

# RISK REDUCTION AND VULNERABILITY TO FLOODS AND DROUGHTS IN THE ESTERO REAL RIVER WATERSHED



## Final Report

*April 2014*



Gobierno de Reconciliación  
y Unidad Nacional  
*El Pueblo, Presidente!*

**MARENA**  
Ministerio del Ambiente  
y los Recursos Naturales



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<b>PROJECT NAME</b>	<i>Risk Reduction and Vulnerability to Floods and Droughts in the Estero Real River Watershed</i>			
PNUD #	00074925	<b>Financing</b>	<b>At endorsement</b> <i>(millions of \$USD)</i>	<b>At MTE</b> <i>(million \$USD)</i>
FMAM #	PIMS 4448			
ATLAS #	00059776	<b>AF</b>	5.07	5.07
Country	Nicaragua	<b>IA/EA</b>		
Region	LAC			
Executing agency	MARENA	<b>Total effective cost</b>	5.07	5.07
Others	NA	<b>Start Date</b>	29 March 2011	
		<b>Closing date</b>		
			Original date: 29 February 2015	Revised Date: 30 June 2015
Period of the MTE	16 December to 31 March 2014 – a version in Spanish with Annexes has been submitted			
Evaluator	Joe Ryan			

## ACRONYMS & ABBREVIATIONS

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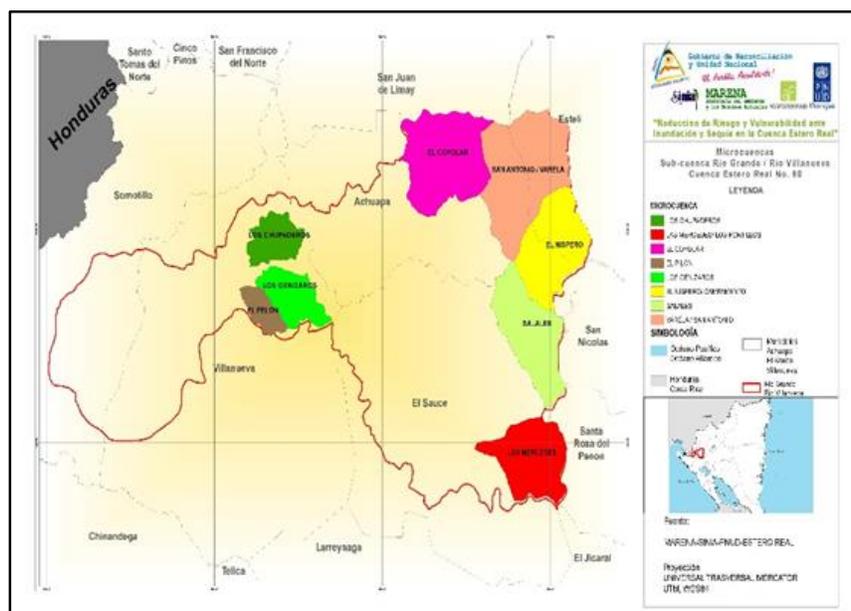
ANA	Autoridad Nacional del Agua
BID	Banco Inter-americano de Desarrollo
CAPS	Comité de Agua Potable y Saneamiento
CAI	Comité de Apoyo Interinstitucional
CBD	Convención sobre la Biodiversidad
CMIN	Convención de Minamata
COFODEC	Fondo Cooperativo para el Desarrollo de Fincas en El Sauce
CCP	Comité de Coordinación del Programa
CP	Coordinador del Programa
CRM	Cuenta del Reto del Milenio
CURS	Centro Universitario Regional, Somotillo
DGCC	Dirección General de Cambio Climático, MARENA
DLTC	Delegación Territorial del MARENA en Chinandega
DLTL	Delegación Territorial del MARENA en León
EMT	Evaluación de Medio Termino
ETM	Equipo Técnico Municipal
FA	Fondo de Adaptación a los Cambios Climáticos
FISE	Fondo de Inversión Social de Emergencia
FMAM	Fondo para el Medio Ambiente Mundial (GEF en inglés)
INAFOR	Instituto Nacional Forestal
INETER	Instituto Nicaragüense de Estudios Territoriales
INIFOM	Instituto Nicaragüense de Fomento Municipal
INTA	Instituto Nicaragüense de Tecnología Agropecuaria
IDR	Instituto Nicaragüense de Desarrollo Rural
INATEC	Instituto Nacional Tecnológico
MAGFOR	Ministerio Agropecuario y Forestal
MARENA	Ministerio del Ambiente y los Recursos Naturales
MBR	Manejo Basado en Resultados
MINSA	Ministerio de Salud
MST	Proyecto Manejo Sostenible de la Tierra
MTI	Ministerio de Transporte e Infraestructura
PNUD	Programa de las Naciones Unidas para el Desarrollo
ONG	Organización No Gubernamental
PAGRICC	Programa Ambiental de Gestión de Riesgos de Desastres y Cambio Climático
PNDH	Plan Nacional de Desarrollo Humano
PIMCHAS	Proyecto Integral de Manejo de Cuencas Hidrográficas, Agua y Saneamiento
ProDoc	Documento rector del Proyecto Estero Real
PSA	Pagos por Servicios Ambientales
SIMOSE	Sistema de Monitoreo, Seguimiento y Evaluación
SINAPRED	Sistema Nacional para la Prevención, Mitigación y Atención de Desastres
SINIA	Sistema Nacional De Información Ambiental
TASCA	Talleres de Salud Campesina
TdR	Términos de Referencia
UNAG	Unión Nacional de Agricultores y Ganaderos
UNAN	Universidad Nacional Autónoma de Nicaragua
UGAM	Unidad de Gestión Ambiental Municipal

## **ACKNOWLEDGEMENTS**

The consultant is extremely appreciative of the Ministry of Natural Resources and the Environment (MARENA) for its full support throughout the mission. In particular, I thank Minister Juanita Argeñal for her strong commitment to the project, Suyen Perez (Director of DGCC) and Denis Fuentes (Director DGP) for their thought-provoking discussions, María Fernanda Sánchez of UNDP, who was one of the pillars throughout the mission, offering great flexibility and excellent insights into all stages of the project. Karla Rodriguez (Technical Coordinator) and her tremendous, committed team of professionals from the technical experts to the extensionists, information nodes, and the support office in El Sauce, who were always there to open and close the office from the early morning until dusk and during field trips. MARENA's Departmental delegates from the Leon and Chinandega were very helpful. Special thanks to the protagonists and their families who shared their time for interviews and for their trust and contributions during my field visits, as well as their logistical arrangements and loaning of horses to climb up into the remote highlands of El Tule. They know more about surviving difficult times in the campo than we will ever know about the seriousness of surviving climate change impacts, because their(C continuous need to adapt. The inspiring protagonists of the assembly at El Tule offered great insight into the daily realities that the protagonist families face and for their hospitality when taking me into their homes. Final thanks go to Don Antonio and Necdar for the many good talks, especially about the importance of the triple safety nets (social, economic and environmental) that all of will need to address climate change that await in the near future.

## 1. INTRODUCTION

The Government of Nicaragua (GoN) and the Adaption Fund (AF) developed the *Risk Reduction and Vulnerability to Floods and Droughts in the Estero Real River Watershed*<sup>1</sup> project in order to test climate change (CC) adaptation measures<sup>2</sup> that could help reduce risks from CC-produced droughts and floods generated by climate change in Nicaragua's semi-arid Pacific northwest region. The pilot project not only aims to help the country address increasingly severe impacts associated with natural phenomena in eight micro-watersheds (Figure 1) the upper part of the Villanueva River sub-watershed<sup>3</sup>, but seeks a model that can help confront social issues created by strong demographic pressures, extreme poverty and reduced productive opportunities resulting from serious water shortages. It also aims to mainstream the lessons learned and best practices into the local agenda and into municipal development plans. If it is effective, then this integrated approach could become a vehicle for implementing the national climate change strategy throughout other semi-arid parts of the country.



**Figure 1: Map showing the location of the eight micro watersheds within the larger, Villanueva River sub-watershed.**

The AF provides most of the funding (US \$5.07 million), the GoN provides in-kind support (\$1,285.88) and the United Nations Develop Program (UNDP) administers<sup>4</sup> the project, while the Ministry of Environment and Natural Resources (MARENA) is the executing agency.

<sup>1</sup> The total Estero Real watershed area is 3,690 km<sup>2</sup>

<sup>2</sup> Measures include agro-ecological practices and participatory watershed management in highly vulnerable rural communities, investments in water retention, long-term farm planning, and institutional capacity building in local communities, as well as municipalities and government agencies.

<sup>3</sup> The Villanueva River Sub-watershed has a total area of 1,550 km<sup>2</sup>

<sup>4</sup> For the purpose of the EMT, implementation defined according to the Subsidiarity Principle, where it is carried out at the lowest practical level (municipalities, comarcas – a unit of local administration, and by protagonist families) according to the Subsidiarity Principle and UDP administers that project while MARENA facilitates its execution.

More than 1000 protagonist<sup>5</sup> families living in eight micro-watersheds located within three municipalities comprise the principle implementers, or *protagonists*, of the project, which began in 2011 and terminates in 2015.

### **1.1 Objective of the Mid-Term Evaluation (MTE)**

The objective of the mid-term evaluation (MTE) is to provide an independent analysis and measurements of the progress made at the time of the evaluation. It also aims to identify design problems (if any) and advances made toward achieving the project's principle objective, to identify and document lessons learned, including lessons that might improve design and implementation of future AF projects supported by UNDP-GEF. The MTE concludes by summarizing the MTE's findings, offering a series of recommendations and actions (Annex 4) that are intended to assist both UNDP, MARENA and the project execution team and the protagonists to make the necessary adjustments that will help improve the efficiency and effectiveness of the project's main objectives, as well as meet the expected outcomes during the final months of the project's implementation. The MTE follows the guidelines, rules and procedures established by UNDP and GEF (UNDP 2013), as outlined in the Terms of Reference (ToR).

### **1.2 The lessons learned and recommendations from the evaluation**

The lessons learned and recommendations presented at the end of this report have three purposes, namely to: i) improve the current project based approach and measure the expected results in an iterative manner based on theory of change (ToC; Vogel 2012) in way that promotes to learning, adapting and continuously improving the approach so that meets project's principle; ii) improve the formulation of other MARENA, UNDP and GEF-AF adaptation projects; iii) develop mechanisms to mainstream a cross-cutting approach to CC adaptation into the social, political and institutional policies. Its implementation and institutional arrangement strategies that will help meet the government's international commitments to confront CC.

### **1.3 Methodology and its scope**

The MTE was developed in order to meet the evaluation guidelines (see Annex 1) and therefore, the evaluation focuses on the following themes:

- 1) Progress towards results
- 2) Adaptive Management
- 3) Institutional Arrangements for Effective Management

The evaluation report begins by examining the project design and its intervention logic, which is essentially the development model, or road map for ensuring that the project meets

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<sup>5</sup> In order to create a more proactive and dynamic approach, the Ministry of Family recommended the term protagonist, rather than the more passive term, beneficiaries. Consequently, the project adopted the term protagonist during the Inception Workshop.

its objective and outcomes by following the most direct route. It looks at the relevance of the project to the government's plans, strategies and policies, as well as its international commitments to confront climate change impacts. Additionally, it provides findings on the adequacy of the risk and assumptions that underlie the intervention logic. It then examines efficacy in terms of achievements to date compared with expected outputs, and to the degree possible at this stage of implementation. Six criteria form a large part of the analysis:

1. **Relevance** – the extent to which objectives and project design match the : i) *Relevance demand* examines the connection of government strategies for sustainable development and adaptation to climate change, as well as the needs and priorities of beneficiaries or other stakeholders; ii) *Vertical Relevance* looks at whether the project is consistent with the principle of subsidiarity; and iii) *Relevance of supply* means that the project meets international, the objectives of the FA and regional needs. Furthermore, it analyzes whether the project is formulated so that the intervention logic provides the most direct route to reach the principle objective and expected results, and whether it allows for tracking changes along the causative results-chain.
2. **Efficacy** – the extent to which the project has achieved its objectives (or is expected to achieve them), taking into account their relative importance. Four points are addressed: i) whether the outputs are leading to the principle objective(s) and if they are produced; ii) progress of activities, outputs and outcomes– asks the question whether the project is on track to turn the outputs into results (outcomes), how well the development intervention's objectives are being achieved, or are expected to be achieved, taking into account their relative importance. It also examines negative, or perverse impacts; and iii) Linkages of the outputs to national or local level activities.
3. **Effectiveness of interventions** - includes the extent to which the objectives have been achieved with the expected positive change leading to development results.
4. **Sustainability**<sup>6</sup> - looks at evidence that the project can eventually run with the existing management and financial arrangements. It also examines the extent to which environmental, social, and institutional benefits will continue after AF-GEF financing support terminates.
5. **Results and Adaptive Management** – examines whether the development model laid out in intervention logic follows a causative chain leading from outputs to outcomes, whether the outputs were effective in producing outcomes that have led to a change of behavior and unsustainable practices. It also examines unexpected outcomes, positive or negative changes that were either planned or unplanned as a result of the interventions.
6. **Efficiency** – examines the cost-effectiveness, or the degree to which outputs and/or the desired effects are achieved with the lowest possible use of resources/inputs and

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<sup>6</sup> Sustainability examines the quality of the measures taken to ensure continuous benefits; financial sustainability through measurements of the level and source of future financial support to be provided to relevant sectors and activities after project completion; socioeconomic sustainability is measured through contributions to sustainable socio-economic changes that support the goals and strategies of national development, among others. Importantly, it also measures whether physical and chemical resilience mechanisms are in place in such a way that ecosystem services are capable of continuously protecting the investments and people's well-being.

how well the investment has been converted into activities (in terms of quality, number of activities, and the time it has taken for implementing them). It also includes the efficiency of resource mobilization (e.g., are there adequate transportation options) and financial management.

### Key Questions, Judgment Criteria and Indicators for the MTE analyses

The MTE analyses the three key themes listed in the ToR and six evaluation criteria by posing a key Evaluation Question (EQ) for each criterion. Answered to the EQs are collected from triangulated data and information, described in the next subsection. The MTE has developed a series of EQ-specific indicators and Judgment Criteria (JC) that are based upon the triangulated supporting evidence. Table 1 presents a summary of the specificity of the key questions in relation to the criteria of the MTE analyses.

**Table 1: Matrix showing the relationship between the three themes from the ToR, the Criteria and EQs and the Judgments (PC).**

THEME \ Criterion	RELEVANCE EQ 1	Efficacy EQ 2	Effectiveness EQ 3	Sustainability EQ 4	Results EQ 5	Efficiency EQ 6
	<b>1. PROGRESS TOWARD RESULTS</b>	⊕	⊕	•	•	•
• <i>PROJECT DESIGN</i> <sup>7,8</sup>	⊕			•	⊕	⊕
• <i>PROGRESS</i> <sup>9</sup>	•	⊕	⊕		⊕	⊕
<b>2. ADAPTIVE MANAGEMENT</b>	-	⊕	⊕	⊕	⊕	⊕
• <i>Work task planning</i>		⊕	⊕	⊕	⊕	⊕
• <i>Financial</i>		⊕	⊕	⊕	⊕	⊕
• <i>Monitoring systems</i>		⊕	⊕	⊕	⊕	⊕
• <i>Risk management</i>		⊕	⊕	•	⊕	⊕
• <i>Reporting</i>		⊕	•	•	⊕	⊕
<b>3. Management Arrangements</b>	•	⊕	⊕	⊕	⊕	⊕
• <i>Effectiveness of Project management</i>		⊕	⊕	⊕	⊕	⊕
• <i>Quality of the execution by stakeholders</i>		⊕	⊕	⊕	⊕	⊕
• <i>Quality of UNDP support</i>		⊕	⊕	⊕	⊕	⊕

<sup>7</sup> Local, regional and national needs and priorities

<sup>8</sup> Baselines

<sup>9</sup> Negative impacts, degree to which protagonists and other stakeholders participated and ownership

Scores are given to each and based on UNDP'S standardized terminology (UNDP 2013, Annex 3) as follows:

- **Measuring Progress** - used the following judgments : Highly Satisfactory ( HS ) , Satisfactory ( S ) , Moderately Satisfactory ( MS ) , Moderately Unsatisfactory ( MU ) and Unsatisfactory ( U ) and Highly Unsatisfactory ( HU );
- **Adaptive Management** - although the same criteria apply as the Progress, there are small changes in the definition (see Annex 3 in the ToR in Annex 1 of this report) Institutional arrangements - are identical to those of the GA.

These validations contribute to the final allocation of the performance of different components of the MTE.

### 1.3 Approach to Data collection for the MTE

The MTE provides quantitative and qualitative information and data, which are based on credible, reliable and useful information, using evidence collected from different sources. Primary and secondary sources were used as evidence throughout the analysis and in this report.

Primary data were collected through cognitive interviews, focal groups and in two assemblies. All oral information was recorded, transcribed and analyzed based on answers that corresponded to the key evaluation questions and the judgments used to support answers to each EQ. Additional sources included field notes, site and intervention-related photos or other relevant materials.

Participatory and consultative processes were used to collect primary information both with government counterparts, UNDP officials in Managua, the main protagonists and community leaders and the project team members in the three municipalities where the project is being implemented. Field notes included comments on the efficiency, effectiveness and perceived sustainability of adaptation measures in the field. The consultant held two separate working meetings with the entire project team to discuss the preliminary findings and to provide guidance that could help correct some of the project shortcomings at mid-term, especially the indicators. The team seized the opportunity and made some good adjustments that had already initiated when the consultant terminated his field work.

Secondary data were collected from the available documentation, including other GEF projects, the Project Document (ProDoc), the PPRs and CDRs for 2012 and 2013, project reports and LFA planning tools, the Inception Workshop report and the Gender Strategy Draft Report. Additionally, peer reviewed scientific literature and the SINIA web site were reviewed.

