



# Vulnerability and Capacity Assessment (VCA) in climate change in Agriculture in the province of San Juan and Subzone Hondo Valle, Elias Piña, Dominican Republic 2014

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Dominican Republic**

**Vulnerability and Capacity Assessment (VCA) in climate change in the Agriculture in the Province of San Juan and subzone Hondo Valle, Dominican Republic**

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## **ACRÓNIMOS Y ABREVIATURAS**

**ABE:** Ecosystem-based adaptation  
**ALC:** Latin America and the Caribbean  
**AMC:** Multi-criteria analysis  
**MEAs:** Multilateral environmental agreements  
**APEDI:** Association for development, Inc.  
**APS:** Water supply and sanitation  
**BANCENTRAL:** Central Bank of the Dominican Republic  
**CA:** Adaptive capacity  
**CAASD:** Corporación de Agua y Alcantarillado de Santo Domingo  
**CABI:** Audiovisual centres and libraries of the INDRHI  
**CC:** Climate change  
**CBD:** Convention of biological diversity  
**CDEEE:** Corporation Dominican of State electric companies  
**CEDAF:** Center for agricultural development and forestry, Inc.  
**CEGA:** Center of management and agribusiness  
**CEHICA:** Center for sustainable management of the water resources in the island States of the Caribbean  
**CEPREMID:** Center for the prevention and mitigation of disasters  
**CEPROS:** Centro de Estudios y Promoción Social  
**CLD:** Convention to combat desertification and drought  
**CNCCMDL:** National Council of climate change and clean development mechanism  
**CNE:** National emergency Commission  
**CNE:** National Energy Commission  
**UNFCCC:** United Nations climate change framework Convention  
**COE:** Emergency operations center  
**CODOPESCA:** Dominican fishing and aquaculture Council  
**CONIAF:** National agriculture and Forestry Research Council  
**COP:** Conference of the parties  
**COPDES:** Presidential Commission on the Millennium development goals and sustainable development  
**Cora:** Corporations of the aqueduct and sewer authority  
**CO<sub>2</sub>:** Carbon dioxide  
**CSA** Climate-smart agriculture, known by its acronym in English  
**DBO:** Biological oxygen demand  
**DC:** Civil Defense  
**DECCC:** Plan of economic development consistent with climate change  
**DGODT:** Directorate-General of planning and Territorial Development  
**DIARENA:** Management of natural resources and environmental information  
**DR-CAFTA:** Dominican Republic - Central America Free Trade Agreement /Tratado of Dominican Republic, Central America-United States of America free trade agreement  
**EGEHID:** Hydroelectric generation Dominican company  
**E:** Exhibition  
**END:** National development strategy  
**ENF:** National forest strategy  
**ENT:** Technology transfer needs assessments  
**EP:** Potential evaporation Turc Formula (Sokolov and Chapman, 1981)

**ER:** Actual evapotranspiration, according to formula of Turc (Sokolov and Chapman, 1981)  
**ERP:** The poverty reduction strategy  
**FAO:** Food and Agriculture Organization of the United Nations  
**FEDOMU:** Dominican municipalities Federation  
**FI & FF:** Investment flows and financial flows  
**GEF:** Global Environment Facility  
**GHG:** Greenhouse gas  
**GIS:** Geographic Information System  
**GPS:** Global Positioning System / Global Positioning System  
**GIZ:** German Agency for development (currently **GIZ** - Deutsche Gesellschaft für Internationale Zusammenarbeit)  
**IAD:** Instituto Agrario Dominicano  
**IDIAF:** Dominican agriculture and Forestry Research Institute  
**IIBI:** Institute for innovation in biotechnology and industry  
**IICA:** Inter-American Institute for cooperation on Agriculture  
**IISD:** International Institute for sustainable development  
**INAPA:** Instituto Nacional de Agua Potable y Alcantarillado  
**INDRHI:** National Institute of hydraulic resources.  
**IPCC:** Intergovernmental Panel on climate change  
**ISA:** Institute of agriculture  
**IWA:** International Water Association  
**R & d:** Research and development  
**JBN:** National Botanic Gardens  
**MA :** Ministry of environment and natural resources  
**MDB:** Table of dialogue on forest  
**Ministry of education:** Ministry of education of the Dominican Republic  
**IWRM:** Integrated water resources management  
**MEPYD:** Ministry of economy, planning and development  
**MESCYT:** Ministry of education top science and technology  
**MIC:** Ministry of industry and trade  
**MIREX:** Ministry of Foreign Affairs  
**MRV:** Monitoring, reporting and verification  
**MSF:** Sustainable forest management  
**NCSA:** National Capacity self-assessment  
**MDG:** The Millennium development goals  
**OAS:** Organization of American States  
**OECD:** Organization for co-operation and economic development  
**ONAMET:** National Meteorological Office  
**ONE:** National Statistics Office  
**NGO:** Non-governmental organization  
**OPS:** Pan American Health Organization  
**PANA:** National plan for adaptation to climate change  
**PATCA:** The competitive agri-food transition support project  
**PCN:** First national communication  
**ECCP:** Strategic plan for climate change  
**PHN:** National hydrological plan  
**UNDP:** United Nations Development Programme  
**PNPSP:** Multi-year national plan for the Public Sector  
**PES:** Payment of services Eco-systemic  
**PROMEFRIN :** Program of market, refrigerator and greenhouse

**SMEs:** Small and medium-sized enterprises  
**RD:** Dominican Republic  
**REDD:** Programme on Reducing Emissions from Deforestation and Forest Degradation  
**SBSTA:** Subsidiary for scientific and technological advice  
**SCN:** Second national communication  
**Music:** System integration Central American  
**SGN:** National geological service  
**SIDS:** Island developing State  
**SIG:** Geographic information system  
**SINAP:** National protected areas system  
**SNIDT:** National innovation and technological development system  
**TIC:** Information technology and communication  
**TNA:** Technological Needs Assessment  
**UAFAM:** Universidad Agroforestal Fernando Arturo de Meriño  
**UASD:** Universidad Autónoma de Santo Domingo  
**UGAM:** Environmental management units  
**UNESCO:** Organization of the United Nations for the education  
**USAID:** The United States Agency for international development  
**WSC:** Water sustainability and Climate

## **GENERAL EXECUTIVE SUMMARY**

This study Vulnerability and Capacity Assessment (VCA) to Climate Change in the Agricultural Sector for the Province of San Juan and Sub Zone Hondo Valle (Province Elías Piña) has been developed at the initiative of the Ministry of Agriculture and the National Council for Climate change and Clean Development Mechanism and the Caribbean Community Climate change Centre-CCCCC- located in Belize, through the Global Climate Change Alliance (GCCA) of the European Union (EU) for the Caribbean.

The GCCA projects seek to incorporate and integrate adaptation into national development and planning and mechanisms to improve the economic and social development and reduce vulnerability of states to climate change through the development of resilient policies the weather.

Considering the guidelines established by the CCCCC, PLENITUD has developed the present study based on the methodology outlined in the "Vulnerability and Capacity Manual, A methodological guide for conducting and integrating vulnerability assessment and capacity in the Caribbean Region" (Vulnerability and Capacity Assessment Methodology. a Guidance Manual for the conduct and mainstreaming of climate change vulnerability and capacity assessments in the Caribbean Region) and has considered the study area contractually defined as the area comprising the Province of San Juan and Sub Zone agricultural Hondo Valle Province Elías Piña.

In this sense, this document includes a detailed characterization of the geographical area comprising the study area, natural physical and socioeconomic characteristics that define it. Identify the types of capital and its role in the development of communities, focusing on the interaction they have and how the expansion of one capital can influence the other.

The Vulnerability Analysis and Capacity Assessment (VCA) developed indicators used for each of the components of sensitivity, exposure and adaptive capacity to integrate, synergistically, the vulnerability of space, of the main economic activities and inhabitants make life in the area, considering the two main scenarios to which they are subjected: a) drought b) heavy rains and flooding.

A fundamental part of this study included an intensive field work, through workshops and interviews with locals and assigned to the main state agencies and civil society organizations that are directly or indirectly related to the activities technical staff agriculture developed there. Direct consultation with these key people in relevant issues on climate change and its potential impact on agricultural activities, allowed to obtain individual and collective perceptions of these groups in relation to each of the surveyed points.

The analysis of information collected and the products developed during the VCA, allowed defining conclusions concerning the vulnerabilities of the area to Climate Change and its variability; and establish the recommendations deemed necessary to reduce their exposure and sensitivity and increasing adaptive capacity, in order to make these communities more resilient to the projected scenarios.

## ***Vulnerability and Capacity Assessment (VCA) in the agriculture sector in the province's San Juan, and sub-zone of Hondo Valle. Dominican Republic***

*This document was produced by the PLENITUD Foundation under the technical supervision of the Caribbean Community Climate Change Centre (CCCCC), the National Council for Climate Change and Clean Development Mechanism (CNCCMDL), the Ministry of Agriculture, funded by the European Union (EU). 2014.*

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# 1 INTRODUCTION

The **Centre for Climate Change CARICOM (Caribbean Community Climate Change Centre-CCCCC)** located in Belize, is implementing projects to adapt to climate change using the **Global Climate Change Alliance (GCCA)** of the **European Union (EU)** for the Caribbean, intended to help the sixteen (16) participants develop the ability to design and implement policies and measures to adapt to climate change.

