Personal Protective Equipment used during pesticide spraying) and 2) limited youth involvement in activities and decision-making, experienced during scoping, including that of young women, can limit the capacity of new generations to carry forward best management practices.</i></p>		
<ul style="list-style-type: none"> ● Three Global Gap-certified horticulture organizations with initial investment in macro-tunnels, latrines, hand-washing stations or metal fencing. ● Non-certified farmers not adopting cost-prohibitive best management practices such as macro-tunnels, latrines, hand-washing stations or metal fencing. ● Non-certified farmer selling produce to “coyotes” who buy at lower prices. ● Youth migration from community and 	<p>Horticulture value chain:</p> <ul style="list-style-type: none"> ● Technical assistance and training in production topics to increase horticultural production quality and yields, including technologies and sanitary practices to improve quality and meet certification requirements such as field-based latrines, hand-washing stations and bio-beds. ● Producer adoption of production systems under controlled conditions such as macro-tunnels and greenhouses, requiring initial investment by the 	<p>No Alternative Actions to the Proposed Action.</p> <p><i>Proposed action mitigation measures include:</i></p> <ul style="list-style-type: none"> ● <i>Recruit/develop male and female master farmers from a range of age groups (e.g. youth, middle-age, elder)</i>

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<p>farm to urban areas, other parts of Guatemala and the United States.</p>	<p>farmer.</p> <ul style="list-style-type: none"> ● Support quality certifications where the market requires them. This can result in a more secure market/buyer and the addition of a small premium on price. 	