#### Criteria for selecting the samples

Field samples and secondary data collection focused on filling in the information for each EQ (see Annex 2) that correspond to the criteria described above. The surveys sought to examine the efficacy, effectiveness and sustainability of the following topics:

1. **Intervention category** - including adaptation measures such as agro-ecological farm transformation plans, protection of recharge areas, improved social well-being and household `patio` (garden) improvements, water collection and distribution works.
2. **Institutional arrangements** – examines coordination, communication and support from both, formal government institutions and non-formal organizations in terms of coordination, communication and institutional support for the project.
3. **Methodological approaches** - such as the application of the adaptive process, results-based management, the subsidiarity principle, theory of change, gender, and awareness raising, and knowledge/information dissemination related to project-generated good practices.

#### Criteria for selecting the protagonists to interview

The list of the names of the actors interviewed and sites visited were selected by MARENA, and discussed in conjunction with UNDP, MARENA and technical team. These actors were primarily district leaders or others who received project support in the areas described above. Additionally, the Consultant selected some random inhabitants of the communities in each micro watershed in order to ensure the reliability of the results and the consultant interviewed other important stakeholders such as the project team (technical, management, extension and nodes), UNDP, MARENA and relevant government institutions involved in the project. He had the opportunity to meet like an assembly consisting of approximately 64 players (40 % women) of El Tule and the pleasure to visit several remote projects by horseback in the hills of El Tule with community leaders (see Annex 7, showing photos of the field visits). The decision to convene such meeting was solely the decision of the consultant and funded independently.

The consultant took precautions to avoid any possible biases. These included random selection of groups not covered by the project. On three occasions after the planned interviews, the consultant visited at six randomly selected households belonging to other protagonist families who were not included in the original list of interviews arranged by MARENA. The aforementioned assembly was agreed upon spontaneously with a chance meeting of the leader of the El Tule comarca, who had just come down to Villanueva on horseback to buy provisions. He arranged for the meeting with over 75 protagonists, as well the comarcial committees for the environment, for health and the fire prevention brigade for El Tule. The extension and information node team members were instructed by the consultant to attend and to only answer questions directed at them. The consultant also met with individual team members in private and under complete confidentiality to ensure that there was no censorship (unwillingness of the respondent to answer questions freely), empathy or other biases. He met with members of the micro watersheds who were not protagonists and other independent actors to assert that there was no bias in the selection of the sampling unit. Finally, meetings were held with stakeholders and technicians from MARENA-IADB's PAGRICC project in order to understand the strengths and weaknesses of that project. It is noteworthy that the Consultant is also conducting the Mid Term review of the PAGRICC project, and thus has a good overview of the strengths and weaknesses of both projects.

## Triangulation methods

The evaluator conducted field visits to all but one of the micro watersheds in each municipality in order to examine different interventions and ascertain the level of ownership among various protagonists in the municipalities of El Sauce, Achuapa and Villanueva. Since it was impossible to visit all 29 communities where the program is being implemented, a sub-sample of 12 communities and 36 project interventions and their surroundings in each of the three 8 micro selected municipalities. A sub-sample of projects and actors was taken within in Central Las Mercedes, Cooperativa El Borbollón Salale, The Lagartillo, San Nicolas, The Janissaries, Las Brisas, El Tule, Los Chupaderos and Las Pilas, representing activities and actors in seven of the eight watersheds.

Primary data were collected during interviews with more than 163 people (90 men and 73 women), these being more than 115 protagonists or other actors at the local level in the municipalities of Villanueva, El Sauce and Achuapa. Over 25 actors working with MARENA (the Minister, the Secretary General, Directorate Changes, Planning Department SINIA, the vice-mayor and coordinator of the Environmental Management Unit (UGA) of the municipality of Villanueva were interviewed in two general assemblies and spoke with more than 60 protagonists and over 40 members of the technical team and students. All interviews were recorded with a digital recorder and relevant interviews (which specifically addressed the project) were transcribed with a software program that digitizes voices in writing.

The secondary data were collected by reviewing available documentation, progress and financial reports, the ProDoc, studies of the Millennium Challenge Authority (MCA), the GEF-supported Sustainable Land Management (MST, funded by GEF, executed by MARENA and UNDP) and other relevant projects, including PAGRICC. However, due to time constraints specified in the TOR, the consultant had to limit their work during the field visits as indicated in the TOR. In addition, 4 *rastras* (artisanal gold-ore crushers) dredges were visited to check that they were using mercury to extract gold with craft practices and an old mine that is in negotiation to open again and the director of the UGA Villanueva and Vice-Mayor of Villanueva met on environmental problem with the pollution of rivers and aquifers with mercury.

### **1.4 Structure of the Evaluation Report**

The sections of this report are organized as follows:

- **Project description and the context of its development** - describes the background, the root causes, the problem facing the project aims, objectives, intervention logic based on the theory of change (Vogel 2012), the parameters selected for establishing baseline conditions, the expected results and performance indicators and project risks and assumptions;
- **Findings** - systematically presents the analysis of the progress of the activities, outputs and outcomes of the 4 components; it measures the degree to which the adaptive management (AM) process was used during the course of the project, as well as its

institutional arrangements. Furthermore, it answers to six evaluation questions corresponding to the criteria used for the MTE analyses. It also examines how the project design and its intervention logic help lead to project outcomes through the Inception meeting's revised indicators on the results of the analysis of the project design and the selected indicators to measure results;

- **Lessons Learned** - collects the fruits of the learning process generated by the project design and judges the degree to which they were generated by experiential knowledge of the team;
- **Conclusions** - summarizes the findings in relation to the criteria, progress achieved, immediate results and observations related to whether the project is on the most direct path towards the principle objective;
- **Recommendations** - Based on the findings, the MTE offers a series of recommendations on how the project team can build upon its strengths and correct the weaknesses during the final months of implementation. It also lays out a set of actions and the responsible actors for carrying them forward.

## **2 PROJECT DESCRIPTION & DEVELOPMENT CONTEXT**

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### **2.1 Background**

The project, which is in its third year of implementation, aims to develop a pilot approach involving a coordinated set of climate change adaptation measures, including agro-ecological practices and participatory watershed management processes to reduce the risks of drought and flooding caused by climate change variability in semi-arid area of the Estero Real River Watershed and in particular, the sub-basin of the River Villanueva - also known as the Rio Grande de Aquespalapa. Both watersheds are located in the highly vulnerable Chinandega and Leon political-administrative Departments in the north Pacific region of the country, where 65% of the population lives. This increasing vulnerability to climate change already has to overcome historically low rainfall rates, strong demographic growth patterns requiring more water and land and high levels of extreme poverty. Already, there are seriously unsustainable uses of surface and ground water, and 75% of the available water resources is used to irrigate crops (UNDP 2013). Not only does this pressure reduce groundwater levels of as much as 50 % during the dry season of the year, but water extraction also exceeds groundwater recharge rates (ProDoc 2011). As such, the project offers a critical test of ways to reduce the vulnerabilities and offer the government tools to that can help implement its policies and legal instruments for addressing climate change in a decentralized and coordinated manner.

The project is based on the Principle of Subsidiarity, whereby the government's policies, strategies and plans are implemented at the lowest practical socio-political and landscape level. The lowest practical level in this case is comprised of eight micro-watersheds located in the upper reaches of the Villanueva River sub-watershed, where more than 1000 families live on family farms in small *comarcas* (a small social and administrative unit within a

Municipality) within these municipalities. The project offers an opportunity to test the Subsidiarity Principle that has been used metaphorically for many years in many countries, but there are few good examples in Nicaragua where it has been carried out in such a coordinated way with potentially useful incentives for confronting climate change.

The project officially began with the signing of the ProDoc March 29, 2011, but due to a slight delay in the start, the closing was set back to June 30, 2015. As mentioned previously, most of the four-year project's funding GEF-AF, with in-kind support from the government. In addition to the startup delay, the project execution team, UNDP, and MARENA also changed several elements listed in the original ProDoc. These changes included an adjustment of several indicators related to the expected results and baseline, as well as integrating a cross-cutting approach to addressing gender and family issues in a proactive manner that goes beyond most previous attempts to confront the situation in Nicaragua.

Another suggested change came from the Ministry of Family, who insisted that the project change the static term 'beneficiaries', to a more proactive and dynamic one that should refer to the primary stakeholders as being 'protagonists'. This is important because it further operationalizes the subsidiarity principle. Finally, the greater role given to the project team's information nodes and the extensionists, who are actually young technicians who are from each of the target communities, has provided greater fluid continuity in terms of two-way communication between protagonists and the project team. Significant adjustments were made in the original waterworks design by the team hydrologist. This not only saved the project considerable sums of money, but it also prevented an area of high biodiversity and groundwater recharge from being dynamited<sup>10</sup>.

## 2.2 The Principle Objective

The project's main objective is *to reduce the risks of drought and flooding caused by climate change and variability in the Estero Real River Watershed*. It employs a set of coordinated interventions (Components 1 and 2) and institutional arrangements (Component 3) designed to introduce, monitor and disseminate best practices and lessons learned (Component 4) involving new agro-ecological practices, water management and other experimental interventions related to CC adaptation. There are numerous potentially useful CC adaptation measures and they include targeted investments in retaining water, energy-saving cooking stoves, long-term farm transformations and planning accompanied by capacity building in local communities, municipalities and government agencies. Furthermore, the project promotes the GoN's decentralized processes through participatory management with protagonist farm families living the eight micro-watersheds and mainstreaming some of the best practices into local plans. This is a critical element because it also recognizes that agro-ecological transformation cannot simply be left at the farm level, nor to run on its own. Continuous feedback and support is required from the municipalities, both in terms of creating synergies that will lead to replication, as well as to ensure the

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<sup>10</sup> The original hydraulic works were designed by a German consulting firm as part of their contract with the Millennium Challenge Authority project. The cost involved more expensive engineering structures, greater distances for the canals and a plan to dynamite the ecologically and geologically sensitive area near Salale.

enforcement of legal and regulatory instruments (especially those related to illegal burning of landscapes). The expected environmental effects of ecosystem recovery require a more integrated and coordinated institutional approach at the micro-watershed level (the aim of Component 3) in order to ensure that the approach is continuous and lasting. Ultimately, the approach to integrate climate change vulnerability in water stressed rural areas is expected to serve as a catalyst for integrating agro-ecological and watershed management practices into a single, coordinated process that is built through informal institutions from the bottom up, and coordinated by formal institutions at the municipal level with support from national agencies specialized in different aspects of environmental, water resource and social management issues.

### 2.3 Expected Program Outcomes

The program has four expected outcomes:

**OUTCOME 1:** Increased availability of water for small scale domestic and productive uses and reduced risk of water stress and drought.

**OUTCOME 2:** Enhanced food security and eco-systemic resilience through agro-ecological practices and effective use of available water in the eight targeted micro-watersheds.

**OUTCOME 3:** Capacity and institutional development in micro watersheds, municipalities and participant institutions.

**OUTCOME 4:** Monitoring and continuous analysis of climate conditions and changes in land use, river basin and soil quality. Disseminated results and lessons learned about building climate change resilience in vulnerable rural communities.

### 2.4 Baseline Indicators

Table 2 summarizes the indicators outlined in the ProDoc and modified during the inception workshop (MARENA 2011). As a result, the project has focused on measuring changes associated with implementing the different interventions and carrying out the necessary institutional arrangements.

INDICATOR	NEW BASELINE
Number of farm families in the targeted micro-watersheds with at least one annual harvest.	400
Percent of farms in each in each micro watersheds with access to irrigation through the hydraulic Works built by the program.	0
Surface area in hectares to reduce risks.	67.55 ha
Amount of water (liters/sec) conducted through the communal irrigation infrastructure system.	0 lts/sec
Percentage of farmers in each micro-watershed, the water use of which is rated as satisfactory in relation to the relevant technical guidelines	5%

Number of water harvesting structures installed and working at the micro-watershed level	0
Percentage of farm families in each micro-watershed implementing agro-ecological farm transformation plans	5%
Number of farming families with agro-ecological farm transformation plans	0
Area (ha) of agro-ecological transformation plans developed in farms	0
Increase in percentage of land in each micro-watershed with vegetation coverage.	25%
Surface in hectares of protected forest water recharge and riparian zones	0
Number of families that benefit with home and patio investments through the Farm Transformation Plans (PTAF).	0
An experientially-based proposal endorsed by three municipal governments for the operation of a Sub-Watershed Committee for the Villanueva River basin	0
Municipalities in watershed with climate change adaptation measures included with their official plans and related normative instruments.	0
Lessons learnt in eight micro-watersheds and the Villanueva River Sub-Watershed available in SINIA and other web sites and disseminated through exchange workshops.	0

**Table 2: List of the indicators selected to establish the project's baselines.**

## 2.5 Principal Actors

The project is administered both by UNDP (Senior Supplier) and executed by the MARENA (Executive Agency). MARENA's Climate Change Directorate leads the program and ensures that the relevant lessons learned from climate change adaptation will help increase national adaptive capacities and that they are used as a basis for future responsive measures in other management efforts at the micro-watershed, municipal and watershed levels both within the Estero Real watershed and throughout the country.

Figure 3 shows the organizational structure of the project. The political-administrative Department of León, represented by MARENA's Territorial Delegation of MARENA (Recipient Superior), is the senior beneficiary of the project (most of the project is located in the Leon Department). The project is executed in the three municipalities by a multidisciplinary team of technical-professional experts, information nodes and extensionists hired by the project. They are led by a technical coordinator who is also hired as a consultant to the project. The inter-agency support Committee is composed of the INETER, ANA, MAG, INTA, IDR INAFOR, and they have offices and staff in each of the three municipalities (El Sauce, Villanueva and Achuapa). The three Municipal Environmental Management Units Municipal (UGAM) play an important role in coordinating environmental actions in the respective municipalities, while the Ministry of Health (MINSA) and the National Autonomous University of Leon and the University of Somotillo make up the

academic segment of the project. However, only fifth year students participated and none of the professors or supervisors got involved, contrary to the original agreements.

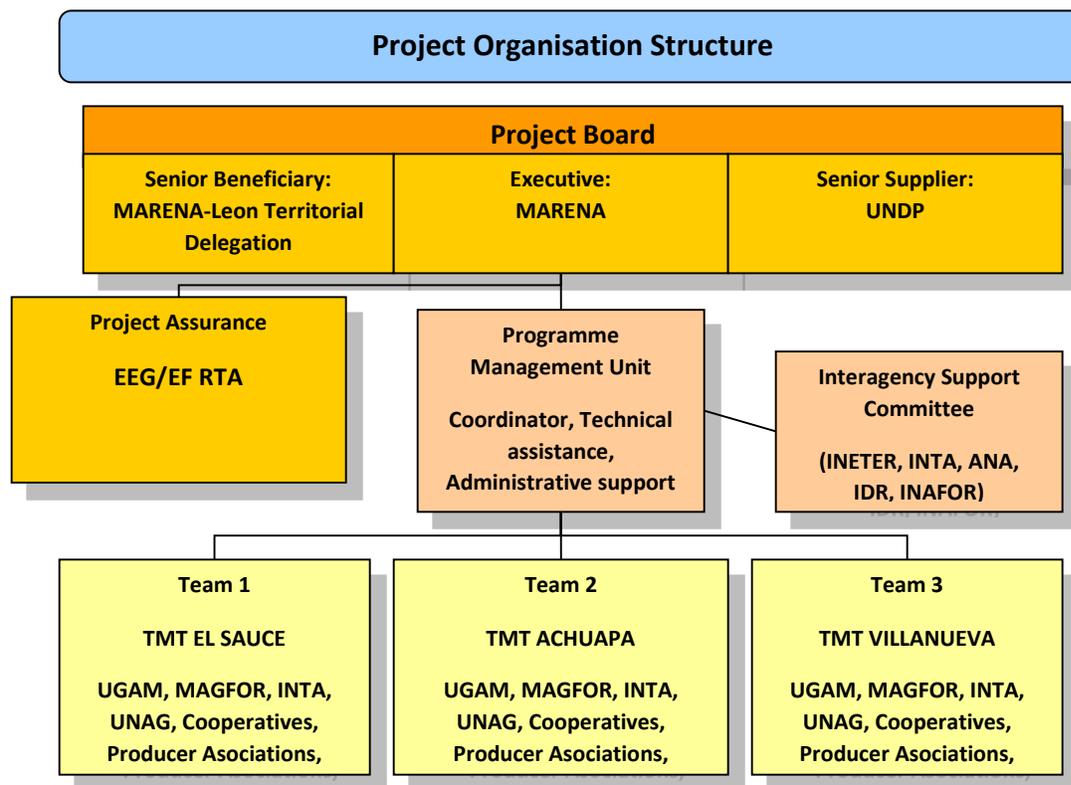


Figure 3: Organization structure of the Estero Real project (MARENA 2011).

## 2.6 Relationship to the Government’s plans, programs and strategies

The project is closely linked to the Nicaragua’s Government of Reconciliation and National Unity’s national strategies on Environmental and Climate Change, Social Development and Poverty Alleviation. It is closely linked to the National Action Plan for Climate Change (PANCC), which aims to develop appropriate measures to help the most vulnerable sectors of the economy and measures of water resources and it will be implemented within the context of the relatively recent (2007) Water Law, which calls for a comprehensive watershed approach to management. This law stipulates the need to develop plans and management tools to advance an integrated approach to water resources, establishes the legal regime for the sustainable use and exploitation of the resource, as well as the relations of institutions and individuals involved, the organization and participation in resource management. In particular the law gives high importance to water resource management at the watershed basin level. However, it is the sub-watershed and the smaller micro-watersheds that serve as the platforms for coordinated and articulated actions for confronting a broad range of interests and environmental, economic and social pressures.

Key elements of the Water Law include the watershed as the fundamental management unit, and it used the decentralized Integrated Water and Sanitation Committees (CAPS) as decentralized management and decision-making body, as established by the National Water Authority and adopted under a special law. These represent a special test for any climate change project because until now, climate change considerations have been absent from previous governmental development strategies, legal instruments such as the Water Law and environmental regulations. In general, there is limited understanding of the multiple interdependencies that drive watershed dynamics, as well as cumulative environmental impacts, socio-political and socioeconomic interests that will further exacerbate the existing vulnerabilities and risks associated.