The **GCCA** project must incorporate and integrate adaptation concerns into national development and planning and mechanisms in order to improve the economic and social development and reduce vulnerability of states to climate change through the development of resilient policies the weather.

In July 2012, Dominican Republic signed a Memorandum of Understanding with the **Center for Climate Change in the Caribbean Community (CCCCC)** to participate in the **EU-GCCA Regional Project**. In 2014 the project working in collaboration with the **Government of Dominican Republic (DRG)** through its institutions such as the **Ministry of Agriculture and the National Council for Climate Change and Clean Development Mechanism** to prepare **Vulnerability Assessment starts and Capacity (VAC)** and the **National Strategy for Adaptation to Climate Change in Agriculture Sector (NASAP)** for which, through a competitive process, is recruited to the Fullness Foundation to carry out both scopes.

This study Vulnerability and **Capacity Assessment (VCA) of the Agricultural Sector to Climate Change**, has been developed based on the methodology established by the *CCCCC: Vulnerability and Capacity Manual, A Methodological Guide to conduct and integrate assessment vulnerability and capacity in the Caribbean region* (Vulnerability and Capacity Assessment Methodology. a Guidance Manual for the conduct and mainstreaming of climate change vulnerability and capacity assessments in the Caribbean Region) and considered the study area defined contractually as the area comprising Province of San Juan and Hondo Valley Sub Area Elías Piña Province.

The structure of this paper is as follows: **Chapter 1** provides a brief description of the Dominican Republic and general conditions that characterize the current status and overall context in which the project is located. **Chapter 2** provides the conceptual framework to be used as a tool to unify criteria; **Chapter 3** describes the methodology used for each developed activity, dates, leveraged tools and limitations. **Chapter 4** is the characterization of the study area itself, placing the reader directly into the geographical, socioeconomic and physical space to be evaluated. **Chapter 5** identifies the types of capital and its role in community development, focusing on the interaction between the capital and the expansion of capital can affect the expansion of others. **Chapter 6** Vulnerability Analysis developed presents the detailed methodology described has been applied, integrated vulnerability indicators used, results and analysis thereof. **Chapter 7** summarizes the results of the workshops and interviews conducted with communities, their perceptions about the effects of climate change, vulnerability and adaptive capacity. Finally, **Chapter 8** presents the key findings of the project and recommended by the technical team that has participated in the same strategies.

## 1.1 General country profile

The island of Hispaniola, or Spanish, is divided into two independent sovereign states: Dominican Republic on the eastern and western Haiti. This island is part of the Senior Antillas Caribbean archipelago, and is located in the subtropical region on the edge of the tropical zone<sup>1</sup>, with an area of 77,914 km<sup>2</sup>.<sup>2</sup>

The Dominican Republic is located in the northern hemisphere and south of the Tropic of Cancer, has as limits the following geographical coordinates: 17 ° 36'-19 ° 58 'north latitude and 68 ° 19'-72 ° 01 west longitude' occupying two-thirds of the eastern portion of the island, with 48,310.97 km<sup>2</sup> (without the maritime territory). Bordered on the north by the Atlantic Ocean, which separates it

from the Turks and Caicos Islands; west by the Mona Passage, which separates it from Puerto Rico; south to the Caribbean or the West Indies, which separates it from Venezuela; and west of the boundary line, which separates it from the Republic of Haiti.



**Figure 1 Ubicación relativa de la República Dominicana.**

According to the last census (2010), has a total population of 9,445,281 inhabitants, of whom 4,739,038 are men and 4,706,243 are women, reflecting a population density of 195.5 inhabitants / km<sup>2</sup>. In the last twenty years the Dominican Republic (DR) has been one of the fastest growing economies in Latin America, with an average GDP growth of around 5.5 percent between 1991 and 2013. Despite this phenomenal economic performance , poverty today is higher than in 2000. The poverty increased from 32 percent of the population in 2000 to almost 50 percent in 2004, following the financial and economic crisis in 2003, gradually declining to 41 percent in 2011.

Su insularidad y su relativamente pequeña superficie permiten que una fuerte influencia marítima controle los patrones climáticos generales, lo que le hace muy vulnerable, por hallarse en la región subtropical de huracanes.

Its maximum dimensions are 390 km from east to west, from Cape Deceit, Deception in the place Cape province La Altagracia to Punta de Agua, in the place Las Lajas, Independencia Province and north-south 265 km., From Cape Isabela, setting La Culebra, Puerto Plata province, to Cabo Beata, place the Three Pools, Pedernales province. Your total perimeter reaches 1963 km, of which 388 km are the border with Haiti and 1,576 km of coastline are. This island, along with Cuba, Jamaica and Puerto Rico from Florida to Trinidad and Tobago are the Great Arc of the West Indies.

<sup>1</sup>SEMARENA y PNUD. (2009). Proyecto Cambio Climático 2009. Segunda Comunicación Nacional.

<sup>2</sup>MEPYD. ONE. (2012). División Territorial 2012.

**Figure 2** Dimensions of Dominican Republic.



Fuente: SEMARENA y PNUD, 2009. Proyecto Cambio Climático 2009. Segunda Comunicación Nacional.

The adjacent islands are Saona (105.03 km<sup>2</sup>), Beata (42.10 km<sup>2</sup>), Catherine (9.18 km<sup>2</sup>), Key Seven Brothers (0.40 km<sup>2</sup>), Islet Alto Velo (0.93 km<sup>2</sup>), Catalina (1.0 km<sup>2</sup>) and Cayo Levantado. Internal Islands (located inside the Lago Enriquillo) are: Kids, Barbarita and Islita.

The country is divided into 10 administrative regions, 31 provinces and the National District; 154 municipalities and 231 municipal districts; 1,178 sections, 9,937 places and 2,631 neighborhoods (National Bureau of Statistics, 2012).

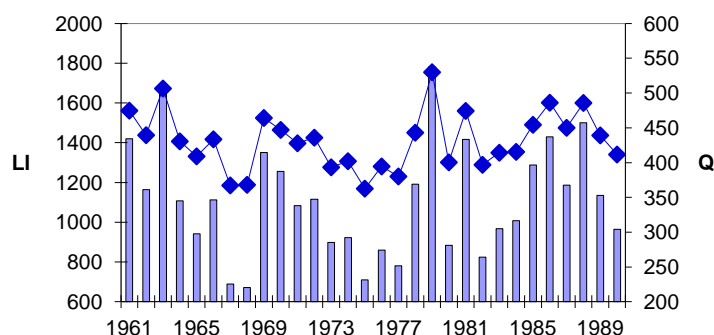
## 1.2 Climate

The varied terrain that characterizes brand differentiation regional climates. For its latitudinal position has a tropical climate, modified by various geographical factors such as the influence of trade winds from the Northeast, the temperature of the surrounding seas, large contrasts in landforms and migratory phenomena that affect it through year.

The average annual rainfall for the whole country is about 1,500 mm, with variations ranging from 350 in the Hoya de Enriquillo to 2,743 mm per year in the Eastern Cordillera. Overall, more than half the country enjoys over 100 days of annual rainfall (days when rainfall 0.5 mm or more), with variations ranging from 31 days to 265 days in Pedernales and San Cristobal. In the country there are five causes or determinants of precipitation: landforms, polar fronts, convection, hurricanes; and the waves of the East.

In Dominican Republic there are three seasons of rainfall, Convective Season (May-July) and hurricane season (August-October) Frontal Season (November April).

Figure 3 Annual March from rain and runoff in Dominican Republic. Series 1961-1990



Fuente: SEMARENA/UNFCCC/GEF/PNUD (2004) Primera Comunicación Nacional. Santo Domingo, República Dominicana.

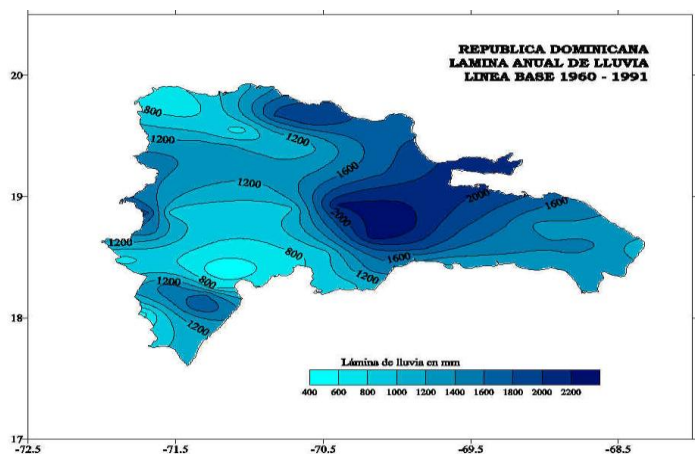


Figure 4 Spatial distribution of rain in line blade base or baseline climate.

Source: Report of the first national communication to the CNUCC<sup>3</sup>

In addition to periods of rain, occur in dry periods, abnormal or accidental droughts that significantly alter established weather patterns, which are related to abnormalities in the general circulation of the atmosphere and the "El Niño" phenomenon, still not well-studied (Agricultural Statistics Yearbook, 1998).