In August 2010, together with the Minister of Environment and Natural Resources (MARENA), the President signed the new Regulations of Law No. 620, known as the "General Water Law ". Decree 44-2010 recognizes the Drinking Water Committees and Committees of Drinking Water and Sanitation (CAPS. The regulation also establishes the responsibilities of government agencies that participate in program activities in the eight micro watersheds and the Villanueva River sub-watershed.

The Universal Declaration of Mother Earth Rights of the United Nations of 2009 is a central piece in the government's approach to development. The project also coincides with the principle of subsidiarity and the model promoted by the government called "Citizen Power" that seeks the participation and involvement of stakeholders at all levels to ensure sound environmental management, poverty reduction, and strong environmental management, including reducing vulnerability to climate change and the recent natural disasters. The National Human Development Plan (NHDP) and other plans for specific sectors prioritize water and agriculture as the most vulnerable to climate change. Besides being a mainstay of food security, employment, the agricultural sector provides livelihood for over 60 % of the population. The National Plan to Combat Drought and Desertification also stresses the need to reduce vulnerability to climate change and Resolution No. 003-2009 AN Climate Change and Adaptability in Nicaragua and the Agricultural and Forestry Strategy, the NHDP.

The project is in accordance with Millennium Development Goal #7 (environmental sustainability) and the Cooperation for Assistance Framework under the United Nations Development Framework (UNDAF) because it supports Nicaragua's strategy for Environmental Protection and Risk Management related to sustainable human development. The direct result expected from the UNDP program is to have strengthened capacities of public institutions, communities, civil society and the private sector to promote, develop and implement policies, plans and programs to reduce the environmental vulnerability of the population and promote sustainable human development. The framework also identifies the integration of climate change mitigation and adaptation into the strategies, programs and relevant national plans of countries like Nicaragua.

## **2.7 Approach to Gender and Family**

The innovative gender and family strategy grew out of the Project Inception Workshop (MARENA 2011) and is being carried forward by the gender expert. While it was not part of

the ProDoc, it adds considerable value to the original approach. At mid-term, it is one of the key cross-cutting issues, together with water governance and environment, which has helped guide the application of the subsidiarity principle and catalyzes the relatively rapid implementation of many of the interventions, especially the agro-ecological transformations, the household and patio improvements. It not only helps guide the implementation of adaptation measures in a more equitable manner but also contributes toward reducing the serious gender inequality gaps that characterize rural Nicaragua. As such, it offers an approach that can help the central and municipal governments implement their policies in rural areas by demonstrating concrete applications, rather than words, of gender awareness, leadership and equity. As a result, the project initiated with a collective group of protagonists comprised of the 1005 families that included women and men, with the understanding that family participation and well-being are fundamental for moving forward with the project interventions. To achieve this end, the gender strategy consisted of three focal areas that include:

- 1) Training (e.g., workshops, meetings, forums) of men, women or other family members;
- 2) Awareness of the family and its role in socio-economic development;
- 3) Integrating gender as a crosscutting issue within the different adaptation measures sustain this strategy throughout its implementation.

The approach is closely linked with positive or affirmative actions aimed at reducing or eliminating gender inequities and enhancing the recognition of women's rights and opportunities, with the aim of empowering women. The project developed a series of actions that are closely tied to government policies related to ensure that projects are implemented in a participatory manner that promotes proactive collaboration between men and women and as such, the project is built on:

1. Identifying looming problems related to the traditional gender roles between men and women in communities having gender advocacy programs;
2. Developing ownership and empowerment for men and women about their role from within the community;
3. Training on the topic of gender equality, its meaning, its importance and significance in the daily lives of each based on the analysis of opportunities and obstacles
4. Promoting the concept of complementarity, respect, justice, non-violence and solidarity between men and women and living without discrimination.
5. Developing added value to the social, labor and economic development capacities of men and women.
6. Assigning activities to men and women without distinction of their gender in order to promote the active participation and inclusion of gender that promote changes in attitudes and adopting a new model of inclusive behavior in daily life of men and women

## **2.8 Other projects related to adaptation and sustainable land use**

MARENA's General Directorate of Climate Change (DGCC) is also leading a similar CC project called PAGRICC<sup>11</sup>. However, it differs markedly in its approach compared with the Estero Real approach in several ways. It does not focus on micro-watersheds, the poor and water recharge are not high priorities. It also uses a far more rigorous and complex approach to establishing baselines, quantitatively measuring results and it uses a comprehensive approach to verifying interventions in the field. As such, it offers an opportunity for comparison, in terms of how the lessons learned could be used in the design of future adaptation projects.

Other projects contributing toward capacity building for improved governance, sustainable use of the land and water have been conducted within the past decade. They include irrigation, agro-silvopastoral and road infrastructure projects financed by the Millennium Challenge Authority (which were never completed) and the governance-related work done by the Danish NGO Ibis. The German International Development Cooperation (today called the GIZ) has also provided long-term support to some of the social stakeholders in the municipalities of El Sauce and Achiuapa and played leading roles in the development of the Strategic Plan for the northern León administrative department that subsequently led to high-level negotiations with the Executive levels of government, culminating in the signing of the Achiuapa Agreements in October 2006. The agreements are aimed at fighting poverty in the dry region of northern León and Chinandega and they involved plans for agroforestry development program, supporting production for food security programs in small scale irrigation and the creation of a bank to provide financial credits for agricultural production. All these issues were part of the GoN's commitment to the Millennium Challenge Authority program. Another result of the agreements was the Achiuapa Sustainable Land Management Project (MST) mentioned above, which was executed by MARENA and a team of technical consultants. The GEF-funded project on the sustainable use of the land in drought-prone areas (MST) in the El Sauce municipality addressed agricultural production, with an explicit focus on environmental issues, promoting agro-ecological practices in 10 municipalities, including those in the upper part of the Estero River Basin Real. It also facilitated the active participation of the Municipal Environmental Management Units (UGAMs) in the operational planning of government support for agricultural production.

Given the preceding, it is clear that there have been many donor and government initiatives that have contributed to raising awareness, improving governance and providing alternative development practices for improving the lives of the protagonists in the area. With the exception of the El Tule community (which has never received any support over the years due to being physically isolated due to rugged terrain), the project must be classified as a contribution (rather than attributing it alone to the observed changes in the protagonists behavior) to a historical and ongoing effort to break from non-sustainable development models and work toward reducing risks and vulnerabilities for the people in the three municipalities covered by the project.

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<sup>11</sup> Environmental Program for Disaster Risk Management and Climate Change

### 3 FINDINGS

The following subsections summarize the MTE's findings related to the analysis of the just-described evaluation criteria, the answers to key questions designed to address each criterion and the evidence used to issue the final judgment on each criterion, as well as evaluating the three focal themes (Progress towards Results, Adaptive Management and Institutional Arrangements) identified in the ToR (UNDP 2013).

It is not the purpose of the MTE to go into great detail about the different interventions as outputs, because these are only intermediate steps in a theory of change approach. What is important at this point is to identify how effective these interventions and institutional arrangements have been to date. This notwithstanding, it may be too early at this stage to measure results. Consequently, the MTE aims to identify incipient signs of the effectiveness or ineffectiveness, as well as the degree to which the interventions are moving toward sustainable implementation and replication into the future.

#### 3.1 Relevance of project design and progress towards results

The first Evaluation Question (EQ) examines project's relevance. EQ 1 asks the question - "*To what extent is the project design and consistent enough to be the most direct route to achieving the development objective and expected results both to meet the needs to adapt to climate change at the global level and the needs of government and project beneficiaries* "? This basically aims to determine whether the project is designed to lead the project to the principal objective in the most effective, efficient and sustainable path (Table 3).

EQ 1 MS	<i>To what extent is the project design and consistent enough to be the most direct route to achieving the development objective and expected results both to meet the needs to adapt to climate change at the global level and the needs of government and project beneficiaries</i>
JC 1.1 MS	The project design is consistent, but does not provide the most direct to the main objective of the project route. Some important risks and assumptions have not been identified, expected outcomes are inadequately formulated. The adaptive management approach is weak and fails to systematically capture of lessons learned from the implementation of CC adaptation measures.
JC 1.2 MU	The expected results and performance indicators are not SMART, or consistent he expected results and performance indicators are neither SMART, or consistent.
JC 1.3 MS	The data used to establish the baseline are not adequately integrated into the framework of the results.
JC 1.4 AS	Project objectives and expected outcomes faced by government priorities and needs of the beneficiaries of the project.
JC 1.5 S	Key actors were analyzed and correctly identified, as were target groups and issues related to the ability to implement the project. .

**Table 3: Summary of the judgments for the Relevance Criterion used in the MTE analyses.**

Additionally, it examines whether the project fits with the objectives of the Adaptation Fund (AF). Based on the available evidence, the EMT rates the project's relevance rated as ***Moderately Satisfactory***, as shown in Table 3 and described in the following subsections.

### **3.1.1 Project Design (CJ 1.1)**

The project is well designed in terms of its purpose, objective, the choice of the area and its socio-economic conditions, as well as its focus on the micro watershed, where the problems originate and where they must be confronted with new development models. The focus on applying the Subsidiarity Principle to this lowest practical geographic and social and building capacity to empower farm families to help them develop synergies that incrementally work to build a critical mass of adaptation measures is well-founded. The proposed `soft measures` (capacity development applied new policies, planning and management) are especially and in retrospect. The focus on water scarcity in a semi-arid area is especially important after the recent findings of the Intergovernmental Panel on Climate Change stating that water resource impacts will be much more severe than originally predicted.

The project has also chosen an innovative and appropriate approach for building social, economic and environmental resilience (although it fails to define and quantify the term, thus missing a good opportunity to contribute to this new field) for adapting to existing vulnerabilities, as well as future climate change impacts in highly vulnerable communities in upper watershed recharge areas of a Tri-National wetland of significant regional importance, namely the Estero Real mangrove complex and the Gulf of Fonseca that is shared with El Salvador and Honduras. The coordinated actions using the subsidiarity principle to develop and implemented carefully targeted adaptive measures that focus on increasing water recharge using environmental and watershed management practices is solid. It also has been designed to create new knowledge and release local innovations that can help slow the heretofore unstoppable expansion of agricultural frontiers that is wiping out forest cover that gets in its the way. It also appears to have identified key protagonists to participate in the project. However, the MTE raises questions regarding the approach to improve water availability for domestic and productive, because it could lead to greater conflicts in a time of increasing water scarcity, largely due to accelerated evaporation and evapotranspiration loss rates in two micro watersheds (Salale and Las Mercedes).

The MTE agrees that the correct approach is to start with a pilot project (instead of a macro project) focusing on experimentation, and learning from diverse adaptation practices and institutional arrangements to prepare for climate change and to confront poverty using improved water and agricultural management techniques. As such, the project design potentially offers a model for decentralized implementation, ensuring local commitments through incentives and empowerment for the protagonists to take charge of creating their own context-specific adaptation measures and involving local government in coordinating the entire process and creating new municipal strategies that institutionalize best adaptation practices. However, as will be described below, the model for capturing the lessons learned and the outcome targets are inadequately designed.

### *The intervention logic of the ProDoc's development model*

The MTE not only examines *whether* the project produces results<sup>12</sup>, but also *how* those results are delivered, and *if* the results are effective and sustainable. It also examines whether the intervention logic is the most direct and effective approach to achieve the project's principal objective. As a consequence, the chain of causation must be carefully examined in order to determine where it breaks down in the case of unexpected results. Such an analysis permits a better understanding of the proposed development model and whether it accurately reflects reality in the eight micro watersheds and if the implementation process follows that model.

Despite the project's exemplary analysis of the root causes, its design to attack them with solidly founded interventions, use of the subsidiarity principal as a guiding process for implementation and creating innovation, and its focus on water and environment as cross-cutting issues to climate change, the project design logic is fragmented due to the *weak intervention logic of the proposed development model, because it is not the most direct and logical path to the project's principle objective*. While project document correctly ascribes to a Results-Based approach to Management (RBM) and the Theory of Change (Vogel 2012), the approach falls apart due to errors associated with the project's indicators that aim to track changes along each link of the results-chain of causation.

The absence of appropriate indicators for measuring changes and causation of those changes not only prevents the EMT from making robust analyses of the effectiveness of the interventions, but it also limits a systematic application of the principle of adaptive management. Consequently, the intervention logic (see Appendix 2) does offer the most efficient and direct route to the project's overall objective.

The ProDoc's is to be commended for its highly appropriate intention to create a critical mass of protagonists with new knowledge that will help lead them to taking innovative approaches to protecting water supplies and use water more wisely to improve their family well-being. However the wording of many of the expected outcome indicators and the mechanisms for disseminating the lessons learned and best practices is not sufficiently robust. This is because the monitoring and dissemination component (#4) is designed to be highly technical. As it is presented in the ProDoc, component #4 bypasses the need to disseminate information at a sufficiently popular level that would promote innovations by the protagonists. The concern is that this could lead to a dependency on technical experts after the project ends.

#### **3.1.2 Expected results, indicators and baselines (JC 1.2 and JC 1.3)**

As can be seen in Table 4, neither the ProDoc's indicator framework (AF-MARENA 2011), nor the revised indicators developed during the Inception Workshop (MARENA 2011) by the project team, MARENA and UNDP are consistent with the recommended procedures for RBM

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<sup>12</sup> In this report the terms Results and Outcomes are used inter-changeably. Results are here defined to include immediate, intermediate and long-term outcomes (impacts).

EXPECTED OUTCOMES	INDICATORS	SMART
<b>Outcome 1:</b> Increased availability of water for small scale domestic and productive uses and reduced risk of water stress and drought (ToR) <sup>13</sup>	1005 farm families in the targeted micro-watersheds with at least one annual harvest due to adaptation measures	✓
	7120 farm families included in Sub- Watershed management proposal	No
	90% of farms in each micro-watershed (65 families in Las Mercedes and 20 families in Salale) with access to irrigation by means of hydraulic works built with programmer funds.	-
	161.5 hectares to increase under irrigation.	-
	50 (lts/sec) conducted through the infrastructure of community irrigation systems.	✓
	90% of farmers in each micro-watershed with water use rated as satisfactory in relation to the relevant technical guidelines.	-
	880 water harvest infrastructure installed and working at the micro-watershed level.	No
	<b>Outcome 2:</b> Enhanced food security and eco-systemic resilience through agro-ecological practices and effective use of available water in the eight targeted micro-watersheds (ToR) <sup>14</sup>	80% of farm families in each micro-watershed implementing agro-ecological farm transformation plans (120 ha).
1005 farm families with agro-ecological farm transformation plans.		No
1005 farm families benefited with housing and patio investments through agro-ecological farm transformation plans.		No
1120 hectares under agro-ecological farm transformation plans.		No
50% increase in percentage of land in each micro-watershed with vegetation coverage (at least 200 ha. of the water system recharge areas and riparian zones)		✓
400 ha of water system recharge areas and riparian zones protected.		✓
Outcome 3: Capacity and institutional developed and strengthened within the municipalities and participant institutions to incorporate the adaptation measures in their work plans, policies and normative instruments.	A validated and endorsed proposal by three municipal governments for the operation of a Sub-Watershed Committee for the Villanueva River basin.	No
	Municipalities in watershed with climate change adaptation measures included with their official plans and related normative instruments.	No
	Hydrological studies and number of informative bulletins to foster the participative monitoring	No

<sup>13</sup> According to the ProDoc, Outcome 1 is: *Reduced risk of climate induced water shortages for small scale domestic and productive uses (ProDoc)*

<sup>14</sup> ProDOc states Outcome 2 is: *Strengthened climate resilient agro-ecological practices for effective use of available water in the eight targeted micro-watersheds*

<b>Outcome 4:</b> Monitoring and continuous analysis of climate conditions and changes in land use, river basin and soil quality. Disseminated results and lessons learned about building climate change resilience in vulnerable rural communities. (ToR) <sup>15</sup>	regarding water quality and quantity, soil conditions and changes in land use.	
	Lessons learnt in eight micro-watersheds and the Villanueva River Sub-Watershed available in SINIA, and other websites, and disseminated through workshops.	No
	Hydrological studies and number of informative bulletins to foster the participative monitoring regarding water quality and quantity, soil conditions and changes in land use.	No

**Table 4: Summary analysis of the degree to which the ProDoc's indicators are SMART** (*Specific, measurable, achievable, relevant and time-limited*).

and Theory of Change (ToC) (see Zahl-Kusek and Rist 2004; UNDG 2011 and Bester 2012 and Ryan *et al.* 2104). Few of those indicators are SMART (specific, measurable, achievable, relevant and time limits), as shown in Table 4. As a consequence, this raises a challenge for the MTE in terms of its ability to verify the effectiveness of interventions according to what was actually expected before the start of the project, since the expectations are inadequately formulated according to accepted practices. This is further complicated by the incomplete baselines, which are not sufficiently inclusive of key aspects such as incomes before the project began, water balance in each micro watershed or biodiversity as a function of vegetative cover and existing conflicts over water and land in the three municipalities. Furthermore, the use of metaphorical and undefined terms such as *ecosystem and climate change resilience* and *sustainability* are impossible to measure unless they are clearly more defined.

The MTE finds that ProDoc's formulation of the outcome indicators for Components 1 and 2 are neither robust, nor SMART. They are vague and rarely include time limits clarifying when the project-induced change is expected to take place. One example is found for expected Outcome # 1 in which the increased availability of water used for both productive and domestic purposes. Although there is a clear indicator for measuring changes in the volumes of irrigated water, increases in the number of annual crops and the rates and volume of water volumes passing through the community before and after the project's hydraulic works are completed, there is no such indicator capable of measuring the changes in domestic water availability. Thus, these indicators are only focused on increasing agricultural production, but not necessarily domestic water supplies. It also makes it difficult to measure the effectiveness of adaptive interventions and institutional arrangements that aim to reduce the social risks of climate change through improving: a) the quantity and quality of drinking water in the micro watershed; b) resilience to droughts and floods; c) family incomes as a result of the project.

Another example of a weak indicator is related to the formulation expected outcomes aiming to measure changes water recharge resulting from the intervention. The indicators are not sufficiently robust to make such measurements and doing so has not been possible in other projects (DFID 2006). These findings to date, there is little scientific and evaluative evidence

<sup>15</sup> ProDoc states that Outcome 4 is: *Disseminated results and lessons learned about building climate change resilience in vulnerable rural communities.*

that have shown the impact of these types of interventions. Consequently, the project has until now missed another good opportunity (the other being the measurement of resilience) to contribute to large gaps in the international knowledge base. Furthermore, the baseline indicators used to measure how the project contributes to reducing the risks and vulnerabilities associated with water. The water baseline is narrowly limited to measuring just two physical parameters – river flow and precipitation, which are undoubtedly important, but other key parameters such as water balance in the micro watersheds, including evaporation and evapotranspiration rates, as well as using existing data on groundwater levels. It is especially curious that groundwater levels are not included, since the INETER diagnostic (INETER 2012) provides a map of groundwater resources and also the location of private water wells surveyed in their study (see Annex 8). With relatively little extra effort, protagonists and other stakeholders could collect monthly time series data on water levels in their wells and provide invaluable baseline information. It is also curious why vegetative cover is the sole parameter for measuring the effects of reforestation in recharge areas. One would expect that an increase in forest cover in recharge areas would also result in a concomitant increase in biodiversity (which as will be described later, has actually happened).

The proposed outcome indicators for measuring causative changes in Components 3 and 4 are actually outputs. They also are neither SMART, nor do they contribute toward measuring the expected outcomes that should lead to the achievement of the principle project objective and it is difficult to measure their effectiveness or incipient signs of sustainability of the proposed approach. Moreover, the framework of indicators used prevents the analysis of some key project assumptions (e.g., "the environmental benefit will begin with the water works, which would increase the filtration and groundwater recharge"). In sum, the weak formulation of the non-SMART indicators may actually provide an inaccurate message about the progress the development model is making toward achieving the main objective.

### **3.1.3 Government priorities and key actors (JC 1.4, 1.5)**

The project is consistent with the government's plans, programs and strategies, including water management at the watershed level, climate change adaptation, gender and family equity, poverty reduction and environment, not to mention its international commitments to combat climate change and preserve Biodiversity. As a pilot project, it offers a new model for supporting decentralization and to mainstream climate change adaptation and cross-cutting issues such as watershed management and environmental management into development plans for three different municipalities who are responsible for sustainable development within the eight micro watersheds located within the Leon and Chinandega political-administrative departments, which are responsible for addressing environmental issues within the entire Estero Real watershed. Its legal foundation is the Water Law which guides the entire project and aims to assist the government implement its National Climate Change Adaptation Strategy.

The project design has targeted key institutions in order to provide technical, legal and practical guidance for the protagonists and facilitate coordinated implementation mechanisms at the lowest practical levels, which include the Watershed Management

Committees (CAP). This should theoretically help ensure that the climate change adaptation interventions are well-articulated within the decentralized government framework of municipalities, CAPs, comarcas and community leaders. These institutional arrangements (both formal and informal) are viewed as being crucial for ensuring good coordination, communication and effective implementation of the diverse climate change adaptation interventions proposed in the ProDoc, and they have the potential to create a dynamic and continuous process for implementing the municipal development strategies continuously is missing is physically disabled stakeholders, whose options are limited. Although several were identified and one attended the El Tule Assembly, they have been ignored by the project.

### 3.1.4 Relevance to the Adaptation Fund Objectives (CJ 1.6)

The project fits well with the Adaptation Fund and many of its indicators (see UNDP 2013). The ProDoc does provide a concrete mechanism through which to implement the subsidiarity principle and for mainstreaming adaptation into national water and environmental policy agenda, as well as municipal development plans. However, it must be reiterated that the project does not outline how is intended to measure *climate change resilience*.

### 3.1.5 Analysis of the Risks and Assumptions (JC 1.7)

Although the risks and assumptions identified in the ProDoc and the Inception Workshop (MARENA 2011) are valid (also refer to section 3.4), they are incomplete. Based on its analysis of these two guiding documents (ProDoc 2011 and MARENA 2011) in which reference is made to the assumptions and risks associated with the project, the MTE has identified several additional concerns (see Table 5) related to the omission of these important elements that must be addressed in the final months of the project's implementation.

IMPLICIT RISK	MTE COMMENT
1. The program will communicate ways to <b>replace the use of agrochemicals</b> with organic biological processes aimed at reducing pollution in water bodies, soil and air, and minimizing production costs while increasing the nutritional and economic value of produce.	This assumes that there is an existing baseline on agrochemical use and also assumes that the farmers will see the value of replicating these best practices. However, many of the earthworm culture canoes are operating in a sub-optimal way and only a few of these interviewed have actually replicated the canoes on their own initiative. This represents a serious risk that must be immediately addressed. However, most importantly, there are several other water-borne pollutants that could seriously undermine the entire effort to improve water storage and ensuring that water resources are safe from other pollutants.
2. The CAPS and the recently formed micro watershed committees will serve as a neutral and unbiased mediator and arbitrator if conflicts over land and water resources arise.	While this offers a potentially important way to resolve conflicts at the local level and outside of the lengthy court process. Experiences elsewhere show that these committees sometimes just further strengthen power relationships that are enjoyed by the wealthy and well-connected. The existing use of unsustainable aspersion irrigation systems runs and the focus on productive water

	uses without much mention of domestic needs raises serious concerns that conflicts will arise. The question is how will the project ensure that the water committees will resolve the conflicts in a fair and equitable manner?.
3.Overall, it is anticipated that awareness in these areas will stimulate the adoption of proactive behaviors to adapt to already experienced climate variability, and also contribute to proactive attitudes for ongoing learning about future climate change effects	While this is a reasonable assumption, the approach to raising awareness in the information posts is not effective according to evidence collected by the MTE. The information is too technical according to those interviewed and it does not promote active participation and the most effective way to share knowledge to all protagonists, including those that have not had the privilege of acquiring technical skills, but instead relay on common sense and traditional forms of knowledge.
4.Irrigation by aspersion is an efficient and effective way to increase the number of annual crops and benefit protagonists in Salale and Las Mercedes micro watersheds.	Given that aspersion irrigators were working in the heat of the morning and apparently it is a common practice, there is concern that the water works in these to systems may be perverse incentives that are counter to good adaptation practices and they could create conflicts with downstream users who will not have the full benefit of water pressure in areas closer to the water source.
5.The presence of fifth year agro-ecology students. with technical support of INTA professionals and coordination and advice from the extension staff on the program team will function as agents of change in the communities and is expected to facilitate the involvement of families and communities in different measures of adaptation to climate change and so that they can attain ownership and empowerment.	This assumption is invalid, even though it sounded like an excellent idea. It resulted in considerable amounts of additional work for the project technical and extensionist teams (up to 40 hours extra per month per project staff member), no anthropologist participated <i>nor did professors from the UNAN-Leon</i> , even though this was agreed. The students and their supervisors could provide invaluable support to establishing baselines when a new group arrives in June.

**Table 5: Summary of the findings of the MTE`s analysis of the original project assumptions and risks.**

Based on the above, the EMT finds that four assumptions were not taken into consideration in the original development model and these are sufficiently critical that if not addressed, they could convert into risks that threaten the project`s final efforts to achieve the development objective. The risks associated with ignoring them are summarized below:

**Assumption #1:** *Pollution in micro-watersheds* is principally considered to be associated with misused agrochemicals. However, pollutants such as mercury, pathogenic bacteria and possibly arsenic in upper and middle watersheds that the ProDoc are serious and they must be addressed:

- **Mercury** – Villanueva`s Vice Mayor and the Director of the municipal Environmental Management Unit (UGA) stated that the mercury released by small artisanal gold mining represents the most serious environmental threat within the municipality and that there is a boom in mercury use in the rock-grinding *rastras* (these are huge boulders that are

set in a shallow well lined with rocks and used to crush gold-containing ores). It is also a problem in some parts of the El Sauce municipality. Mercury is released not only into streams feeding into the Villanueva River, but also into the atmosphere. Its bioaccumulation effects are chronic in humans and other living organisms and it leads to cerebral impairment in those affected, particularly unborn fetuses who are especially vulnerable to permanent brain damage.

Uncontrolled mercury pollution of groundwater and surface waters poses a high risk to the AF investment because it threatens to permanently contaminate drinking and irrigation water in the middle and lower parts of the watershed. It is noteworthy that there is an abandoned gold mine the El Tule comarca just above the Villanueva River (see photos in Annex 6) that is presently being considered for reopening. Gold extraction with mercury, which is released directly into streams and rivers would be a serious detriment to the sustainability of the project investment.

- **Fecal coliform bacteria** represent another source of pollution that is widespread, according to several sources that include Ministry of Health (MINSA) epidemiologists. If left unchecked, bacterial pollution could render water supplies dangerous in the future due to the presence of bacteria and other associated pathogens in surface and ground water. Acute and chronic diarrheal disease is a debilitating problem that would commit further investments in the government's efforts to build resilience for adapting to climate change.
- **Arsenic** - although there only anecdotal sources of information and unconfirmed data from sources such as the Villanueva-UGA, CIRA-UNAN university's water testing laboratory and INETER, arsenic is stated to be a problem in several wells in the Villanueva River sub-watershed.

**Assumption #2:** *Micro watershed management committees are the best solution* for resolving water conflicts and contributing to the decentralized management, decision-making, monitoring and enforcement in each of the eight project micro watersheds.

- **The Condega municipality case studies** examined water conflicts and cooperation in water management in two rural communities in the Condega municipality (Mena et al 2011, Gomez 2012) and clearly showed the potential for abuse and inequitable sharing of water resources. Power, wealth and political connections and other inequalities create asymmetric dependency relationships between the elite and the majority of the citizens of the community. This in turn, significantly affected the ability of people to request help for outside parties to intervene in situations where they are denied the right to access to water. The studies argue that within the context of inequality, rural communities and their residents and various segments of water users cannot cope with water allocation decisions and the conditions placed on water usage. Although domestic water use has a priority over the productive uses in the national water law, domestic demands were only given secondary consideration in the Condega examples. Consequently, the poor and less powerful were given a low priority in the water distribution arrangement and they became further marginalized. Consequently, additional safeguards are required to ensure that the CAPS and the micro watershed committees do not abuse their authority.

**Assumption #3:** Farmers and others stakeholder without a formal education are able to read maps and understand the technical information that is available in information nodes located in each micro -watershed.

- Interviews indicated that 90 % of respondents did not fully understand the technical information (e.g., ecosystem maps) presented in the information booths and many of them had difficulty reading topographic maps placed there. From This suggests that the approach to disseminating information about best practices, the location of key features and farms participating in the project may not be the best design for achieving the expected results, which include: a) transmitting the necessary knowledge that beneficiaries and other stakeholders need to know about the project and generate new knowledge; b ) promote participatory action research; c ) involve stakeholders of micro -watersheds in the monitoring process of continuous and sustainable manner. Targeting the information to a more technical audience that does not live in these areas presents a serious risk to the important process of creating ownership and sustainability. Most importantly, accessible new information can help lead to local innovations that are at the heart of sustainable development.

**Assumption #4: The selected approach to water irrigation is suitable** for increasing crop yields in the Las Mercedes micro –watershed.

- **Aspersion irrigating devices** were introduced as a best practice for increasing crop production, despite efforts by the technical team to promote drip irrigation techniques. The protagonists refused to accept the drip systems and there is evidence from the literature and from observations in the field that irrigation by aspersion creates a situation in which evaporation and evapotranspiration rates increase and the net recharge of groundwater and surface waters could be at or below zero. Surprisingly, there is not mention of the need to collect and analyze baseline and monitoring data for any of these critical parameters. As a consequence, the aspersion devices run the risk of becoming a perverse incentive for the farmers and it may be difficult to get them to switch to drip systems or other more sustainable approaches to water use, without creating conflicts with the project. The practice also fringes on the rights of downstream water users and given that the water is free of charge, there is no way to control unsustainable water use practices. The lack of water pricing in these new water distribution systems is seen as contributing to potentially serious water conflicts in the future. Although the Madre Tierra gives free ecosystem services, those services must be protected and pricing has been shown to be an effective tool.

The situation with the students described in Table 5 is easy to understand and is explained in greater detail in section 3.3.3.

## **3.2 PROGRESS TOWARDS OUTOMES**

This section presents the findings from the analysis of the six criteria related to the project`s Efficacy, Effectiveness and any incipient signs of Sustainability at mid-term.

### 3.2.1 Efficacy

Table 6 summarizes the analysis of the EQ 2, which asks “*To what extent have there been advances in delivering the agreed upon outputs expected to contribute toward achieving the expected project outcomes and objective*”? The findings (Table 6) related to answering this question are fundamental for identifying whether the project is on the most direct course to meet its principle objective. At mid-term, the efficacy is judged to be **Satisfactory**.

#### 3.2.1.1 Achievement of outputs and performance of the Project team (JC 2.1)

The project has achieved a high degree of success in meeting its expected outputs in a timely manner (see Table 6) and Efficacy here is rated as **Highly Satisfactory**. The multi-disciplinary project team exemplifies a highly professional work culture that creates synergies and an untiring commitment to their daily tasks. They invest time and energy that

EQ 2 S	<i>To what extent have there been advances in delivering the agreed upon outputs expect to contribute toward achieving the expected project outcomes and objective?</i>
CJ 2.1 HS	The project has made good progress and has met the targets set in terms of the delivery of materials needed to implement the interventions identified in the ProDoc. In addition, the performance of the team has been adequate in terms of its commitment to create the necessary to meet the primary objective conditions and expected results.
CJ 2.2 MS	The project is not on track to meet its objectives, the four or expected results, although all activities are under way or were executed with over commendable achievements.
CJ 2.3 HS	The project has used the logical framework as a planning process in an appropriate way and this has allowed a good track progress when necessary, but has not been used properly process of adaptive management.
CJ 2.4 MU	The monitoring component has not met its goals - data, publications and reports are incomplete on the SINIA web site, the site is not user friendly and cannot track changes along a results chain according to ToC. This impedes the measurement of baseline changes potentially caused by the project interventions it fails to systematically capture the lessons learned that it is supposed to disseminate. The data available for the government institutions only describes their mandate and not how, or what, they contribute to the project.
CJ 2.5 S	The dissemination of results to stakeholders and other interested parties is adequate for technical and other people who have had the privilege of an education. However, it is too focused on technical means that are not accessible to the majority of society and for relatively few players in the project area.

**Table 6: Summary Analysis of Effectiveness.**

beyond what was expected in the ProDoc, which seriously underestimated the amount of work involved with the project. They are clearly committed to ensuring that the project meets its targets and in many cases, the expected outputs have exceeded the original expectations (e.g., significantly greater reforestation and vegetative protection in water recharge areas), saved considerable sums of money (Salale hydraulic works) and ensured

that a biodiversity hotspot was not dynamited (Salale-Lanusa waterfall), as was proposed by a German consulting firm in an other non-GEF-FA project. The highly dedicated multi-disciplinary is backed with strong support from the project's technical coordinator and MARENA. The UNDP office has remained flexible and proactive in contributing to the over-achievements and ensuring that the project is on course. In this sense, the computer, both the field team, MARENA and UNDP performance has been exemplary. However, there are signs of stress among the team related to the heavy work pressure to meet deadlines and outputs, and this must be addressed by the technical coordinator and MARENA because it could lead to turnover, which will require training new people. As a result, this is a potential risk in terms of not being prepared to meet the remaining targets.

### ***3.2.1.2 The path toward meeting the principle objective (JC 2.2)***

Although the project has achieved a high degree of success in terms of meeting its expected outputs, the lack of robust outcome indicators make it difficult in general to measure how these outputs will lead to the expected changes. Table 7 examines the achievements to date.

PROGRESS SINCE THE START	BASELINE	INDICATOR
✓ 920 farm families (91.54% of 1005 families) with agro ecological transformation plans for their crops. Of these 840 are in the process of being implemented.	400	Number of farm families in selected micro watershed with at least one annual harvest.
✓ 100 families <sup>16</sup> benefit from the communal irrigation systems in the Las Mercedes (68 families) and Salale (32 families) micro watershed, having at least one guaranteed crop, or 138% greater than the target, which was 90%.	0	Percentage of farms in each micro-watershed with access to irrigation by means of hydraulic works built with program funds.
✓ A total of 74ha under irrigation with an average of two harvests per year in the Las Mercedes micro watershed (mws).	67.55 ha	Surface area in hectares to increase irrigation
✓ Communal irrigation system in the Las Mercedes mws with two components: 1) intake structure in Mercedes Centro benefitting 17 farm families and the washing zone, benefitting 22 laundresses. 2) Collection system of the Ismael Castillo Cooperative carries 50lt/sec and water used to irrigate by flooding through channels, benefitting 11 farm families.	0 lts/seg	Amount of water (lts/sec) carried through the communal irrigation system infrastructures.
✓ Dam built for the Salale communal irrigation system with intake capacity to carry 30lt/sec and benefitting 32 farm families.		
✓ 36% of rain water collection structures built in Achuapa, El Sauce and Villanueva municipalities.	5%	Percentage of farmers in each micro-watershed, the water use of which is rated as satisfactory in relation to the relevant technical guidelines..

<sup>16</sup> Although this should be expressed as a percentage, the MTE only reports the available data from the Project office in El Sauce and the PPR (UNDP 2013).