The seasonal average temperatures in the coldest months of December to February range from 20 to 25 ° C. In the warmer season from June to November, temperatures fluctuate between 25 and 27 ° C (C. McSweeney, new M., and G. Lizcano, 2009). There are two low temperature zones coincide with the upper part of the Central Mountain range and a third Center of low temperature moving from the northern mountains to the Atlantic coast in the Yasica River basin.

The annual variability in climate is strongly influenced by El Niño Southern Oscillation (ENSO). ENSO years bring warmer and drier conditions than average conditions between June and August, while a year La Niña brings cooler and wetter than average conditions<sup>4</sup>.

<sup>3</sup> SEMARENA/UNFCCC/GEF/PNUD (2004) Primera Comunicación Nacional. Santo Domingo, República Dominicana.

<sup>4</sup> AusAID/ DFID (2012) CARIBSAVE Climate Change Risk Atlas, Climate Change Risk Profile for The Dominican Republic Department for International Development (DFID) and the Australian Agency for International Development (AusAID)

### 1.3 Morphology

The land relief of the Dominican Republic is abundant in landforms, featuring Plains, valleys, depressions, ridges, mountains, plateaus, promontories, precurrences and mogotes.

The morphology of Dominican territory presents depressions and elevations, whose ranks are from less than 40 meters below the level of the Sea (mbsl), in the Hoya de Enriquillo, to 3,187 metres above the level of the Sea (m), in the Central Mountain range. The topography of the country is characterized by ridges and mountain ranges, arranged in the direction West - East, large valleys of lacustrine and alluvial origin, coastal plains and karstic regions. (MARENA, 2012)

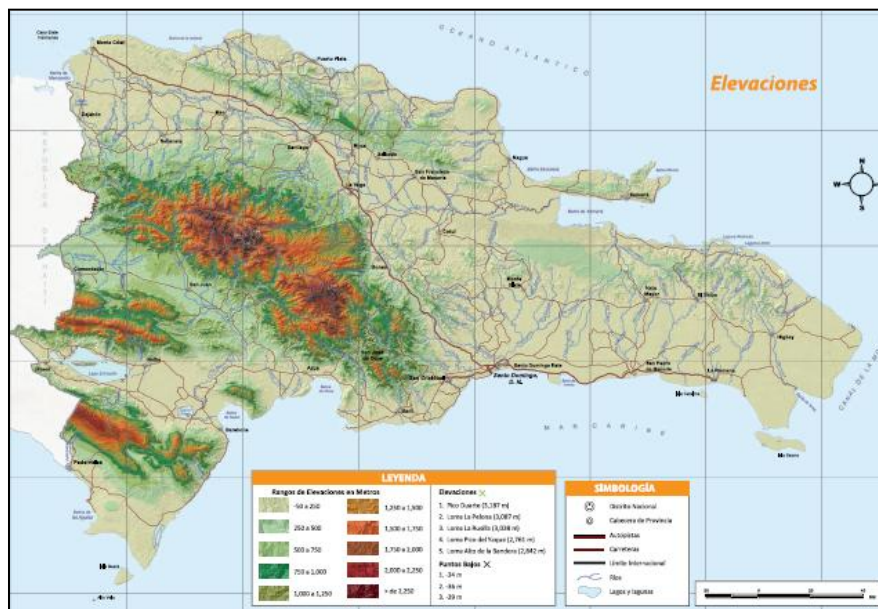
The most important mountains of the country is the Central Mountain range, which extends from Haiti and reaches the higher elevations of the West Indies: Pico Duarte (3,187 m), La Pelona (3,087 m), the Rusilla (3,038 meters above sea level, high flag (2,842 m) and the peak of the Yaque.)

### 1.4 Geology

The geology of the island of Spanish is the result of a process of oblique convergence between the North American Plate and the Caribbean Cretaceous island-arc, ending in collision. The Spanish, located in the northern part of the Caribbean Plate includes several slip faults separated domains, consisting of igneous, metamorphic and sedimentary rocks of Jurassic and Cretaceous, formed in intraoceanic context and island-arc . These rocks are covered by other dominantly sedimentary ecocena to today, which postdate the island-arc activity recorded age and collisional period dominantly transpressional deformation regime (See Map 2 and Figure 5).

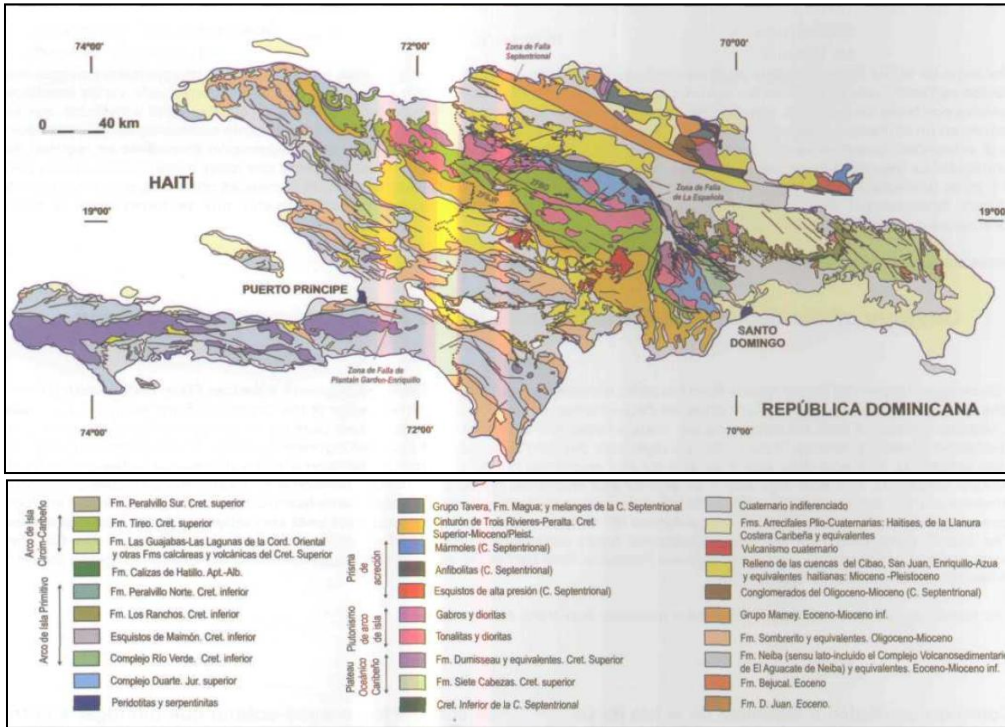
The Dominican Republic has been divided into several tectonoestratigráficos land based on their different geological history, tectonically juxtaposed areas desgarre by WNW-ESE that started its activity in the Eocene: the Fault Zone of Rio Grande (ZFRG) Zone Septentrional fault (ZFS) of the Spanish (ZFLE) Bonao-La Guácara (ZFBG) Restoration of San Juan (ZFSJR) and Enriquillo-Plantain Garden (ZFEPG) (See Figure 6).

**Map 1 Schematic geological map of the island Hispaniola (Pérez-Estaún, a. et to the., 2007)**

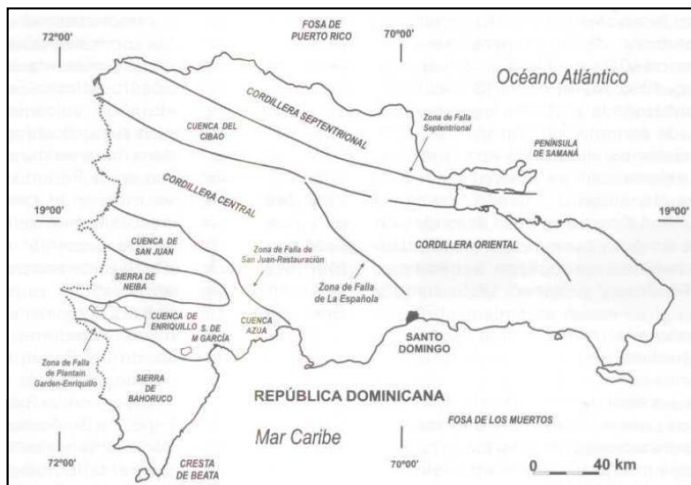


Fuente: MARENA, 2012.

## Map 2. Geological Map of the La Española island

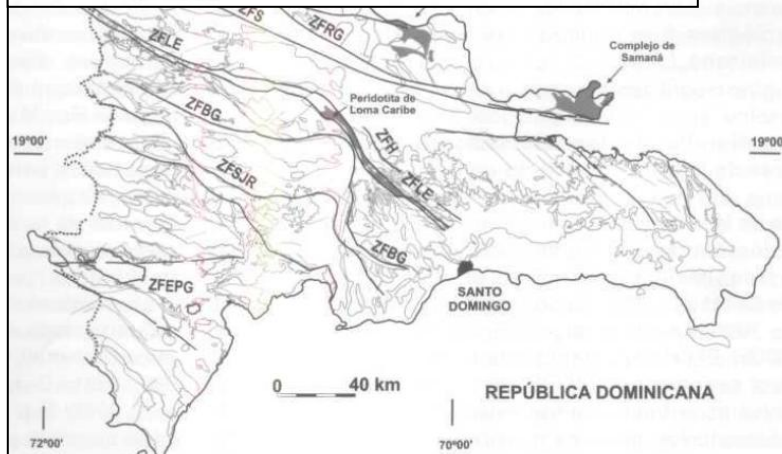


Source: Pérez-Estaún, A. *et al.*, 2007.