✓ 316 rain water collection and storage structures built in communities in the municipalities of Achuapa, El Sauce and Villanueva, benefitting an equal number of families.	0	Number of water harvesting structures installed and working at the micro-watershed level
✓ A total of 91.54% of Agro ecological Farm Transformation Plans formulated in communities of the municipalities of Achuapa, El Sauce and Villanueva	5%	Percentage of farm families in each micro-watershed implementing agro-ecological farm transformation plans.
✓ A total of 920 agro ecological farm transformation plans (PTAF) have been formulated, equivalent to 91.54% of the total programmed, distributed as follows	0	Number of farming families with agro-ecological farm transformation plans
✓ The 920 plans formulated to date include the agro ecological transformation of 2,059 ha, exceeding the goal expected at the end of the project.	0 <sup>17</sup>	Area (ha) of agro-ecological transformation plans developed in farms
✓ The goal has been surpassed from 100% to 172.5%.	25%	Increase in percentage of land in each micro-watershed with vegetation coverage.
✓ A total of 690ha in riparian areas and 4,107ha of forest water recharge zones in the 8 targeted micro-watersheds.	0	Surface in hectares of protected forest water recharge and riparian zones
✓ Achuapa: supplies delivered for the construction of 250 improved stoves, 172 chicken coops and 45 pigpens, benefitting a total of 467 families. 15 stoves built in the community of Las Tablas, benefitting 15 families.	0	Number of families that benefit with home and patio investments through the Farm Transformation Plans (PTAF).
✓ Villanueva: Supplies delivered for 152 improved stoves, 32 chicken coops and 28 pigpens, benefitting a total of 212 families. 30 stoves built in the communities of San Ramon, Los Genzaros, Los Tololos and El Tule, benefitting an equal number of families.	0	An experientially-based proposal endorsed by three municipal governments for the operation of a Sub-Watershed Committee for the Villanueva River basin.
✓ Eight micro-watershed committees formed in Achuapa (2); El Sauce (3) and Villanueva (3). The committees are duly registered in the National Registry for Water Rights (RPNDA), being legally constituted to begin functions.	0	Municipalities in watershed with climate change adaptation measures included with their official plans and related normative instruments..
✓ Based on MARENA's official methodology for the formulation of the Municipal Climate Change Plans, 18 workshops were held in the municipalities of Achuapa, El Sauce and Villanueva to collect information that allows the population to know the situation and effects caused by climate change and identify climate change adaptation measures in these municipalities.	0	
✓ Plans approved by the three Mayor's Offices: El Sauce in 2012, and Achuapa and Villanueva in 2013 and now revised by the MARENA General Planning Division for their reproduction and dissemination.	0	
✓ The Project's progress and achievements has been disseminated through several instruments: Nicaragua: Promoting climate resilient Communities. UNDP Climate Change Adaptation News Bulletin, 12th edition (March 2013). Government promotes construction of Eco- friendly stoves. Online Environmental News Bulletin, MARENA, 33d Edition (January 2013).	0	Lessons learnt in eight micro-watersheds and the Villanueva River Sub-Watershed available in SINIA and other web sites and disseminated through exchange workshops.

<sup>17</sup> The goal is not specific in the available reports.

Nicaragua works toward reducing risks and vulnerabilities due to floods and droughts in the Western part of the country. Online Environmental News Bulletin, MARENA, 35th Edition (March 2013). The Project's website is still under construction. Project has generated regular, periodic progress reports regarding the project's physical and financial execution.

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**Table 7: Progress toward the delivery of outputs at mid-term.**

### ***3.2.1.4 Progress Monitoring System (JC 2.4)***

Outputs produced by the monitoring component are incomplete. There are relatively few publications (other than the ProDoc and Informative Bulletins) and reports available on the SINIA web site (under the north Pacific Regional node) covering the project's progress. Furthermore, the maps presented on the website are static, and not interactive, and the monitoring system is neither easily navigable for finding spatial and temporal data, nor is it user friendly. The site is loaded with weighted files containing information that is of little relevance to the project, in terms of the contributions of different institutions to the project. According to information provided by the IT specialist responsible for the component, the absence of the relevant information is due to more than one year of technological problems associated with the MARENA-SINIA server platform over the past year, and this has hindered the dissemination of data and information related to the project. However, the computer specialist project ensures the tool (website) is almost ready and it contains the System Monitoring and Assessment Program, based on comments from MARENA'S Planning Directorate, SINIA and General Directorate of Climate Change (DGCC). This issue must be closely examined in the final evaluation.

The evidence also indicates that the monitoring system is weak and the parameters that have been selected to establish the baseline are not sufficiently robust to contribute to measure changes using an adaptive approach. The focus is purely on environmental issues and it lacks indicators for other dimensions of sustainable development (e.g., biological, ecological, social - cultural, economic, operational and chemical) parameters. However, it is worth highlighting that many of these problems are linked to the poor design of the monitoring system in the ProDoc and the lack of action taken during the Inception Workshop.

### ***3.2.1.5 Advances in disclosure of the project's rationale and progress (JC 2.5)***

The dissemination of results to stakeholders and other interested parties is not optimal. In general, component 4 has reported very little on the progress of the project and nothing on the lessons learned. The focus is highly technical and political and it does not lend itself to popular dissemination. This is especially problematic at the micro watershed level where the information nodes display information that is difficult to understand and use, according to interviews with numerous protagonists and non-project community members. They further stated that the information (the ecosystem maps in particular) are very technically advanced for them and they do not add significant value. Discussions with several protagonists indicated that more interactive tools such as scaled, physical models of each watershed would be valuable by providing them with something they appreciate in 2 dimensions and

also something that allows them to use for discussing , thereby adding considerable value. Also, coloring books with a key message about adaptation were mentioned as something that could be useful.

### **3.2.1.6 Other advances**

Besides the previously mentioned positive advances in producing the expected outputs, the following progress is noteworthy:

- The initiatives to increase vegetation cover in strategic recharge areas have far exceeded the original expectations, with an impressive total of 4,107 hectares of critical groundwater recharge areas reforested and/or protected with fencing and another 690 hectares of riparian forests protected and/or replanted along important rivers and streams in each micro watershed;
- The construction of 2 communal irrigation systems benefitting 100 families in the Salale and Las Mercedes watersheds have captured significant volumes of water at a much lower cost than was originally calculated (due to the project hydraulic expert's innovative design). However, there are many questions related to the equitable distribution of the water, future conflicts related to the use of water, lack of economic disincentives (the water is essentially free of charge) for over-extracting of water, as well as the efficiency and sustainability of the irrigation model being implemented due to water losses from the system thorough evaporation and evapotranspiration the project urgently have to face;
- Collective laundry areas designed to save water, latrines in the same complex and collective livestock watering areas (see photos in Annex 7) have made it easier for many women to wash due to greater water availability. Ranchers said that the watering areas are beneficial for providing water for their animals in a central location. However, control must be taken to ensure that these watering holes do not convert into a focal point for transmissible diseases that could devastate the livestock, given that so many different groups of animals are passing through the drinking troughs.
- The project team has been successful in motivating the protagonists and getting them to commit to the project and understand the benefits adapting to climate change and they are trusted by the stakeholders. Based on interviews this has been much more effective in disseminating the best practices and other knowledge than have the information posts in each micro watershed;
- The project has created synergies with other government agencies, such as INETER, ANA, MEFCCA and INTA. For example, collaboration between INETER MARENA ANA and the project has contributed to a change of approach in planning at the departmental level to the basin and sub - basin, as required by law. ANA prioritized approval of the Water Committees. MEFCCA activities are complementary to the project and there is overlap in the focus of key stakeholders in the watersheds. According MEFCCA, the advantage of the project is that it has a close relationship to food security due to increased availability of irrigation water. Also, they suggested the concept of ` players ` that has been adopted by the project.

- Three Climate Change Adaptation Plans have been formulated and implemented in the Achuapa, El Sauce and Villanueva municipalities ;
- INETER`s study demarcating water recharge areas and riparian areas, as well as flood-prone areas completed for the town of Villanueva and La Posa was successfully completed (see Annex 8);
- Eight micro watershed committees watershed have been legally established, but they are not yet operational. These committees are legally registered with the Registry of Water Rights (RPNDA), and thus allowed to start their mandated functions related to water resources according to the water law.

### 3.2.2 Effectiveness of the interventions and institutional arrangements

This subsection describes the effectiveness of the outputs (interventions and institutional arrangements for improved coordination) presented in the previous sub section and the extent to which these interventions have contributed toward achieving the project's main objective. It also examines the degree to which these interventions contribute to improve adaptation responses to climate change (e.g. income generation, gender equality and women's empowerment, improved local governance, etc.). Table 8 summarizes the findings of the analysis of the Effectiveness Criterion and it asks the key question: *To what extent is that adaptation interventions have been effective enough to contribute to the achievement of the main objective of the project?*

EQ 3: S	<i>To what extent is that capacity development, training and implementation of the activities of the components contributing to the effective implementation of adaptation measures to climate change?</i>
JC 3.1 S	It is premature to pronounce definitively on the effectiveness of the implemented measures and their contribution to the main objective of the project, but there are signs that the project has achieved some immediate results that are directly attributed to the interventions (products in Table 7). These have led to some benefits that are driving the project toward achieving the main goal of the project.
JC 3.2 HS	The project has improved the capacity and knowledge of the protagonists of the project in terms of implementation of best ecological practices and the importance of protecting water recharge areas and riparian forests within the project area.
JC 3.3 HS	The institutional arrangements for the project have been effective in implementing interventions and institutional arrangements for managing them. The model family and genus for families of players that is promoted by the project to improve gender equity and thus promote a partnership relation between the families interviewed.
JC 3.4 S	The institutions involved in project implementation have actually contributed to the execution of the tasks for which they have responsibility and this has contributed to a nascent medium-term results.
JC 3.5 MS	Although there are some unexpected positive results, there are others that weaken the adaptive approach (e.g., spray irrigation with aspersion) and they are considered to be perverse incentives.
JC 3.6 S	Advances in the application of best practices, training or other activities designed to improve the ability of the protagonists to take adaptation measures have catalyzed positive actions that demonstrate the environmental, social and economic benefits from the project.

**Table 8: Summary of the findings related to the analysis of the project`s Effectiveness.**

As mentioned previously, the MTE explores the links between outputs to expected project outcomes (and of course, whether they lead to impacts after the project ends), with the purpose of tracking changes of causation along each link of the results-chain. Robust, SMART indicators are fundamental for tracking these changes, and systematically collecting lessons learned about the implementation process. Consequently, this section of the MTE goes beyond identifying whether outputs were achieved, but how effective they were in leading to the expected outcomes. The analysis aims to identify either explicit or incipient signs of effectiveness that will lead to expected outcomes that will take the project on the most direct path toward its principle objective.

### ***3.2.2.1 Effectiveness of the training and capacity building for the protagonists***

While it is still relatively early in the implementation process to measure effectiveness of the project outputs, there are incipient signs that some of the interventions are leading to short-term (immediate) changes in the protagonist's daily practices and the government stakeholders view the importance of the project. For example, there is evidence that the protagonist families have used some of the new adaptation measure knowledge to catalyze family actions that appear to be demonstrating some early environmental, social and economic benefits. Again, however, the indicators are not sufficiently robust to measure the effectiveness of these interventions in these three dimensions and the team is adjusting the indicators, based on working meetings held with the MTE consultant during the mission<sup>18</sup>.

Field visits clearly indicated that the project has improved the knowledge of many of the protagonists regarding the urgency of taking action to adapt to climate change impacts. Those interviewed had a clear understanding the need to implement adaptive measures such as the recommended agro-ecological practices, improving food security and protecting water recharge areas are fully understood.

This notwithstanding, the MTE underscores that there is an inherent weakness in the approach used by the technical teams and extensionists to verify the effectiveness of these interventions in the field and there is acceptance that the verification process must become more rigorous. Experiences with verifications of interventions in the PAGRICC project were cited as a possible example for how to improve the Estero Real project verifications. However, it is clear that there needs to be a layer of quality assurance inserted into the verifications and this could be done using independent inspectors who could also help collect the lessons learned in a systematic way. As they are currently designed, the verifications of Estero Real project do not promote adaptive management or systematic lesson-learning, as will be described in in Section 4.

The dissemination and awareness-raising activities used in Component 4 do not appear to be having a positive effect. Although the SINIA web site and the link to Newsletters, publications, maps and other information aim to communicate the project's achievements to other stakeholders outside the project area, there is no evidence demonstrating that the

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<sup>18</sup> While this approach is not a conventional one, the MTE consultant decided that this was too much of a critical issue to ignore, especially given that the project team was in the process of preparing their annual work plan. Consequently, two working sessions were held with the team to help guide them in making the outcome indicators SMART and more robust.

approach has contributed to a change the behavior or knowledge to the protagonists and inhabitants of the micro watersheds who do not comprehend technical terms and who cannot maneuver through a web site that is not interactively dynamic nor user-friendly. The inability to easily observe changes brought about by the project and the absence of good lessons learned that could be replicated raise further questions about Component 4's present design and its overall effectiveness (e.g., changes in vegetation cover, rates water recharge , increased gallery forests ). As such, it presently has all indications of being a static output that needs an overhaul, which could lead to measureable results (e.g., measureable changes in people's knowledge and perceptions) before the project terminates.

The information posts are well-established in each watershed represent and they are a first-step toward disseminating project results at the local level. However, there is no evidence that the posts have contributed to a change in the behavior of the actors or other members of the community. An interview with over 20 stakeholders indicated that most felt that the information presented in the information nodes was technically complex and that they had difficulties interpreting the maps, particularly coded maps ecosystems. They suggested that a physical, three-dimensional model and popular maps of each micro watershed could be more useful in making the information posts more interactive and participatory and it could help them better understand how they are contributing to climate change adaptation. None of the eighteen non-protagonists from the communities where an information post is present, said that they understood the information (they said it was something technical) and had little interest in learning more about the project. However, it must be noted that some of these non-protagonists may have answered negatively because they were not invited to be part of the project. It could also explain their lack of interest. Nonetheless, the message here is that considerable work needs to be done to involve the communities in exploring and actively contributing to the information in the micro watershed information nodes.

### ***3.2.2.2 The effectiveness of the outputs in contributing to change***

The institutional arrangements for the project have been effective in helping ensure that the project interventions take place in a coordinated manner. This is follows the principle of subsidiarity that is implicitly referred to in the ProDoc and there is good evidence that many of the protagonists interviewed are taking on ownership of the project ad modifying some of their behavior regarding more sustainable use of the land and water. This notwithstanding, there are still some behaviors that are difficult to change, such as unsustainable use of water during irrigation, as will be described shortly.

Not only has MARENA has been instrumental in getting the eight watershed committees legally registered according to National Water Law requirements, but it has also played an important role in spearheading inter-institutional cooperative agreements (MARENA - INTA; MARENA - ANA; MARENA - Unite - Leon; MARENA - INETER MARENA - MAG and MARENA Achiuapa the municipalities of Villanueva and El Sauce) to integrate other relevant institutions into the capacity building and data collection efforts. This is considered to be a positive development, because MARENA has historically tried to do many things by itself and

these have met with limited success because they tried to get into areas that were not part of their core competence.

The institutions involved in project have actually contributed key inputs that are linked to their institutional mandates. Have worked in close coordination with MARENA, who has created good coordinating mechanisms for promoting water management at the watershed level and integrated environmental issue into the approach (e.g., increasing vegetative cover in critical recharge areas). This collaboration offers an excellent opportunity upon which future inter-agency collaboration could be built. The technical assistance and studies carried out by these institutions (e.g., INETER, INATEC, ANA and MARENA) have effectively contributed to providing knowledge that can be used to help change protagonist behavior and to target physical interventions that can help reduce the risks and vulnerabilities of the stakeholders in several the project areas. The work carried out by INETER on identifying flood prone areas in the Villanueva municipality and identifying groundwater resources and family drinking water wells offers a good example of these important inputs. However, other than having prioritized recharge areas with INETER's support, there is no evidence that this information has been used for following up or to establish baselines on a regular basis. Additionally, the Ministry of Family (MEFCCA) has contributed positively to gender and family issues, while other important inter-institutional arrangements include the active support from the three mayors, and especially MARENA's Leon departmental delegation.

### ***3.2.2.3 Beneficial contributions to the project at mid-term***

The project has contributed to three important building blocks for guiding the project toward the principle objective. They include: a) Mainstreaming climate change adaptation into the government's policies and strategies, as well as local government development plans, as well as mainstreaming adaptation into the national strategy to focus on watersheds as the targets of management; b) Integration of a new model of gender and family in the factory of the project; c ) Planning and inter-sectorial communication to address cross-cutting issues of climate change in a coordinated fashion at the central level and implemented in conjunction with decentralized actors based, using the Subsidiarity Principle to implement at the lowest practical levels.

#### Mainstreaming Adaptation and Management of Catchments in Government Policies, Strategies and Plans

The fact that the new municipal strategic development plans are incorporated into MARENA's planning system and vice-versa). Adaptation, gender and decentralized environmental management are keystones of the three municipal plans is a major achievement because it indicates that MARENA's involvement has actually led to a change in the way that the three participating municipalities view climate change adaptation. What is lacking, however, is a framework for establishing a baselines for a number of parameters that could be monitored over time in order to determine whether these municipal plans were effective in producing changes. However, at present this is not contemplated and not found in the approach to monitoring under Component 4.

Although the involvement of stakeholders in data collection and monitoring of precipitation and river flows does indicate that the popular monitoring strategy is now operational, the question is whether it will be sustainable and whether measuring only these two parameters will provide useful information that can be used to measure the effectiveness of the different project interventions. However, it is a good start and inclusion of other simple monitoring parameters might help provide a better picture of the effectiveness of these interventions, as well as increase awareness and generate new knowledge that can be applied by protagonists.

An operational approach to integrated Gender and Family into the implementation process

Understanding the importance of the project’s operational approach for integrating gender and family into the agro-ecological farm transformations requires a historical perspective that is best summarized by specialists in the field of land tenure and gender. For example, Broegaard (2013) notes that while Nicaragua is a country with more than sufficient legal instruments for ensuring that women have formal access to land, the SIG index (Social Institutions and Gender Index) notes that the country sadly ranks as having boasts the highest level of gender discrimination in all of Latin America and the Caribbean (Cerise *et al.*, 2012). Consequently, it is clear that there are other factors besides laws that are important for ensuring that women have access to and control of land. One shortcoming in the country’s gender focus is that there are no mechanisms for implementing the laws, nor are there ways to ensure that the full force of the law will come down on violators (Spichiger *et al.* 2013; Broegaard 2013). While the current government has worked to confront this issue, it is a slow process.

In general, few women living in rural areas of Nicaragua have land titles in their name. Most titles are in the name of the head of household (GoN 2012; Broegaard 2012; Deere *et al.* 2012). For example, in the municipality of Achuapa than a third of the 2,805 registered owners in the town are actually women with titles. Unfortunately, it is impossible to ascertain the proportion of women-held titles in the municipalities of El Sauce (13,000 households) or Villanueva because they have ignored any effort to disaggregate title holdings by gender. As a consequence, the project has missed an opportunity to establish a baseline related to gender indicators proposed by the project data and this could have been a condition for MARENA to insist on for the municipal development plans. It is important that the two municipalities begin to disaggregate the global data as soon as possible because it will represent an important contribution to the baseline and for measuring any possible changes in the percentage of women-held land titles in the three municipalities.

Table 9 presents a summary of the results from the MTE analysis of the effectiveness of the gender approach, using the project’s gender indicators.

PROPOSED INDICATORS (GON 2012)	FINDING (% Women involved)	JUDGMENT
1) Percentage of women and men participating in each activity promoted by the Program	40% (N=64 women participants in the Assembly at El Tule)	S

2) Percentage of households with land titles in the name of the couple or the woman.	100% (N=26 families interviewed)	HS
3) Percentage of women have their water resource accessible housing. (uptake)	78% <sup>19</sup> (N=18 interviewed)	HS
4) Percentage of women with income generating activities patio (coops, pens, fruit).	22% (N=18 interviewed)	Pr
5) Percentage of women generating subsistence food for their families (coops, pens, fruit).	78% ( N=18 interviewed )	HS
6) Percentage of women supporting agroforestry transformation plans.	94% ( N=18 interviewed )	HS

**Table 9: Summary of the findings of the rapid analysis of a sub set of the gender indicators proposed by the project (GdN 2012). HS= Highly satisfactory; S= Satisfactory; Pr= premature to measure this results.**

The data indicate that there is an interesting pattern that differs from the general pattern in the rest of rural Nicaragua and Achuapa, where less than 30% of land titles are in the name of women. Here, the number of households of the protagonists in which both women and men appear as co - owners of the property in 100 % of the households. Although the sample is relatively small (N=22), the data indicate that the workshops, forums, meetings or other forms of awareness plus agro-ecological interventions have contributed to a behavioral shift. Obviously these patterns require further investigation, but preliminary results indicate that this strategy deserves closer attention from the government and the project team.

The table also indicates that there is a high level of women participating in organizational and decision-making meetings. Over 40% of the attendees at the public dialogue with the MTE consultant were women. Together, these findings indicate that there is something very special about the project`s approach to including women in the implementation process and that in the areas visited, there are emerging signs that the project could be changing traditional gender roles in some of the project areas. Again, this is based only on a relatively small sub - sample compared to the overall data, but one could easily test the hypothesis that the project area is no different from other non-intervened areas in the northern Pacific region of Nicaragua. This underscores the importance of establishing baselines for gender and to measure changes over time as a function of the project interventions. It is worth highlighting that the indicators selected for measuring changes in gender roles as a result of the project are not SMART and require a careful review and improvement prior to starting any new study related to women's participation in the project.

### ***3.2.2.4 The effectiveness of the outputs in contributing to change***

There have also been several positive results that were unexpected. For example, the acceptance and operativity of the approach to integrating gender and family issues into the

<sup>19</sup> Two women who are heads of families live in an isolated part of rural El Tule and it is difficult for them to carry heavy cement bags to their property to construct water holding tanks. The project adapted correctly and substituted the cement with hard plastic water tanks with over 1000 liters capacity.

project is interesting because projects that incorporate gender issues are generally slow in starting and they tend to reinforce the traditional roles of Nicaragua's male-dominated culture. Another unexpected result is related to the significant savings in project funds and the avoidance of a potential catastrophe with the new design of the water works Salale due to clever, forward looking solutions by the project's responsible civil engineer. He and his team and the protagonists accomplished an impressive feat and they used local materials to the extent possible.

The high level of support and empowerment of community leaders has also been a surprise. This implies that the incentives (both economic, social and environmental) were correctly chosen. The next step is to ensure the availability of the necessary indicators to measure changes along the causative chain if they are there, and also the measure the efficiency and sustainability of the interventions for the remaining time left in the project.

It is important to emphasize the incipient signs of ownership that are developing among the protagonists. It also was noted in the interviews with the small number of district and community leaders whose support has been instrumental in moving the implementation process forward. The project's technical team, the extensionists and information nodes have all played important roles in this catalysis. They regularly disseminate information about the project to other community members and they lead by providing good examples to the protagonists and their commitment to the project is an intangible asset to the project.

Another positive outcome is related to over-achievement of the efforts related to reforestation and protecting groundwater recharge areas, and the project team and the protagonists have quadrupled their original targets. However, the most interesting finding from interviews is that many of the protagonists in these areas indicated that there has been a corresponding increase in biodiversity, including reported and confirmed (this was confirmed by independent sources) 'lions' (puma), 'tiger' (jaguar), endangered birds and bats are just a few of the species entering these newly reforested and protected areas. Although it was not planned, these results have actually assisted Nicaragua in meeting its international commitments to support the Convention on Biological Diversity. It also demonstrates that climate change adaptation, biodiversity and environmental management of watersheds are cross-cutting issues within this context. Unfortunately, the project has no baseline data (i.e., number of animals per area, new species of flora and fauna, size and configuration of fractals of ecosystems and the distances between them) that could help ascertain whether the project's reforestation and protection of critical recharge areas are creating new biological/ecological corridors). It could add considerable value to the project and demonstrate clearly that CC adaptation is just another form of integrated environmental management, as is managing to increase biodiversity resilience. Ideally, this work could be taken over by the new group of fifth year UNAN-Leon students who will be participating in the project in June 2014.

### **3.2.3 Sustainability**

Table 10 summarizes the results related to the sustainability question- *Are there conditions in place at mid-term that could sustain the continuous production of benefits and results produced by the Project after the existing financial support has terminated?*

PC 4 S	<i>At mid-term are there conditions in place that could sustain the continuous production of benefits and results that the Project has produced after the existing financial support has terminated?</i>
JC 4.1 S	The factors that ensure the sustainability of the project which were integrated into the design and are executed properly.
JC 4.2 MS	There is financial sustainability in the medium term and for the future. The question is whether the 7.5% allocated by the municipalities from their budgets is adequate.
JC 4.3 S	There are early signs of an institutional sustainability and governance associated with the project
JC 4.4 S	There are early signs of an economic-financial sustainability.
JC 4.5 HS	There is a level of political commitment to the project can be sustained in the future
JC 4.6 MS	There is evidence that are replicating good practices for adaptation, or that can be easily replicated in the near future.

**Table 10: Summary of the results from the analysis of the Sustainability criterion.**

The analysis of the project's sustainability underscores the following points:

1. The social and financial incentives that were used to entice the protagonists to implement best practices related to adaptation are well-received and there is some evidence that several protagonists are taking their own initiative to improve the original interventions or purchasing additional fruit trees for their property with their own funds.
2. The project adequately addressed the issues of financial and economic sustainability. Recurrent costs are sustainable after the project is completed and the municipal authorities plan to use 7.5 % of the transfer to municipalities from the central government to finance interventions for adaptation. It remains to be seen just how much money this will be, but it is indeed a positive imitative by the municipalities.
3. The evidence suggests that the interventions and institutional arrangements being implemented are showing initial signs of effective integration of watershed management at the micro watershed level and also integrating the project's approach and lessons learned in the three municipalities 'development plans and taking ownership of the project. The project is also providing an example of how many of the government's strategies and laws can be implemented using the subsidiarity principle. It also indicates that many of the protagonists are taking ownership, some are providing innovative improvements to the original intervention design.
4. Project interventions have led to a greater capacity of retaining water in the micro watershed. What remains to be tested is whether the unsustainable use of the water through aspersion irrigation, the inequitable distribution of water resources, the absence of quantifiable indicators to measure changes in domestic water use an pattern will not undermine the project's advances as it nears completion.
5. There are some key risks that were not identified in the ProDoc or the PPR and their absence raises several risks that potentially threaten the project's long-term viability of the project. For this reason, it is important that the project should develop a strategy and action plans to address these threats to the project's sustainability.

### 3.3 Analysis of Results and the use of Adaptive Management (AM)

Table 11 provides a summary of the judgments related to EQ5: *To what extent are the project stakeholders using an adaptive management (AM) framework to manage, administer, produce results and systematically compile lessons learned during the AM process?* The primary purpose of the question is to examine the extent to which the project uses AM to track and identify the lessons learned from the project-related changes that are produced along each link of all the chain of causation in order to ensure that these determinations can help improve the model upon which the intervention is based and therefore provide specific lessons to consider in modifying future the implementation process for future interventions.

<b>EQ 5 MU</b>	<i>To what extent are the project stakeholders using and adaptive management (AM) framework to manage, administer, produce results and systematically compile lessons learned during the AM process?</i>
<b>JC 5.1 HS</b>	The project has used the logical framework and adaptive management in its planning process in an appropriate way and this has allowed a good adaptive tracking and project planning.
<b>JC 5.2 MS</b>	Emerging results were detected that could contribute to the achievement of the main objective of the project.
<b>JC 5.3 MS</b>	The project has been flexible in adapting to the bottleneck that has faced since the beginning of the project, cost-benefit effectiveness is appropriate and has generally been efficient.
<b>JC 5.4 MU</b>	It has adapted to bottlenecks and opportunities but has not done so systematically and has not followed the RBM and ToC proposed in the ProDoc, thus making it difficult to make a systematic compilation of lessons learned and best practices generated by the project.
<b>JC 5.5 U</b>	The SINIA monitoring component is poorly designed, static and not user friendly. It does not use a theory of change-RBM approach, nor PSR indicators. The available information for being able to use a results-based monitoring system is either lacking at present, or it is of limited value for allowing analysis of the findings and this limits the options for conveying the role of AM in collecting lessons learned and measuring the effectiveness of interventions. A PSR approach could help overcome some of these problems. Dissemination is highly technical and the lack of an adaptive approach indicates that Component 4 is static and had the MTE not taken place, it would have remained the same without critically examining the problems stated by the protagonists.
<b>JC 5.6 MU</b>	The project team has missed several additional risks and assumptions that threaten to sidetrack the project from meeting its principle objectives and as such, they have not developed mitigation measures to confront the risks identified by the MTE.

**Table 11: Summary of the findings of the analysis of the Results and AM criterion.**

#### 3.3.1 The use of adaptive management in project planning

AM is an internationally accepted process that essentially involves experimentation designed to generate lessons that can be applied to improve existing practices and streamline them so that they are more effective, efficient and sustainable in contributing

toward achieving the project objectives. For this reason, it is important to recognize that errors are a part of any project and one should not be afraid to make mistakes, as long as the project is designed to capture them, to learn and acquire new knowledge, and adapt continuously by refining the approach until the best practices evolve to confront the context-specific problem.

Although the evidence indicates that the project has adequately used the logical framework and results-based planning for managing the project given the limitations of non-SMART indicators already mentioned, the application of the adaptive management process has not been systematic. Consequently, it has not been effective in: i) systematically extracting lessons learned and best practices (i.e., effective interventions that contribute to the achievement of the main objective) from the implementation process; ii) designing the monitoring systems both in the field and on the SNIA web site; iii) learning from the approach and using the results to disseminate good practice; iv) identifying new assumptions and risks by continuously examining unexpected results as they arise.

Based on the preceding, the MTE finds that the project's use of adaptive management is only moderately unsatisfactory. While there is no doubt that there have been some good adjustments that have responded to several obstacles already mentioned. However, these adaptations have been more spontaneous than carefully planned. The methods used for field verifications of the interventions could be greatly improved these could provide valuable inputs for making the implementation more dynamic and adaptive.

Another explanation for the weakness in the approach to AM appears to be a basic lack of understanding about the AM process and how it can be used to make a project more dynamic and effective. This became evident in several of the meetings that the MTE consultant had with the project team. This could also help explain why the revision of the project's intervention logic was incomplete and why the choice of indicators during the Inception Workshop did not overcome the shortcomings of the ProDoc.

### **3.3.1.1 UNDP'S use of AM**

Although the PPR system used by the UNDP and the log-frame of MARENA and the project administration team to monitor progress include some good observations on the use of adaptive management and lessons learned, the MTE does not consider these to be sufficiently robust. Instead, they appear to be more of an *ad hoc* listing than they are systematic. Essentially, the adaptive management does not appear to be used in a systematic manner, but rather based on experiential knowledge of experts in the various topics of the project and much less focused on the use of GA and lessons learned at the level of watershed and communities. This finding is described in greater detail below.

The flexible and proactive approach used by UNDP has been an important strength of the project and there is evidence that suggests that projects funded by grants such as this AF-GEF financing may be important for starting CC adaptation projects when compared to taking loan-financed projects. The example used here is a parallel-running the Inter-American Development Bank's loan to Nicaragua (executed by MARENA) to carry out the

PAGRICC project. The project lacks sufficient flexibility to allow adaptation and lesson learning and it uses a rigid approach to quantifying results that is complex and focusing on impacts long before the project ends. As a result, it discourages experimentation, which is essential in the initial stages of most projects such as those related to finding ways to adapt to CC impacts.

### ***3.3.1.2 The project's approach to AM***

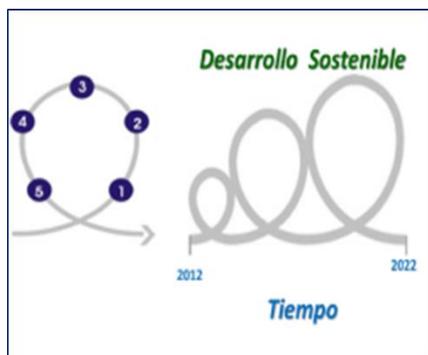
There are several good examples demonstrating how the team adapted their approach in order to confront various challenges. For example, the project team, MARENA and UNDP decided that several of the original results and corresponding indicators were weak and formally agreed to change them. The adaptation to the original hydraulic works design made by the German consulting firm for the Millennium Challenge Authority significantly reduced construction and the potentially devastating environmental costs.

The shift in plans to hire an international consulting firm and instead using the money to hire INETER to make valuable hydrological studies also resulted reduced economic expenditures. The project team also made the excellent decision to create new positions for which they hired extension workers who are actually from the communities in each micro watershed and the evidence strongly indicates that this has created considerable trust by the protagonists in the approach and all interviewees stated that they felt that they could call on the extensionists and information nodes at any time of the day if they had a question to be answered. This appears to have been an important contribution toward improving efficiency and effectiveness of the implementation process. On a similar topic, the extensionists and information nodes were important liaisons between the technical experts and the protagonists in the sense that they not only helped check on the execution of interventions, but also helped follow-up on technical guidelines set forth by the project's technical staff. Consequently, it is likely that the project would not have progressed toward its outputs without these key team members.

This notwithstanding, it is important to reiterate that the flexibility in the Estero Real project has been used outside of a formal adaptive management approach (Ryan et al 2014). Users of the AM should not be afraid to experiment and make mistakes, because there will always be mistakes. However, there is considerable pressure from MARENA, who is pressured from higher up to produce results in the timeliest manner possible. As a consequence, there is little tolerance for mistakes and this is no different from the pressures exerted by multinational companies and some donors who require that their staff meet annual goals in a cost-effective manner. Errors are discouraged and often punished, rather than viewing the mistakes as opportunities for learning, adapting and improving the original approach. However, in a climate changing world of many uncertainties, complexities and considerable unpredictability, the adaptive, experimental approach in adaptation projects is crucial for learning exactly which adaptation practices are the most effective and lasting for reducing risks and vulnerabilities.

### 3.3.1.3 Another view of AM

The adjacent drawing depicts the two approaches to AM. The figure at the top shows a more proactive approach<sup>20</sup> to AM in which lessons learned are more easily extracted and one in which it is much easier to identify the need for adjustments in the original approach in order to improve the interventions and to be better prepared to replicate more effective, efficient and sustainable interventions elsewhere.



One of the tools that is frequently used to engage in a systematic approach to AM is through the project cycle in which root causes are identified (1), interventions are designed to address the root causes (2), approved by contracting parties (3), implemented (4) and subjected to monitoring and evaluation of the effectiveness of the intervention in confronting the problem. This is a continuous and dynamic, lesson-learning process whose aim is to institutionalize good practices and eliminate unsustainable and ineffective practices over time.

The findings from over 100 interviews with the stakeholders and more than 20 members of the project team, field visits to more than 30 interventions in seven of the eight micro watersheds, as well as from the available documentation available clearly indicate that the project team and MARENA require a much better understanding of AM and how it could be applied in a systematic way that would actually lead to greater efficiency and effectiveness over time. This lack of understanding of the AM is one reason why several interventions were not evaluated adequately and why adjustments were not made to correct the problems. As a result, some interventions that are either inefficient or unsustainable continue being promote. Examples include pilot approaches such as the use of irrigation using aspersion, the use of students to formulate agro ecological farm transformation plans and optimal use of earthworm culture<sup>21</sup> as a tool for the production of fertilizers, protection foliage and alternative to agrochemicals. If these interventions fail, they could affect the good will and ownership that the project has been responsible for creating.

In summary, even though work plans are results-based, the weak formulation of the indicators used to measure those results represent an impediment to an adaptive, lesson-learning approach. The extreme pressure on the project team to produce outputs further impedes the AM process and this has led to the continued use of interventions that are not necessarily effective or efficient. As a result, it is difficult to reward success and it is possible

<sup>20</sup> COSUDE (2013)

<sup>21</sup> Although the evaluator found that only 2 of the 10 canoes used for earthworm culture actually functioned correctly, the technical team notes that 85% of actors who have received these modules are using good management practices. Based on the MTE'sS informal suggestion, the program is now making a detailed assessment on whether to field based on the lessons learned this technology and to strengthen training and technical assistance that is already established.

that the project has been awarding failure, as is the case with the CC adaptation unfriendly irrigation aspirators.

### 3.3.2 Incipient signs of achieving immediate results

Table 12 presents the findings of the analysis of a subsample of 18 project outputs and their effectiveness in contributing to immediate outcomes that help meet the project's main objective.