**Figure 5 Physiographic domains of the Dominican Republic, with the location of their major basins (Pérez-Estaún, a. et to the. 2007).**

Source: Pérez-Estaún, A. *et al.*, 2007.



**Figure 6. Location of the main areas of faults in the Dominican Republic. Fault zone of Rio**

Grande (ZFRG), area of Northern failure (ZFS), the Spanish (ZFLE), from Bonao - the Guacara (ZFBG) of San Juan-Restauración (ZFSJR) and de Enriquillo-Plantain Garden (ZFEPG).

Source: Pérez-Estaún, A. *et al.*, 2007.

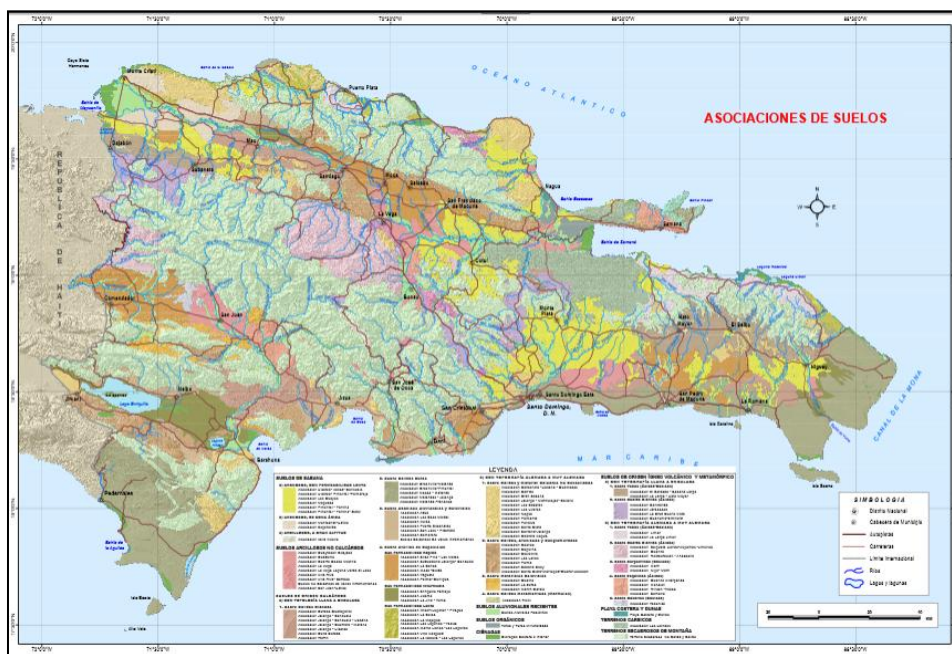
## 1.5 Soil

Physiographically the Dominican Republic consists of four nearly parallel mountain chains with east southeast to west northwest and are related to the eastern and central part of Cuba and the mountains of Puerto Rico. Five basins of deposition and plains interspersed also the most fertile soils comprising the Dominican Republic.

In Dominican Republic the soil survey was conducted in 1967 under the "Recognition and Evaluation of Natural Resources of the Dominican Republic" project, sponsored by the Organization of American States (OAS). With the rise of information in the field and analysis of aerial photographs at 1: 60,000, corresponding to geomorphological soil associations and in some cases were delineated Series. Representative profiles established soil units were determined, with their respective samples for physical and chemical analysis.

The study established over a hundred soil associations were grouped according to the main characteristics of the dominant soils, resulting in ten major groups: Flooring Sheets; Not Limestone Clay Soils; Limestone flooring origin; Igneous origin flooring, Volcanic and metamorphic; Recent alluvial soils; Marshes; Coastal Dunes and Beach; Organic Soils; Karst terrains; Mountain Land and rugged.

Map 3 Soil associations.



Source: Ministry of environment and natural resources.N.d.  
<http://ambiente.gob.do/IA/Suelos/Documents/Asociaciones%20de%20Suelos.pdf>

## 1.6 Hidrology

In the Dominican Republic, it was determined that there are about 17 Producing Areas Water, located in the main mountain systems. Being the *Cordillera Central* which has the largest number of them and where born around 709 channels of rivers and streams. Other producing areas include the Sierra waters Neyba and Bahoruco. The country has some 118 river basins, where rivers longest and mightiest of the Antillean area include Rio Yaque del Norte with 7,050 km<sup>2</sup>, Rio Yaque del Sur with 5,340 km<sup>2</sup>, with 5,070 km<sup>2</sup> Rio Yuna rivers etc. relevance as Camu, Artibonite and Nizao. Its waters are used both for farmland irrigation, power generation and drinking water for use of Dominican población.<sup>5</sup>

In the Antilles, the Dominican Republic, is the one with the highest number of lakes and lagoons such as Lake Enriquillo with an area of 265 km<sup>2</sup>, the largest body of lentic waters of the Caribbean and Central located about 40 feet below the sea level.

## 1.7 Biological Diversity

The Caribbean island has been considered as one of the five most important for global biodiversity areas (Myers et al., 2000), and the Spanish, along with Cuba, are the two islands that most contribute to this diversity. The high degree of biodiversity and endemism reporting Dominican Republic is due to geological complexity and geomorphological phenomena modeled surfaces valleys, hills and mountain ranges of the island.

<sup>5</sup> MARENA/GEF/PNUD (2010) Cuarto Informe Nacional de Biodiversidad: República Dominicana.

These characteristics influenced the conditions for the evolution of a complex mosaic of vegetation, to a greater or lesser extent, influences the distribution of the fauna, which is correlated with the distribution of forests, as well as various types of climates, with the topographical conditions, ecological factors are decisive for different lifestyles (MARENA, 2012)<sup>6</sup>

According to the Fifth Report of Biodiversity, the country has a forest cover of 18923.46 km<sup>2</sup>, equivalent to 39.2% of the country. This percentage has increased by 29% from 2003 to 2012 (Ministry Of Environment And Natural Resources, 2014).

Overall the country has 7 large ecosystems, which in turn drives for various associations or similar vegetative composition according to predominancias species and soil conditions are made. According to data presented at the Fourth National Biodiversity Report, the country has a total of 9,177 floral species (vascular and nonvascular), 2,050 endemic species, representing 34.1% recorded for the country. In the same report, the diversity of wildlife has reported a total of 9,682 animal species (vertebrate and invertebrate) representation with both terrestrial and marine, 2,830 of these being endemic (29.3% of all species reported for Dominican Republic).

El The National System of Protected Areas (SINAPs) of the Dominican Republic, was created by the Sectoral Law of Protected Areas (Law 202-04). One consists of a total of 119 protected areas, grouped into 6 categories of management, covering a total area of 25472.04 Km<sup>2</sup> territory. Currently, the territorial waters of the country, has an area of 13225.96 km<sup>2</sup> under protection and terrestrial protected area coverage to 12246.08 Km<sup>2</sup>.<sup>7</sup>

The main causes of threats to biodiversity are associated with: Change, fragmentation and loss of natural habitats; introduction of invasive alien species; overexploitation of species; climate change; and agrochemical pollution.<sup>8</sup>

## **1.8 Socio-economic aspects relevant to National Level**

The Dominican Republic has a population of 10.4 million people, where almost half the population is under 25 years old and about a third between 25 and 49 years, which defines the country as a nation of fairly young population (ONE, 2014).

It has a per capita income of about US \$ 5.800 per annum (CBDR, 2014), classified as upper-middle income country (World Bank, 2014), with critical levels of inequality<sup>9</sup> and monetary poverty levels remain high. It is estimated that 36% of the population live below the general poverty; that is, with a monthly income of less than RD \$ 4.440 person; and 10.3% in extreme poverty, whose income per person is less than RD \$ 2.050 (MEPyD, 2014).

In the last two decades the average growth rate of Gross Domestic Product (GDP) is higher than 5%. Since some four decades ago, the production structure has been largely transformed primary exporting economy, such as sugar cane, coffee, cocoa and snuff, supplemented by exports of

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<sup>6</sup> MARENA, 2012. Atlas de Biodiversidad y Recursos Naturales de la República Dominicana. Amigo del Hogar, Segunda Edición.

<sup>7</sup> Op. Cit. MARENA/ GEF/ PNUD. 2010.

<sup>8</sup> Ministerio de Medio Ambiente y Recursos Naturales. (2014). Quinto Informe Nacional de Biodiversidad de la República Dominicana. Santo Domingo, República Dominicana.

<sup>9</sup> Índice de Gini estimado en alrededor de 0,50 (MEPyD, 2014).

bauxite and ferronickel, a service economy agricultural goods. Today, nearly two-third of GDP is generated by services, which include trade (10%), transportation (9%); Real estate and rental (9%), and hotels, bars and restaurants (7%). Industry contributes 25% of GDP, mostly manufacturing activities, while the agricultural sector contributes 7.6% (CBDR, 2014).

Population growth in the last 20 years has been 1.79% per year, maintaining a downward trend projecting into the next four decades (ONE 2014).

The population density is increasing at a moderate rate, reaching almost 200 inhabitants per square kilometer, with large differences between regions. Being higher in the Ozama (2,396 inhabitants / km<sup>2</sup>) and North Cibao (278 inhabitants / km<sup>2</sup>) regions, due to rapid urbanization where they currently live three out of four people.