PROGRESS SINCE INCEPTION	IDENTIFIED OUTCOMES <sup>22</sup>	
1. Family agro-ecological transformation plans (920) for crop production.	S	<i>Incipient immediate Outcome</i> – Awareness raised in 920 families, but most importantly, interview and site visit sub samples indicate behavioral changes in all but one protagonists interviewed. Anecdotal evidence from several protagonist leaders indicates that while most protagonists are changing their unsustainable practices, there are still some who are reluctant and only involved with the project to get short term benefits.
2. Two communal irrigation systems benefitting 100 families with an annual harvest.	MS	<b>In theory this is an <i>immediate result</i>.</b> However, there are no guarantees about equity and distribution of the newly routed and accessible water and the aspersion irrigators are considered to be perverse incentives.
	U	
3. A total of 74ha under irrigation with an average of two harvests per year (in 2013) in the Las Mercedes mws	MS	<b>In theory this is also an <i>immediate result</i>.</b> Again, there are no guarantees that the water will be shared equitably and the same comment applies to the aspersion devices.
U		
4. Water intake structure at Mercedes Centro, conducting 30 l/sec for irrigation via aspersion and benefitting 35 farm families.	U	<b><i>Perverse Outcome</i></b> There are no guarantees that the distribution will be equitable or effective as an adaptation measure due to the potential for accelerated evaporation y evapotranspiration.
5. A tank with 25 m <sup>3</sup> water capacity fills with intake to give water for 17 families to give water to their cattle and 22 communal washing posts.	S	<i>Incipient immediate Outcome.</i> Savings in water storage due to the concrete tanks and communal water systems for washing and livestock and an increase in food security. Nonetheless, there are no guarantees that the water will be distributed equitably.
	MS	
6. Water storage area in the Ismael Castillo cooperative receives 50l/sec for irrigation through canals constructed by the project.	S	<i>Incipient immediate Outcome;</i> More efficient water distribution, but no guarantees that the water will be distributed equitably.
	MS	
7. Communal irrigation system at Salale with transport capacity to deliver 30 l/sec, benefitting 32 farm families.	S	<i>Incipient immediate Outcome</i> More efficient water distribution, but no guarantees that the water will be distributed equitably. Aspersion irrigators are a perverse incentive.
	MS	
8. 36% water capture and storage structures to catch rainwater are constructed in the communities.	O	<b><i>Output:</i></b> There is no measurement of whether the water use is satisfactory nor what are the results from this output?
9. 316 water capture and storage devices to capture rainwater in the communities.	S	<i>Incipient immediate Outcome</i> – Water savings due to communal water systems and increased food security. However, lacking is evidence that quantifies these savings and to demonstrate that the ponds do not results in greater evaporation and evapotranspiration in the micro watershed.

<sup>22</sup> **KEY:** S= Satisfactory; MS= Moderately Satisfactory; U = Not satisfactory and Perverse; O= Output: Shading in the middle column indicates that degree of urgency for taking action on the issue described in the third column.

10. 91.54 % of all agro-ecological transformation plans developed.	O	<u>Output</u>
11. 920 agro-ecological transformation plans developed (PTAF) formulated (over 90% of the target) Achuapa: 375 plans, El Sauce: 270 plans and 275 plans in Villanueva.	O	<u>Output</u>
12. 920 plans formulated for agroecological transformations in 2,059 hectares, surpassing the final target significantly.	O	<u>Output</u>
13. The objective to reforest and protect recharge areas exceeded the target from between 100% and 172.5%.	O	<u>Output</u>
14. 690 ha of gallery forest replanted and protected now increased to 4,107 ha. In the 8 micro watersheds.	S	<u>Immediate, incipient result</u> In addition to the natural regeneration, the frequency of uncontrolled fires have been reduced and this is especially true for the recharge areas that have been fenced to protect them from grazing livestock and from iguna hunters who burn the forest to clear the animals out of these areas.
15. Delivered, patio and household improvement interventions.	O	<u>Output</u>
16. Eight micro watershed committees formed in three municipalities.	O	<u>Output</u>
17. CC adaptation plans formulated in three municipalities, thereby assisting them to collect information that can raise awareness to the dangers of flooding.	S	<u>Output/Incipient immediate Outcome</u> Approved enforced, and that they will be effective. However, the change in institutional behavior is considered as being positive and therefore an immediate results.
18. Dissemination of the advances and achievements of the Project through bulletins and web site. The web site although preliminary is operating. Reports and publication listed on the web site.	O	<u>Output:</u>

**Table 12: Analysis the degree to which the project has achieved immediate results at mid-term.**

Based on the finding, there are only four immediate outcomes in which the project might have contributed to changes in the protagonists` attitudes regarding improved water conservation and agro-ecological farming practices. There are six incipient results evolving and it is possible that these might eventually produce outcomes (see the red and yellow shading in the middle column). To do so will require special attention to nourish them along. Eight of the items which the project team and ProDoc would consider to be outcomes, are actually just outputs. These findings are presented in greater detail in Annex 4.

Based on the above and the evidence collected form the site visits in three of the micro watersheds, interviews and discussions with the technical team, the project is at a critical juncture as it enters its final phase of implementation and completion. Although the delivery of outputs is highly satisfactory at this point, there is considerable work remaining to be done for ensuring that the project focuses on the correct expected outcomes.

### 3.3.3 Unexpected perverse outcomes

In addition to the positive results, there are three unexpected, perverse outcomes, which could become risks to the project unless they are confronted immediately:

1) **Irrigation by aspersion** – although the project technical team recommended drip irrigation from the outset, protagonists insisted on powerful aspersion devices and the team conceded. However from site visits it became clear that the selected devices are not a good adaptation measure as they are currently being used. Many of the protagonists have farms located away from their homes and as a result, they begin their irrigation in the morning and leave the water spraying through the hot part of the morning. This enhances evaporation under the intense solar rays and together with evapotranspiration, these CC adaptation unfriendly devices could reduce many of the benefits that the project created with the new hydraulic works. This unsustainable use of the newly accessible water also raises concerns regarding the inequitable distribution of water in that the new access points appear to only benefit those who are nearest to the water distribution systems in Salale and Las Mercedes. It is expected that any attempts to change the present irrigation distribution system will be met with resistance and it may be difficult to change. The fact that the water is free of charge will further complicate any effort to switch to more sustainable irrigation practices.

2) **Cattle watering ponds** (not to be confused with the communal cattle watering troughs) developed by the project offer a large surface area that enhances evaporation, as well as greater evapotranspiration by surrounding plants. While the watering holes are important to cattle farmers for ensuring survival of their animals, it would appear that the ponds could be made more adaptation friendly by planting vegetation that would provide shade and reduce evaporation, as well as retain water within the micro watersheds to the greatest extent possible.

3) **University student's involvement is highly inefficient** due to the large amounts of time that was required from the entire team to train them. The effectiveness of the approach is also questioned. While there is no doubt that this was a well-intended strategy to offer 35 fifth year students an opportunity to get invaluable hands-on experience with an innovative project, the reality was different in terms of the high demands the students placed on the project team's time. This could have been minimized had the university professors and supervisors appeared, but for some reason they never presented themselves and conveniently left the students to the project team to handle. This resulted in the technical experts investing at least one week each month with students to train them and monitor their work.

4) **Loss improved pasture seeds** was not an uncommon event and resulted from poor timing of seed delivery during the dry season or delays in getting the seeds to the farmers in time for the planting season. This created considerable frustration and it is difficult to know why it happened. The important point is to take adaptive measures that will ensure that the project learns from the mistakes related to seed delivery schedules.

5) **The water retention tanks as nurseries for dengue and malaria** became an issue during a mortal dengue epidemic that hit the area in 2013. The uncovered cement water holding devices used to collect rainwater and built by the project became focal points for mosquito larvae in many households. MINSA extensionists applied an organo-phosphate

insecticide (Abate), but this seems to defeat the project’s aim to reduce the use of pesticides. However, several protagonists took an innovative approach and either covered the open tanks with plastic or zinc. *It is these kinds of adaptive responses that the project should collect and use to develop best practices that can be disseminated to other protagonists. They also are excellent indicators of sustainability and effectiveness.*

Interestingly, the project has not capitalized on some of the good practices and lessons learned from previous projects that could have saved time and made the monitoring system more effective, and involving the protagonists in the monitoring process. For example, the MST- Sustainable Land Management Project (funded and implemented by the UNDP - GEF-MARENA ) generated new practices that included simple methods for measuring soil erosion and recharge of water that could be used to establish some physical baselines that could easily be measured and monitored by the protagonists.

### 3.3.4 Efficiency

EQ 6 asks the question *‘to what extent do the processes and mechanisms that are used to execute the Project maximize the efficiency and cost-effectiveness of the Project’s administration and implementation?’* Table 13 summarizes the finding according to the MTE’s Judgment Criteria.

EQ 6		<i>To what extent do the processes and mechanisms that are used to execute the Project maximize the efficiency and cost-effectiveness of the Project’s administration and implementation?</i>
S	MS	
JC 6.1	MU	Delivery mechanisms used by the project executing agency (MARENA) and the coordination office (El Sauce) have been generally efficient and effective based on the investment, although the amount of time invested in the 35 students and the lack of transportation for the technical team has led to considerable loss of time for the project team.
JC 6.2	HS	The mechanisms for financial delivery of the project used by the implementing agency (UNDP) are efficient and effective compared to the cost of the service provided.
JC 6.3	MU	While there have not been any financial mis-use of funds and the allocations are well spent, the logistical arrangements in some cases could be improved. For example, the loss of seeds to late shipment and poor timing of their arrival in the dry season is just one example.
JC 6.4	HS	The Project has met the milestones set forth in the expected results in an effective and efficient manner. However, as noted repeatedly, these results are inadequately formulated. So while the results are being achieved, they are not necessarily going to lead the Project toward meeting its objective.

**Table 13: Summary of the analysis of the project’s Efficiency at mid-term.**

The ToR state that the EMT would make a cost-benefit analysis of the project results. However, there are two basic impediments to accomplish this task. The first obstacle is related to the relatively short time that has passed since the interventions were implemented - a middle ground is difficult to measure the effectiveness of interventions and their sustainability. At this point, there are only signs of effectiveness for some of the interventions

and it is difficult at this stage to assign a cost-benefit analysis. The second barrier is related to inadequate formulation of performance indicators.

The delivery mechanisms used by the project executing agency (MARENA) and the coordination office (The Sauce) have been efficient and effective in terms of the benefits of solid coordination and project management and in general the use of funds has been efficient and effective in producing outputs in a timely manner. However there are at least issues related to the project's overall efficiency of the project, and these are easily solved:

- 1) **The lack of adequate transportation** (4 wheel drive trucks) for the technical team has resulted in significant loss of time for the team. MARENA and the project appears to have tried to save money and it has been counter-productive. This not the first time this has happened – at least one other GEF UNDP-MARENA project experienced the same problem and it is highly recommended that this lesson be learned and not repeated in the future. It is unfortunate that the lessons are not learned and corresponding action taken to eliminate this inefficient issue. Based on the evidence, each technician loses at least a week every month because this problem is calculated. The Delegation of Leon has contributed a vehicle and had it not been for this, the loss in time would have been significantly greater. A mid-term, the project was discussing the purchase of another vehicle, based on the MTE consultant's suggestion.
- 2) **Payment of project related expenses** - there have been significant delays in the payment of per diem or other expenses incurred by the team in the area due to bureaucratic steps and centralizing disbursements within MARENA. This is extremely frustrating and can become a disincentive to the team because they must invest their own funds and then wait long for periods for reimbursements;
- 3) **The approach to integrating students into the project was highly inefficient**, although the benefits to the students was great. However, the time the team spent in training was not worth the high cost of time lost - it is estimated that this resulted in 40 additional hours of work for each technical expert, and a similar amount of time was expended by the extension and information nodes. The final straw is that none of the teachers of the university and the team appeared to take on 100 % of the work. The next group of students must fit in to the project in a much more time effective manner and if done correctly, they will significantly contribute to the project (see Recommendations).
- 4) **Financial delivery mechanisms used by the implementing agency (UNDP) are efficient** and effective compared to the cost of the service provided. The overhead used for the administrative part leading UNDP is well spent (on average 6% were used). As the financial and administrative management of the project is exemplary.
- 5) **Evidence suggests that the Adaptation Fund has had a good result in terms of the effective use of funds** due to the high level of commitment of the team and the players who have been trained by it. It has a highly committed management team and they are executing and gaining very good experience on the project, which could benefit new projects, provided that the lessons learned are captured more systematically.
- 6) **Each team member is working towards an equivalent two people per day**. However, there is evidence of stress due to work pressure, it is imperative for leadership to address this issue and reduce the pressure where possible. The loss of a team member at that point could have a major negative impact in the final months of implementation.

### 3.3.4.1 Financing and Co-financing

There are inconsistencies in financial data reported in the ToR of the EMT (UNDP 2013a) and the figures presented in CDR (UNDP 2013B). The CDR notes that until December 2014 the project has spent a total of \$ 1,235,785.01, or a little over 20 % of the total budget. The government of Nicaragua has contributed 11% of these costs (\$ 138,386.91 USD). Of FA funds, UNDP has been used less than 6 % for management and coordination of the project by UNDP (approximately \$ 75,000), an expense that is reasonable compared to other projects of the same size. The summary of financial data is presented in Annex 7. However, the data presented in the ToR said it has spent a lot more money. In the final version, these discrepancies are resolved and the draft report figures CDR is presented. It is noteworthy that the CDRs are the official UNDP documents.

Figure 3 presents a summary of the expenditures by component compared with the total amount executed by the project at midterm. Costs incurred by component 4 so far are worrying because the available evidence indicates that there is still much to do to improve the results and adjust management to make this consistent with the recommendations of the MTE.

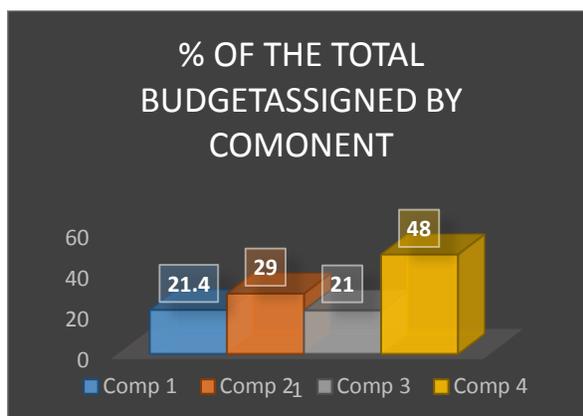


Figure 3: Summary of the percent of expenditures by component (UNDP 2013b).

In terms of component-specific expenditures, the adjacent figure shows the available data from the latest CDR (PNUD 2013). CDR (UNDP 2013b). As the figure indicates, component 1 has executed less than a quarter (\$ 530,733) of the total designated for water works (\$ 2.48 million). Component 2 has spent nearly a third (\$ 382.5660) of the total amount to fund on agro-ecological

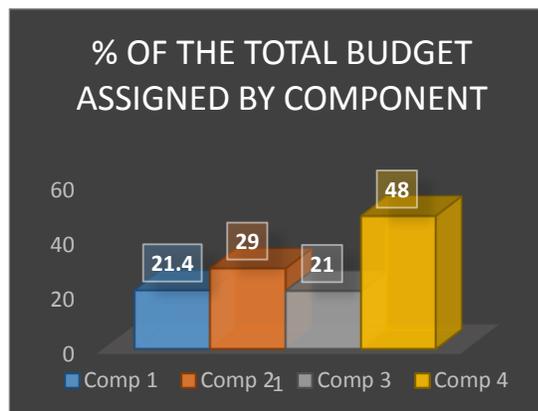


Figure 4: Summary of the percent of the total budget spent for each component. (PNUD 2013b).

interventions (\$ 1,300,000) while component 3 has used 21 % of its budget to strengthen institutional and legal arrangements (\$ 440,000 ). Component 4 has spent nearly half of its total budget (\$ 450,000).

Table 14 presents a summary of the co-financing and financing sources for the project.

Sources of co-financing	Name of co-financing agency	Type of co-financing	Amount at GEF endorsement	Amount used at mid-term
GEF-AF	GEF-AF	Loan	5,070,000	1,802,299.00
GoN	GoN	Matching funds	138,386.91	138,386.91
<b>TOTAL</b>			5,208,386.91	1,940,685.91

**Table14: Summary of the financing and co-financing arrangements (PNUD 2013b).**

### 3.3.5 Monitoring Systems

The SINIA monitoring system has already been discussed. However, the project uses other monitoring tools including the UNDP-GEF tracking performance and financial expenditures, as well as the logical framework to track outputs and results. The PPR and CDR are well managed by the UNDP and they have both been updated as required. Although the MTE agrees with most of the entries on both systems, the list of risks to the project are incomplete, as indicated in the relevant sections of this report and the lessons learned that were chosen are not inaccurate, but they would benefit from generating those lessons from a more systematic approach to AM, as described earlier. Many of the expected outcomes in the PPR are actually considered to be outputs, and the reasons for this confusion have been mentioned in this report. Other exceptions have been highlighted in previous sections of this report. The PPR also provides the necessary information for the UNDP, GEF and the government to monitor the economic performance and indicators based on project outcomes and it generally provides good information. However, the lack of a systematic approach to AM has not necessarily catalogued the lessons learned listed in the PPR in a systematic way, but in what appears to be an ad hoc manner.

The project administration manages the long-frame monitoring system and its corresponding indicators to track progress and especially the generation of outputs. The approach is used mainly to satisfy MARENA's requirements to demonstrate progress related to project benchmarks and in the annual operational plans that are monitored by the General Planning Directorate.

The monitoring and dissemination efforts through the SINIA, and to a lesser extent, the micro watershed information posts, are by far the weakest of the three monitoring systems. The design of the monitoring system is considered *unsatisfactory* because it provides limited amount of information and it also is based on a static and non-user friendly model. For example, the available maps on the website are not interactive, difficult to navigate and they lack real data from the project. Therefore, the monitoring system is largely and information dissemination tool rather than an interactive monitoring system.

The monitoring system and the database could be improved with relatively little effort and some innovation. Ideally, one could expect that the baseline and follow-up monitoring data obtained from Components #1, #2 and #3 to be channeled directly to Component #4. However, the present web-based system on the SINIA site does not use this approach and as

a consequence, there is still much work to be done on this monitoring system. One place to start is to examine the conceptual and physical structure of SINIA’s data base management system and critically examine whether the present structure is conducive for receiving data from the other components and archiving their effectiveness, efficiency and lessons learned. As mentioned earlier, a pressure-state-response approach linked to a theory of change framework based on results is recommended.

The absence of a critical mass of SMART indicators is another reason that it has been difficult for the SINIA monitoring system to develop a robust monitoring system under Component 4. This situation compromises the monitoring system’s potential for achieving greater effectiveness and efficiency. The absence of good SMART indicators also reduces the robustness of the UNDP’s PPR monitoring tool and the project’s logical framework-focused management approach. Another impediment to SINIA monitoring system is the lack of a suitable database. The monitoring system SINIA has a relatively low budget and urgently requires drastic changes to improve the designer and operator’s skills. This has been discussed extensively with the project team, UNDP and MARENA and strong consideration should be given to re-allocate funds and target them carefully into improving the design of the monitoring system, the structure of its data base management system and its accessibility to users who are more interested in monitoring than they are to simply obtain information about the project. A good monitoring tool should have both elements.

### 3.3.6 Risk Management

The project has only focused on managing those risks identified in the ProDoc. However, the MTE has identified several other risks that were presented in Section 3.1.3. This notwithstanding, it is useful to examine the ways that the project has handled the original risks and examine the adequacy the measure used to confront those risks. Table 15 shows the risks that are presently being considered and the mitigation measures used to address those risks, as well as the adequacy of the measure, which is shown in the third column of the table. The table shows the risks that are presently being considered and the mitigation measures used to address those risks, as well as the adequacy of the measure, which is shown in the third column of the table.

RISK	RISK MANAGEMENT MEASURE	ADEQUACY
Farmers and households have limited understanding of the importance and/or the possibility of responding and planning for current and future climate change impacts	<ul style="list-style-type: none"> <li>- Over 55 community awareness-raising assemblies for farmers and households to understand climate change risks and project adaptation measures.</li> <li>-farm families are implementing agro ecological transformation plans and with a more resilient productive model</li> <li>- new partnership model created with the Extended and Production Cabinets</li> </ul>	<ul style="list-style-type: none"> <li>• Define and demonstrate the <i>‘more resilient productive model’</i> and provide measurable resilience data</li> </ul>
Limited access to credit can limit adopting new technologies	- Construction of 2 communal irrigation systems benefitting 100	<ul style="list-style-type: none"> <li>• This is good but it is a short term solution because families may need money to</li> </ul>

	<p>families and guaranteeing at least one harvest a year.</p> <ul style="list-style-type: none"> <li>- Implementation of 920 Agro ecological Farm Transformation Plans initiated. The beneficiaries have received materials and plants in the</li> <li>- 402 families have received material for building improved stoves and domestic animal care.</li> </ul>	<p>replicate their good experiences on the farm and new farmers wanting to replicate the experiences will need credit</p>
<p>Key national and municipal stakeholders do not agree on a common watershed adaptation strategy</p>	<ul style="list-style-type: none"> <li>- 8 watershed management committees integrated with national and local stakeholders</li> <li>- Institutional agreements to work in the Estero Real River watershed (MARENA-INETER), (MARENA-ANA), (MARENA-UNAN - Leon), (MARENA-MAGFOR) and (MARENA, 3 Municipalities).</li> <li>- 24 Micro Watershed Committees community meetings to discuss duties and rights the committees should have according to Law 620 in Art. 35, chapter IV. These are duly registered in the National Registry of Water Rights (RPNDA),</li> <li>- Formulation of three (3) Municipal Climate Change Adaptation Plans</li> </ul>	<p>Essential to establish a baseline on water conflicts, the perception of the efforts by the inhabitants of the micro-watersheds and measuring the effectiveness of the approach in terms of risk and vulnerability reduction measures</p>

**Table 15: Summary of the risks, the measures used to confront them and their adequacy.**

Based on the above, the EMT argues that the project team should provide additional data to demonstrate that all risks are adequately dealt with. This not only includes a need for further analysis of the risks identified in the ProDoc, but also the risks identified in section 3.1.3:

### 3.3.7 Relevance of Baseline and Indicators

Table 16 summarizes the results from the analysis of outcome baseline indicators.

INDICATOR	BASELINE	MTE COMMENTS
Number of farm families in the targeted micro-watersheds with at least one annual harvest.	400	As mentioned previously, this indicator assumes that the transformation plans will contribute to the overall objective. Nonetheless, there is not statistical test designed to demonstrate this result.
Number of farm families included in Sub-Watershed management proposal.	0	IDEM.

Percentage of farms in each micro-watershed with access to irrigation by means of hydraulic works built with program funds.	0	This indicator assumes that the hydraulic Works will lead to a sustainable and equitable use of the water delivered by the Project. Nonetheless, the preliminary indicators suggest otherwise.
Surface in hectares to increase low risk	67.55 ha	Same as above
Amount of water (lts/sec) carried through the communal irrigation system infrastructures.	0 l/sec	Same as above
Percentage of farmers in each micro-watershed, the water use of which is rated as satisfactory in relation to the relevant technical guidelines.	5%	No comments at this point.
Number of water harvesting structures installed and working at the micro-watershed level	0	<b>Good indicator, but are they sustainable?</b>
Percentage of farm families in each micro-watershed implementing agro-ecological farm transformation plans.	5%	The indicator assumes that the plans contribute to the overall objective, although there is no means for verifying this.
Number of farming families with agro-ecological farm transformation plans	0	Same as above
Area (ha) of agro-ecological transformation plans developed in farms	0	Same as above
Increase in percentage of land in each micro-watershed with vegetation coverage.	25%	<b>Very good</b>
Surface in hectares of protected forest water recharge and riparian zones	0	Although this is a reasonable indicator, it does not necessarily indicate that there will be measurable changes in groundwater recharge (DIFD 2006). It is important to prove that this assumption is valid.
Number of families that benefit with home and patio investments through the Farm Transformation Plans (PTAF).	0	The indicator assumes that the plans contribute to the overall objective, although there is no means for verifying this.

An experientially-based proposal endorsed by three municipal governments for the operation of a Sub-Watershed Committee for the Villanueva River basin.	0	This is an output that requires re-wording.
Municipalities in watershed with climate change adaptation measures included with their official plans and related normative instruments.	0	This is an output that requires re-wording.
Hydrological study and number of news bulletins to disseminate the participatory monitoring of water quality and amount, soil conditions and use changes.	0	This is an output that requires re-wording.

**Table 16: Summary of the analysis of indicators for the expected results.**

Another weakness in the design of the baseline indicators is related to the selection of the parameters that make up the baseline. Currently, there are only 2 parameters – water flow and precipitation. These parameters are uni-dimensional (physical) and it is unfortunate that the project has not included parameters from other equally important dimensions of sustainable development such as the social (e.g., better living conditions, health), cultural (e.g., changes in community organization, changes in the culture of uncontrolled burning, use of agro-chemicals, etc.) and economic (e.g., changes in family income). Without such a holistic view it becomes difficult to measure closely linked changes that might be produced by the project, including better preparedness to adapt to the risks and vulnerabilities today and to climate change impacts in the future.

## 4 CONCLUSIONS

Overall, this AF-GoN funded climate change adaptation pilot project is rated as **satisfactory** midway through its execution. In general terms, the project’s **ADVANCE TOWARD RESULTS** is judged to be **Satisfactory** and this rating is bolstered by high achievement regarding outputs and the performance of the project team, MARENA’s DGCC and DGP, as well as the UNDP project management unit. The extensionists and the information node staff have played an important role in linking the project seamlessly with interventions implemented by the protagonists in the micro watersheds. The entire team’s commitment, professional and timeless work ethic are exemplary and each of these elements has created synergies that have moved the implementation process forward quickly. However, there are signs of stress under the constant work pressure and this must be addressed in order not to risk losing staff at this critical juncture for finalize the project.

The project is not only on track to deliver its expected outputs, but it has also exceeded its original output targets in several thematic areas. Interventions have expanded water

availability for irrigation in two micro watersheds, increased the harvest cycles from one to two per year in several farms, they have quadrupled the expected area under protection and reforestation plans in critical water recharge areas in all eight micro watersheds. Of special importance is that there are incipient signs of increasing ownership among the different protagonists who were interviewed. Many protagonists have been actively involved in collecting and monitoring changes since the project began, but the innovative approach to integrate gender and family equity into the project has been one of the pillars that has held the project together and in helping move forward. The gender approach also appears to offer an important breakthrough in altering traditional, male-dominated roles in farming by actively involving women in all aspects of the implementation process.

The project has also been able to integrate a decentralized approach to climate change adaptation and watershed management at the lowest practical level (micro watershed, municipality and family), and mainstream these three cross-cutting issues into municipal development plans within the Villanueva River sub-watershed. Accordingly, the approach potentially offers the government a solid climate change adaptation and micro watershed management model that could contribute toward improving the implementation of national climate change adaptation, watershed management and decentralization strategies according to the Subsidiarity Principle continuously and in a coordinated manner.

The above notwithstanding, there are several *less than satisfactory* findings. On the one hand, the project offers an excellent approach for promoting a coordinated set of adaptation measures in order to reduce risks and vulnerabilities in northern, semi-arid Nicaragua where poverty levels are high and the **INSTITUTIONAL ARRANGEMENTS** are judged to be **Satisfactory**. The project correctly focuses on key elements such as improving the capture and storage of water as a CC resilience mechanism, providing agro-ecological farm transformations that break with the classical non-sustainable practices of the past and implementing the interventions and coordinating them at the lowest practical levels.

Ultimately, the MTE aims to identify not just *if* an output was produced, but also *how* the project delivers its outcomes. However, the ProDoc's fragmented intervention logic, the missed opportunity to identify a complete range of risks and assumptions and the paucity of SMART outcome and weak baseline indicators make it difficult to identify clear links between outputs and immediate outcomes that would permit changes to be easily tracked along each link of the causation chain. The theory of change approach mentioned in the ProDoc is not employed in the project, even though it is fundamental for carrying out the Adaptive Management process, which is also given a high priority by the ProDoc, the MTE's ToR and the PPR monitoring system. Much of these issues can be traced back to the weak intervention logic and possibly a poor understanding by the project team on how to operationalize AM. As a consequence, the lessons learned from the project have been more on an ad hoc basis, than they have been produced systematically. While the financial and economic efficiency of the project are considered to be satisfactory, the overall approach to Adaptive Management is only **Marginally Satisfactory**. This is largely due to the *unsatisfactory* rating of Component 4 and the performance of the monitoring system and dissemination approach, which is considered to be far too technical according to interviews.

A more popular approach would help balance the technical focus and help make the information reach many more protagonists than does the present approach.

Identifying where a chain of causation breaks down is also important for examining why the project produced several unexpected results and situations in which the interventions have deviated from the intervention logic. For example, the unexpected perverse incentives created by the choice to promote unsustainable use of irrigation aspersion devices is going to be difficult to change, even though these devices work against adaptation goals and they may lead to inequitable uses of the newly accessible water by more privileged members of the comarca. Also, increasing the volume of water flowing through several micro watersheds raises questions about equitable distribution among not just protagonists near the water distribution source, but also those below it. The focus on using the water for productive purposes is fine, but there is no indicator to measure changes in domestic water availability. The absence of a water pricing instrument is especially worrisome because it could lead to water conflicts in the future and experiences in another municipality highlight the problems associated with water CAPs that tend to favor the powerful and privileged members of a community. However, there were some very positive results that were also unintended. These include triangulated evidence that the increased watershed protection and reforestation efforts are actually leading to an increase in the presence of endangered and threatened species such as jaguar and puma, among others. This is likely due to decreasing the distance between forested habitats as they expand and changing the size and shape of the physical fractals. Involving university students and their supervisors in establishing baselines and monitoring these unintended changes in biodiversity is a much more efficient use of time that was their involvement in developing the farm transformation plans and such a shift will benefit all who participate in the project, and such efficiency will be crucial during the remaining months of the project.

## 5 LESSONS LEARNED

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The main lessons learned from the project are the following:

- 1) **The Subsidiarity Principle is a key to generating effective and lasting environmental benefits**, not just locally, but also at the national, regional and global levels. The approach of working at the lowest practical levels has led to early signs of effectiveness and sustainability associated with several project interventions due to the focused on the more practical and manageable landscape levels (the sub- and micro-watersheds), on decentralized institutional coordination (municipality and comarca) and the implementation and management of natural resources at the family farm level. The local benefits measured in the micro watershed can be translated to other projects at national and regional levels, but only when SMART indicators are developed to identify good practices and lessons learned in the process of developing them. A proactive, adaptive approach rather than an *ad hoc* reaction, is fundamental for producing guidelines aimed at disseminating best practices.

- 2) **Adaptation projects offer cross-cutting tools** that can integrate watershed and natural resource management into a coordinated effort that is essential for building resilience to climate change (CC). Instead of being an isolated approach, adaptation is essentially a crosscutting axis for carrying out integrated environmental management, and for that reason, it should involve different formal and non-formal sectors to facilitate its implementation based on the principle of subsidiarity. By focusing on water management at the lowest practical landscape level, the project has produced unexpected results that include operational tools leading to biodiversity conservation (increase in plant and wildlife cover), improved water capture and distribution systems and to a lesser extent, CC mitigation tools (carbon sequestration in plant biomass).
- 3) **The best intentions aimed at hydrology adaptation can create perverse incentives** that exacerbate the impacts of climate change. The lack of a comprehensive and multi-sectorial strategy to address the practical aspects of reducing water-related risks and vulnerabilities in the face of climate change impacts can jeopardize adaptation investments and impose even greater risks to vulnerable communities unless projects integrate strategies to minimize water losses by natural processes (e.g., evaporation, evapotranspiration), inequitable resource use shaped by relationships of power and privilege.
- 4) **A robust analysis of the intervention logic is crucial prior to starting a project**, as is prior training in the approaches to management based on theory of change, adaptive and results-based management. It is essential to map the proposed development model and identify the products and their links with the immediate results and intermediate assumptions and risks to ensure that the indicators are SMART and sufficiently reliable to detect changes in each link in the causative chain of effects. While it is important to measure the scope of the results, it is also essential to know both the mechanisms that led to the outcomes. Weaknesses in the chain of results can contribute to the unexpected results originating from a non-robust analysis of the risks and assumptions associated with the project design.
- 5) **An adaptive approach to management is fundamental for systematically generating lessons learned** and contributing toward measuring the effectiveness, efficiency and sustainability of a project and ensure that the fundamental effectiveness of proposed best practices that could be implemented outside the project area.
- 6) **The absence of a popular and dynamic dissemination approach** undermines the basic conditions required to create local innovation or other processes which enhance the protagonists. Otherwise, there is a high risk that the project will unequally target some of the more technically minded experts and make it difficult for the protagonists to use the existing knowledge.
- 7) **A robust analysis of assumptions and project risks is fundamental** to any adaptive management framework in order to reduce the possibility of surprises and to help ensure an effective and lasting implementation of a project.
- 8) **A robust strategy for the verification of the effectiveness of interventions in the field is critical**, both to create a dynamic monitoring system and to ensure that

problems in the field are not only documented, but that also that the root causes of those problems are identified.

- 9) **The role of extensionists from a local community cannot be overestimated** because it creates trust and other basic conditions required to engage protagonists continuously and provide them with the necessary feedback for strengthening or adapting their practices so that they are adaptive responses to the threats of CC impacts.
- 10) **Actively integrating operational gender and family aspects into the implementation framework is essential** for promoting synergies that can catalyze more effective and lasting ownership of CC adaptation projects.

## 6 RECOMMENDATIONS

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Based on the analysis results of the three themes and six evaluation criteria, the MTE recommends eight actions that aim to improve the efficiency and effectiveness of the project, and to place the project on a more direct course for meeting its principle objective. Annex 8 presents a matrix with more details about the actions required to implement these recommendations, which include the following:

1. **Review and update the logic project intervention** including the risks, assumptions, as well as ensuring that expected outcome and baseline indicators are SMART. The project team should continue to build on their good efforts at making these adjustments in working sessions with the MTE consultant.
2. **Expand the baseline parameters** to include the socio- cultural , physical-chemical , biological , ecological and economic dimensions of the baseline and involve other institutions such as UNAN-León, INETER , MINSA and TASCA in designing participatory approaches involving protagonists in monitoring these new parameters to ensure continuity after the project ends.
3. **Eliminate and replace the perverse incentives that undermine adaptation to climate change** by gradually replacing aspersion irrigation sprayer with more appropriate and adaptation-friendly practices that may contribute , not weaken (e.g. , through evaporation and evapotranspiration) the benefits of water recharge promoted by the project works. Establish a baseline related to the current conflicts over water resources in the 8 micro watersheds measure the effectiveness of its resolution by the micro watershed management committees.
4. **Improve the monitoring system** by making it more dynamic, interactive and friendly - not just for technical experts, but also for ensuring that the message reaches those who do not have technical backgrounds. The maps on the SINIA web site should be interactive and designed a learning tool, rather than just a static information model. Data should be accessible and it could be considered to use a hierarchical approach for structuring it according to four dimensions of sustainable development, namely the physical-chemical, biological-ecological, social-cultural and economic-operational, and creating sub-units of data/information under each of these

dimensions. A Pressure-State-Response framework should be integrated into the approach, given that it is stated to be an important aspect of SINIA's design on the SINIA web site.

5. **Popularize information and disseminate data to improve the level of popular understanding** and contribute to local innovation processes promoted by the protagonists. Physical models, more popular posters and maps, recapturing the art of sustainable traditional agro-ecological and watershed management practices, coloring books, pamphlets or other forms of popular dissemination that could be discussed with the players and improved in a way that allows them to take ownership and use the approach to add further information that can help lead to greater innovation of CC adaptation measures in the future.
6. **Develop indicators for metaphorical terms** such as resilience and sustainability, which are mentioned in the ProDoc and used in project-related reports. Attempts should be made to describe how they will be measured.
7. **Improve verification tools for testing and measuring the effectiveness, efficiency and sustainability of project interventions** and have a better quality control process that may contribute to a better understanding of the effectiveness, efficiency and sustainability of interventions in the watershed.
8. **Improve project efficiency** - ensuring that the technical team has adequate means of transport, on-time delivery of seeds and other inputs, and improve extension remain as key links between the project and the protagonists in each watershed.

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