The situation in terms of Quality of Life (MEPYD, 2014) reports that in 2010 the Quality of Life Index (QLI) stood at 73.2 and 40.4% of households is in conditions of widespread poverty and 10.4% in poverty extreme, while poor households Unsatisfied Basic Needs (UBN) stood at 36.9%.

According to the current state of risk management in the Caribbean, natural disasters had a devastating impact on the socio-economic and environmental landscape in the last decade. On average, six natural disasters (between 1970 and 2006) have occurred in the region every year, with higher incidences in Haiti and the Dominican Republic. The active hurricane season in 2004 resulted in damage in the Caribbean reached USD 3.1 billion, with catastrophic impacts on gross domestic product (GDP) of the countries of the region.<sup>10</sup>

### **1.8.1 Education**

One of the structural problems facing the nation has a greater relative investment of the national budget, close to 4% of GDP levels, refers to education. In this sense we have made significant progress in the area of reducing illiteracy by implementing a national program of civic literacy and an intensive plan of construction of school physical infrastructure. It is estimated that a large number of classrooms have been incorporated into the educational system in the last two years this tendency towards eradication of illiteracy in the last forty years recorded a reduction to the case of the population aged 6 years or older from 33% to 13 % now (ONE 2010). However, there are three regions on illiteracy continue to maintain high rates well above the national average: Valley region, where nearly a quarter of the population over age 6 can not read and write, and the Cibao and Northwestern regions Enriquillo with about a fifth of the population is illiterate.

### **1.8.2 Behavior of agricultural GDP**

In the last two decades the agricultural GDP has registered an average rate of about 3.5% annually, with a lower relative participation rate of growth exhibited by the Gross Domestic Product of the country which has grown at a rate of 5% .

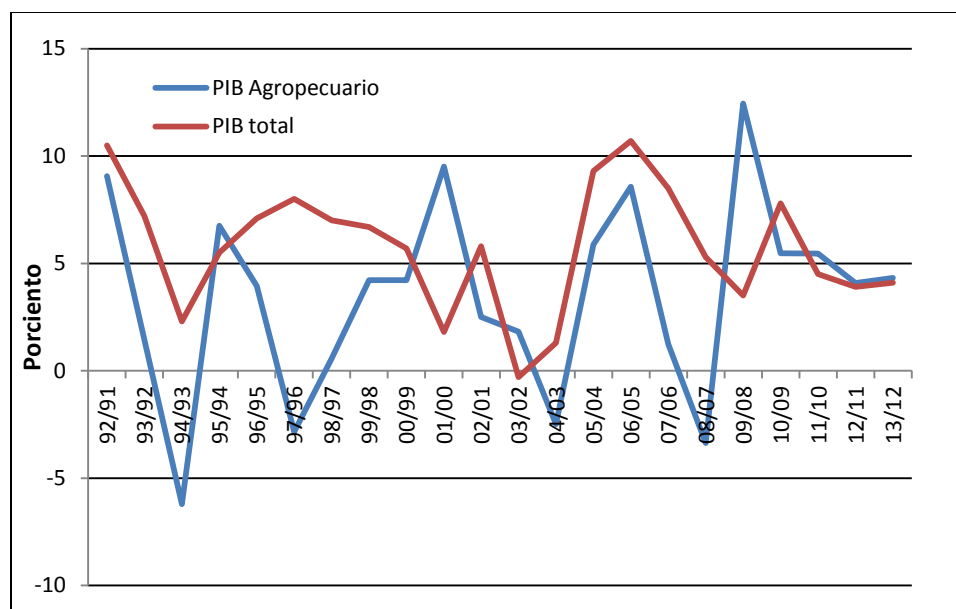
The behavior of agricultural activity has been significantly influenced, unlike other dynamic sectors of the economy, increased exposure to climate variations, existence of public policy incentives and price changes in international markets in the last decade. This has led to vulnerabilities in terms of

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<sup>10</sup> FAO (2013) Status of disaster risk management. Plans for floods, hurricanes and drought in the agriculture sector a Caribbean Perspective. *February 2013. Barbados Subregional Office*

income changes and instability for farmers, while for the same consumer population has meant reductions in purchasing power and food skills.

**Figure 7 Dominican Republic. Rate of annual growth of agricultural GDP and total GDP. 1992-2013.**

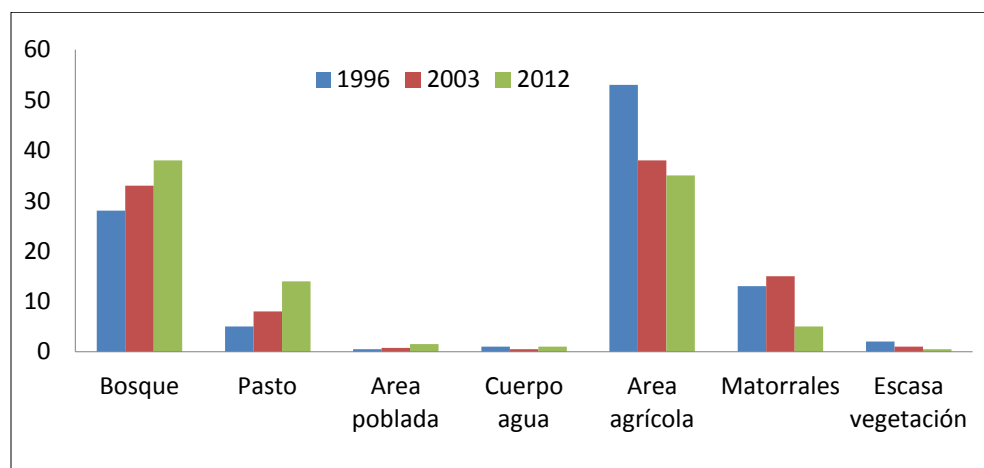


Source: Elaborated with data of the Central Bank DR, BCRD (2014).

### 1.8.3 Use of territory and irrigation infrastructure.

The behavior shows significant land use changes related to increased resilience to the effects of climate change in terms of temperature modulation, absorbing runoff, capture greenhouse gas emissions and natural barriers to expansion wind. As shown in Figure 8, in the period 1996 to 2012 has significantly reduced both the area devoted to agriculture and scrub area. However, grazing areas and populated areas have increased..

**Figure 8 Dominican Republic. Use of soil 1996-2012 (%).**



Source: Ministry of Environment and Natural Resources (2014) Study of Use and Land Cover 2012. Methodological report and results.

## 2 CONCEPTUAL FRAMEWORK OF THE VCA IN THE AGRICULTURAL SECTOR

The conceptual framework for the assessment of vulnerability and capacity in climate change is based, builds on key concepts according to the Intergovernmental Panel on Climate Change (IPCC) in its Fourth (AR4) and Fifth Report (AR5 ) and the Framework Convention of the United Nations Climate Change (UNFCCC). The methodological approach was performed according to the Vulnerability and Capacity Manual, A Methodological Guide to Conducting and integrating vulnerability assessment and capacity in the Caribbean Region (Vulnerability and Capacity Assessment Methodology. A Guidance Manual for the conduct and mainstreaming of climate change vulnerability and capacity assessments in the Caribbean Region)<sup>11</sup>.

The UNFCCC, in its Article 1, defines climate change as "change of climate attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" . The UNFCCC thus makes a distinction between climate change attributable to human activities altering the atmospheric composition, and climate variability attributable to natural causes. the IPCC<sup>12</sup>, defines climate change as the change in status of identifiable climate (eg using statistical tests) by changes in the mean and / or variability of its properties, which persists for long periods of time, typically decades or longer periods long. Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or land use.

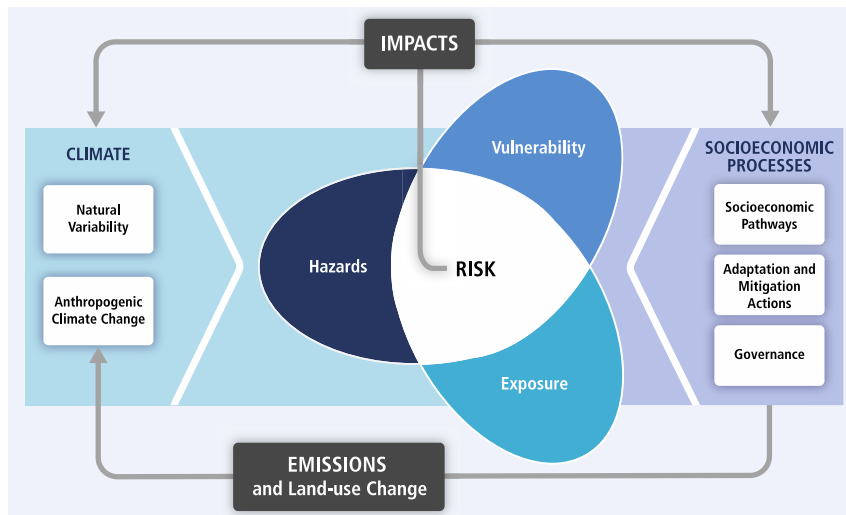


Figure 9 Illustration of the central concepts of the Working Group II of the fifth report of the IPCC, GTII AR5 (WGII AR5)<sup>13</sup>.

The risk of weather-related impacts resulting from the interaction of hazards related to climate (including hazardous events and trends) with

<sup>11</sup> Pulwarty, Roger S. and Natalie Hutchinson (Digital edition, 2010) **Vulnerability and Capacity Assessment Methodology**. A Guidance Manual for the conduct and mainstreaming of climate change vulnerability and capacity assessments in the Caribbean Region. Caribbean Community Climate Change Centre, Belmopan, Belize.

<sup>12</sup> **IPCC, 2014: Summary for policymakers**. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1-32.

<sup>13</sup> Op.Cit. IPCC, 2014: Summary for policymakers

the vulnerability and exposure of human and natural systems. Changes in both the (left) and the socioeconomic climate system processes, including adaptation and mitigation (right) are the drivers of the hazards, exposure and vulnerability.

The **impacts** of climate change are the effects on natural and human systems. The impacts generally refer to effects on the lives, livelihoods, health, ecosystems, economies, societies, cultures, services and infrastructure due to the interaction of climate change and weather events hazardous that occur within a specific time period and vulnerability of a society or exposed system. The impacts are also known as the consequences and results. The impacts of climate change in geophysical systems, such as floods, droughts and rising sea levels are a subset of the known impact physical shock.

The **disclosure** relates to what is at risk from climate change and the changes that the system will encounter. The exhibition, according to the Fifth Report of the IPCC, is defined as the presence of people, livelihoods, species or ecosystems, environmental services and resources, infrastructure, and economic, social, and cultural assets in areas likely to be affected adversely. The disclosure relates to a wide range of climate-related stimuli (sea level rise, changes in temperature, changes in precipitation, storms, drought, floods, etc.).

The **sensitivity** is regarded as the biophysical impacts of climate change, taking into account the socio-economic context. The IPCC defined as the degree to which a system is affected, either adversely or beneficially, by climate-related stimuli.

**Adaptive capacity** is the ability of a system to adjust to climate change, climate variability and extreme events. It is considered as the initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects. There are different types of adaptation; eg anticipatory and reactive, private and public, and autonomous and planned. Examples of adaptation are the construction of river or sea walls, replacing thermal shock sensitive plants with more resistant, etc.

**Resilience** is the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, and its self-organization, and its ability to adapt to stress and change.

The **vulnerability** is considered as the degree of susceptibility or inability of a system to cope with the adverse effects of climate change, particularly climate variability and extreme events. Vulnerability is a function of the character, magnitude and rate of climate change to which a system is exposed, and its sensitivity and adaptability.

The vulnerability is calculated according to the formula, which includes:

$$\text{Vulnerability} = \text{Exposure} \times \text{Sensitivity} / \text{Adaptive Capacity}$$

Differences in vulnerability and exposure are due to non-climatic stress factors and multidimensional inequalities, forming the difference of the risks of climate change. The vulnerability and exposure vary over time and in different geographical contexts. Changes in poverty or socioeconomic status, ethnic composition, age structure, and the government has had a significant influence on the outcome of past crises associated with climate-related hazards.<sup>14</sup> For

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<sup>14</sup> IPCC WGII AR5 (final draft march 2013) Chapter 27. Central and South America

the assessment of vulnerability and capacity we consider the interrelations between biophysical systems with socioeconomic therefore incorporated under capital community taking into consideration the natural, human, social, cultural, physical capital and financial capital built . See Section 3.4 (Assessment of Vulnerability and Capacity).

### 3 METHODOLOGY

Assessment of vulnerability and capacity in the Province of San Juan and Subarea of Hondo Valle Elías Piña province, was performed following the recommended Methodological Manual for the implementation of VCA methodology<sup>15</sup>, with the support of the Caribbean Community Climate Change Centre (CCCCC) under a cooperative agreement with the National Oceanographic and Atmospheric Agency (NOAA). That document, rather than a "recipe" of the steps, provided the input and guidance of work for the implementation of the process to be performed; ie, the type of information that should be collected, how to manage stakeholders and provide some of the tools that could be used to analyze the data, develop products and process decisions.

More detailed methodological steps and the Indicators and Assessment of Vulnerability and Capacity (VAC) in the provinces of San Juan and Elías Piña, Hondo Valley Subzone in the Dominican Republic, is in detail Chapter 6 (Integrated Vulnerability Indicators).

Assessment of Vulnerability and Capacity VCA was conducted jointly with the National Strategy for Adaptation to Climate Change in the Agricultural Sector, so many of the methodological steps and the strategy of stakeholder involvement and the document review and as the creation of the database of georeferenced information systems (GIS), took place at the beginning of the evaluation.

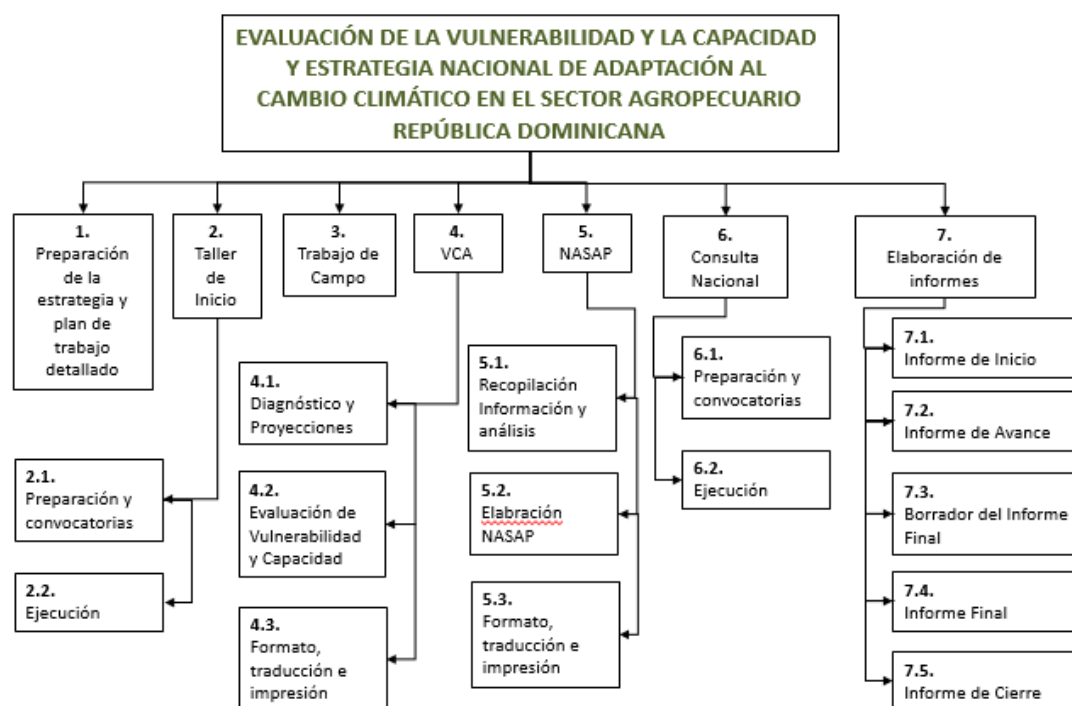
Seven main steps were performed:

- 1- Preparation phase,
- 2- Workshop start,
- 3- Fieldwork,
- 4- Development of vulnerability assessment and capacity,
- 5- Strategy development phase (not included in this report as it is in a separate report),
- 6- Reporting,

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<sup>15</sup> Op. Cit. Pulwarty, Roger S. and Natalie Hutchinson (Digital edition, 2010) Vulnerability and Capacity Assessment Methodology.

Figure 10 Breakdown Structure Task Methodological Work Plan.



### 3.1 Phase 1. Strategy preparation and detailed work plan

After signing the contract, the team at PLENITUD prepared **Detailed Work Plan**, schedule of activities, strategies for each of the planned activities and methodological tools to be used.

The project began with an **Internal Inception Meeting** where all the technical equipment involved subsequently executed activities. At this meeting the scope, schedule and methodological approaches were discussed. Made this March began the collection of information available on each topic to be discussed at government agencies, NGOs, as well as the documentation center of fullness itself. Simultaneously the key project stakeholders (institutions, relevant and names of the actors) to begin the work of preparing the workshop agreed to launch this project were identified.

This phase included Data Collection and Preliminary Analysis of the same ; studies, reports and documents that focus on the country's ability to respond to the impacts of climate change were collected maps, weather data, official reports of topics related to the study objectives, including relevant background. Relevant data were also collected in relation to the institutional and legal framework related to climate change and risk management as well as the agricultural sector. Based on the information collected during previous studies (international and national agencies and consultants) for the study area, an initial list of topics and critical issues that should be considered in the analysis.

The database (documentary and maps) the Ministry of Agriculture, Ministry of Environment and the Fullness database (GIS and maps) that were relevant to the assessment were consulted.

**Defining the scope of Vulnerability Analysis and the capacity to climate change (VCA).** The specific scope of the VCA was defined on the basis of the information available and the objectives

to be achieved. During this activity, the specific methodological issues were identified: socio-economic and biophysical indicators relevant climatic parameters required of hydrometeorological stations available, among others.

Map of key players and decision-making processes: cross-cutting issues and responsibilities. This step is focused on defining the decision making processes for adaptation to climate change and in terms of climate variability: mitigation, preparedness, response and recovery. Key stakeholders to be consulted and strategy involvement thereof in order to obtain their cooperation in achieving the objectives, including promoting greater knowledge, information and feedback on project activities to achieve are identified a complete and consensus document. (See Annex 1).

The map key actors identified themes and cross-cutting responsibilities, identification of critical actors at each jurisdictional level; assumptions of each actor with respect to the risks; different types of information that each could provide and subsequently require as a result of this study for policy decisions (see Annex 2. Matrix of Institutional Actors ties and links with the theme of climate change, risk management and Agriculture DR including local actors and Hondo Valle San Juan).

Also at this stage the legal and institutional framework that currently governs agricultural activities, current relationships and dependencies among others defined.

### **3.2 Phase 2. Workshop Start**

This workshop was designed to introduce these stakeholders the rationale, objectives and scope of the project and encourage the support and commitment required from them for the achievement of objectives.

In this workshop, the team presented PLENITUD stakeholders given its detailed work plan and strategies to address each of the planned activities and inputs required. Fullness, CNCCMDL, Ministry of Agriculture, Ministry of Environment and cooperation agencies, civil society, farmers' groups, schools and other key stakeholders: people contact and strategies with the various agencies were identified.

It was held in the hall of the Center for Agricultural and Forestry Development (CEDAF) on Tuesday June 24 in Santo Domingo, Dominican Republic.

Attended by 41 people from public, private and NGO institutions:

Ministry of Agriculture, National Council on Climate Change and Clean Development Mechanism, CONIAF, Ministry of Environment, ONAMET, JAD., FONDOMARENA, AECID, IAD, REDDOM, Oxfam, ADHA, FAO, CEDAF, EU, TNC, ONAMET, and independent consultants.

The proceedings, lists of participants, agenda, invitation and event photos can be found in Annex 3.

### 3.3 Phase 3. Field work (workshops, focus groups and interviews with the interested parties of the community)

The results of the workshops and interviews were processed in the field to present the perception of social vulnerability to climate change and climate variability, its perception by the events of the past and the process of decision making, the strategies used and other perceptions that define the current status and trends. The methodology suggested by the CCCCC proposes that the most important component of the VCA is "the social aspect and how people cope with events today." It provides an assessment of the visibility to the affected population and the institutions included involved as well as the perception of the risks to which they are subjected. consider that if they do not perceive themselves as vulnerable, is unlikely to implement adaptation options.

Where the results are as follows: To achieve these particular objectives surveys, interviews and workshops (background risk profile and adaptive capacity See Section 7) were performed. The data collection instrument used in the workshops are found in Annex 4.

Participated in these workshops a total of 92 people including producers, farmers, public and private institutions and NGOs:

**San Juan:** Ministry of Agriculture, Ministry of Environment and Natural Resources, Rural Women, INDRHI, IAD, IDIAF, Irrigation Board, CODOCAFE.

**Hondo Valley:** Ministry of Agriculture, Ministry of Environment and Natural Resources, Ministry of Education, Fire, and DGDF PROSOL.

#### 3.3.1 Workshops in San Juan de la Maguana

Two workshops were held in San Juan de la Maguana James Carpenter Hall in the University Center West Regional UASD. On July 16, 2014, was held the workshop with technical staff of key institutions in the agricultural sector of the South Zone West (San Juan). In the same place the next day July 17 was held the workshop with farmers and agricultural South Zone West (San Juan) producers.

The objective of these workshops was to encourage, inform, raise awareness of the project Assessment of Vulnerability and Capacity and National Strategy for Adaptation to Climate Change in Agriculture-Dominican Republic, as well as engage and obtain information from institutions and local producers directly involved with the agricultural sector in relation to the relevant project implementation issues.

The specific objectives of the workshop were to apply data collection instruments to the technical staff of the participating institutions related to agriculture in the Province of San Juan to gather relevant information.

The rapporteurs, guest lists, program and photographs of events found in Annex 5.

#### 3.3.2 Workshops in Hondo Valle, Provincia Elías Piña

Institutional consultation Workshop, producers and farmers communities Elías Piña province of the region URPE South West Sub Area Hondo Valle, was held on July 23, 2014, in Hondo Valley Technology Center.

The workshop objectives were the same as those held in San Juan, applied in this the same data collection instruments.

The rapporteurs, guest lists, program and photographs of events found in Annex 5.

### 3.4 Phase 4. Assessing Vulnerability and Capacity

#### 3.4.1 Performance of Static Risk Maps

Units of physical infrastructure and administrative measures to evaluate and organize the physical and organizational risk components in a graphical format, to help identify priorities: static risk maps were mounted. Some indicators and maps used were: infrastructure (irrigation, communication, highways, etc.), hydro-geomorphology, watershed. These maps, together with socio-economic and biophysical data, served for vulnerability assessment.

#### 3.4.2 Evaluation of past, current and projected climate conditions

The analysis of past weather conditions to determine the level of risk in our area of interest. This analysis was based on three climatic variables, collected by stations INDRHI area in the period 1968-1998 (30 years): precipitation, mean temperature and humidity.

The raw data from Station San Juan de la Maguana located in the center of San Juan del Valle were selected and refined to achieve consecutive data sets and statistical processes needed to apply for inferences and comparison. The three variables were standardized and calculated based on various periods of time (monthly, quarterly and annually). Other stations were taken into consideration (Matayaya, Sabana Mula and Vallejuelo) but the series are incomplete and did not allow reliable statistical calculations.

The rainfall pattern in the area was evaluated using the Standardized Precipitation Index (SPI), which allowed us to evaluate the deficit and excess rainfall and compare values from different areas and time scales to each other through a process of standardization. The calculations were made based on studies by McKee (1993) where the base values of monthly precipitation were fitted to a normal distribution with a mean value corresponding to 0. The values of rainfall that differ from the average corresponding to a number standard deviation, which allows to determine various degrees of drought and high rainfall (considered unusual when values exceeded -1 or +1 standard deviation).

Table 1 illustrates the degree of drought and heavy rainfall associated with standard deviation ranges.

**Table 1 Degree of drought and heavy rainfall associated with standard deviation ranges**

Calculated SPI Value	Corresponding grade
Superior to 2.0	Exceptionally humid
From 1.6 to 1.99	Extremely humid
From 1.3 to 1.59	Very humid
From 0.8 to 1.29	Moderately humid
From 0.51 to 0.79	Abnormally humid
From -0.50 to 0.50	Normal
From -0.51 to -0.79	Abnormally dry
From -0.8 to -1.29	Moderately dry

From -1.3 to -1.59	Very dry
From -1.6 to -1.99	Extreamely dry
Inferior to -2.0	Exceptionaly dry

SPI is calculated on the period 1968-1998 from the data station located in San Juan INDRHI for periods of one month, three months and one year respectively.

Temperature variable was tested by calculation of the temperature anomaly Blanquero presented in percentage (2012)<sup>16</sup>. The calculation corresponds to the comparison of the monthly average of a given month with the monthly average for the period 1993-2013; This result is divided by the average monthly period and multiplied by 100. This calculation standardizes temperature anomaly values and generally eliminate the influence of temperature change over a long period of time.

### 3.4.3 Assessment of socio-economic trends and determinants

During this phase the key development trends in the region and expected scenarios, where the most important socio-economic activities are and how they might be affected by climatic events communities were evaluated. This section describes the current and future population described and evaluating statistical data, service availability, connection of the population served by them, the current quality of services available, the current requirements of the agricultural sector, current production of some items and others. (See section 4.8)

Some data analyzed the current situation and major socio-economic trends presented were:

- *Population Demographic Characteristics*
- *Production (food security, demand, consumption)*
- *Quality of life ICV*
  - *Employment*
  - *Income*
  - *Poverty levels*
  - *Health*
  - *Education*
  - *Housing*
  - *Access to water and sanitation*
- *Territory Uses*
- *Infrastructure (irrigation, communication, electricity)*
- *Public and private organizational structure s(formal and informal networks)*
  - *Social protection programs*
  - *Agricultural Insurance*

The ICV has the ability to characterize the households according to their comfort level, why, in the definition and construction, underlying dimensions of education, housing and basic services, from which the level is determined quality of life of households and their categorization. Quality of life is a broad concept that is complexly influenced by access to physical assets, basic services, health,

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<sup>16</sup> Blanquero, R., Carrizosa, E., Pita, M.F., Camarillo, J.M. y Alvarez-Francoso, J.I. (2012): *Modelo estadístico para la predicción del Índice Estandarizado de Sequía Pluviométrica (IESP) en Andalucía*, En "Cambio climático. Extremos e Impactos", Asociación Española de Climatología y Universidad de Salamanca, pp. 261-270.

development of human capacities and sociodemographic characteristics of household members<sup>17</sup>. This index integrates dimensions of built, cultural and financial social, human and physical capital.

### 3.4.4 Community capital framework

According to the framework of community capitals (MCC-Flora et al. 2004)<sup>18</sup>, seven community capitals (human, social, cultural, natural, financial, political and physical) were analyzed, and the interactions between them, to support the process of selecting indicators applying an adaptive and participatory approach. This approach allows a better understanding of the processes of interaction of areas of natural environment with social and economic and is used to make interdisciplinary assessments of the impact of agricultural research on poverty eradication (Flora et al. 2004). This step is detailed in Section 5.

### 3.4.5 Desarrollo de indicadores de vulnerabilidad

To perform the vulnerability assessment was collected and classified the indicators of the three components of vulnerability: exposure, sensitivity and adaptive capacity.

The vulnerability was calculated according to the formula, which includes:

$$\text{Vulnerability} = \text{Exposure} \times \text{Sensitivity} / \text{Adaptive Capacity}.$$

The selection of elements and set priority indicators was conducted with the participation of the main actors (stakeholders) and groups of expert opinion and technical assessments.

The selection of indicators was based on its consistency with the criteria (SMART) specific, measurable, relevant, relevant and time-bound. Also, depending on availability constraints have been taken into account only those indicators that were available at the district level studies and / or surveys available.

### 3.4.6 Vulnerability assessment in the context of integration

Here are the indicators that were considered appropriate for the calculation of vulnerability and for which efforts were made to collect information that would allow their incorporation are presented.

Definition/Vulnerability Component	Indicators	Composed index
<b>Exposure:</b> Refers to what is at risk for climate change and changes that the system would have to confront	Percentage of workers in the agricultural sector (*)	
	Climate class	
	Agricultura drought category (*)	
	Densidad Poblacional	
	Percentage of area covered by exposed crops	

<sup>17</sup> SIUBEN (2012) Quality of Life Household Socioeconomic Study Model Optimized Categorization. System of Beneficiaries-Vice President's Office, UNDP, World Bank, IDB. Dominican Republic.

<sup>18</sup> <http://www.soc.iastate.edu/staff/cflora/ncrcrd/capitals.html>

	Number of disasters linked to floods in the last 20 years (*)	
	Percentage of cultivated areas in flood areas	
<b>Sensitivity:</b> is considered as the biophysical impacts of climate change, taking into account the socio-economic context. The IPCC is defined as the degree to which a system is affected, positively or negatively, by climate-related stimuli.	Porcentaje de áreas agrícolas con pendiente superior al 10%	
	Water demand for agriculture (*)	
	Water supply for agriculture (*)	
	Index of sensitivity to desertification (SSF)	
	Percentage of area covered by intensive farming	
	Percentage of areas affected by erosion	
	Collected by floods or droughts in the last 10 years economic losses (*)	
	Percentage of irrigated areas	
<b>Adaptive Capacity:</b> the ability of a system to adjust to climate change, climate variability and extreme events. Vulnerability indices calculated risk calculated in the past to Dominican Republic is included.	Quality of Life Index	
	Poverty Index	
	Amount of agricultural loans (*)	
	Number of beneficiaries of agricultural loans (*)	
	Percentage protected area in each district	
	Percentage of irrigated areas	
<b>Vulnerability Index</b>	<i>Exposure x Sensitivity / Adaptive Capacity</i>	

(\*) Maps that have not been able to develop because the information in the government agencies that can provide it is not broken Municipal District level which is the unit of analysis of this information.

After collecting and analyzing information on the indicators that could have wide Municipal District (which is the field of spatial analysis thereof) vulnerability indices for scenarios of drought and storms were calculated and floods. The detailed explanation of the methodology is found in Section 4.1.

### 3.5 Phase 5. National Strategy for Adaptation to Climate Change in the Agricultural Sector (NASAP)

This phase resulted in a National Strategy for Adaptation to Climate Change in the Agricultural Sector (NASAP) has been presented as a separate document.

### 3.6 Phase 6. National Consultation Workshop

The National Consultation Workshop was held at the Barceló Hotel Aries Lounge, Maximo Gomez Street in Santo Domingo, on Thursday October 30, 2014, at 9:00 AM to 4:00 PM.

The objective of the national workshop focused on publicizing the results of the Assessment of Vulnerability and Capacity address climate change in the province of San Juan and Subzone Hondo Valle and submit the National Strategy for Adaptation to Change Agriculture-climate in Dominican Republic in order that participants provide additional information and discuss strategic points contained in the above documents.

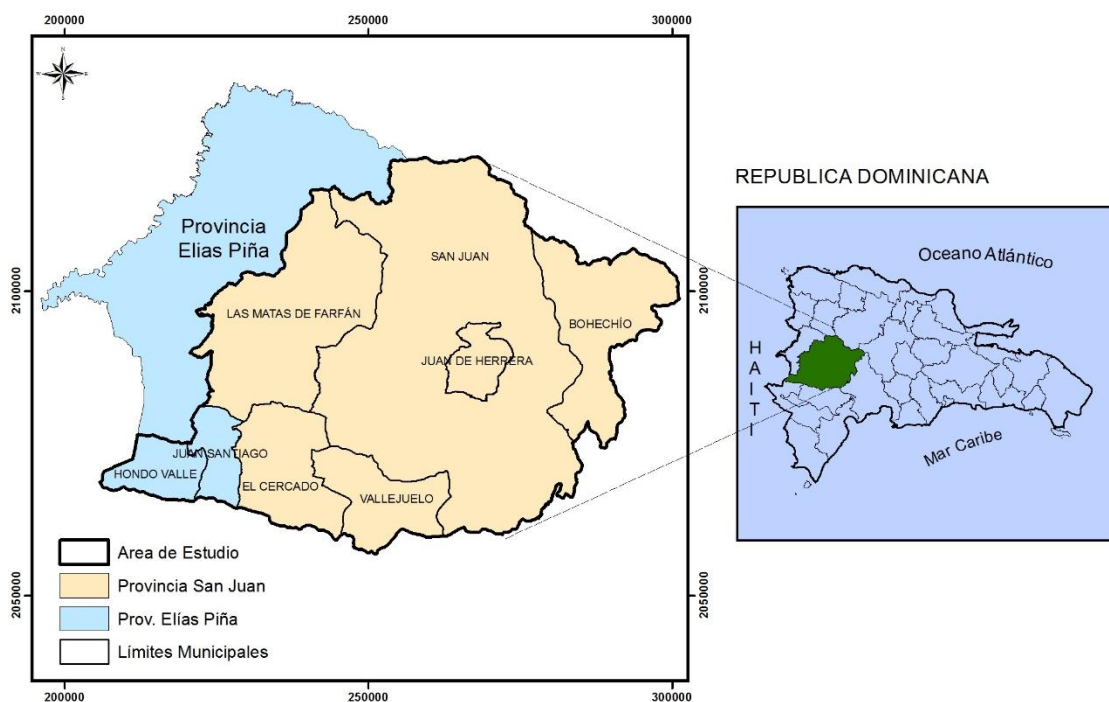
During this workshop, the main actors in the agricultural sector reviewed the document and made recommendations, which are integrated.

30 participants from 15 institutions. The lists of participants, invitation, program and rapporteur found in Annex 6.

## 4 STUDY AREA CHARACTERIZATION

The present study was conducted in the South West Agricultural Zone and the sub-area Hondo Valle, located in the area of geomorphological regions Valley San Juan Mountains and the Cordillera Central Neyba in the southwestern region of the country. Specifically the political division of the study area comprises the province of San Juan with all Municipalities and Municipal District (San Juan area) and the Municipalities of Hondo Valle and Juan Santiago (sub-area of Hondo Valle) Elías Piña province ; however, according to the administrative division of the Ministry of Agriculture, the agricultural area of San Juan include all agricultural sub-framed areas in the province of San Juan (sub-zones Arroyo Loro, Juan de Herrera, Bohechío, Sabana Larga , Vallejuelos, El Cercado, Las Matas de Farfan and Peter Short), while the agricultural area Elías Piña only the territories comprising the agricultural sub-area of Hondo Valle (Valle Hondo Municipal, Township and include Juan Santiago the Borough of Rancho la Guardia).

**Figure 11** Relative location of the study area



### 1. San Juan Area.

The San Juan is located on the west side and southwest of the Yaque del Sur (in the area of influence of the Rio San Juan and its tributaries). This area comprises (at the bottom) a significant swath of the San Juan Valley, part of the southern slope of the Central Cordillera (in the mountainous part of the north side) and part of the Sierra de Neiba in the northern part and Northeast this. The province of San Juan (San Juan area) is bounded on the north by the provinces Santiago Rodriguez and Santiago, to the south by the province of Bahoruco province east and west of Azua, Elías Piña province.

## 2. Sub-Zona Hondo Valle.

The sub-area Hondo Valley is part of the province of Elías Piña province has a land area of 1383.31 km<sup>2</sup>. Of this area, the sub-zone occupies 223.67 km<sup>2</sup> (The City of Hondo Valle 128.53 km<sup>2</sup> and 95.14 km<sup>2</sup> Santiago Juan Municipio) representing 15.07% of the provincial total.

This Sub Area is located within the catchment area of the basin of the river Macasía, Artibonite river basin, with its tributaries the river Vallejuelos Reed and west, from the Dominican side of the river. The sub-area Valle Hondo (Hondo Valley Towns and Juan Santiago) comprises the southern Sierra Norte Neyba partly comprised of strip (Hondo Valle -Vallejuelos) between two parallel mountain ranges that define the unit Sierra Neyba.

The hollow Hondo Valle-Juan Santiago and it's extention Vallejuelos, in the south, comprising the northern slope of the extension of the Montagnes Trou d'Eau in Haiti, which runs up towards the boundary with OE extending to the divisory mountain range of Martin Garcia and the Cordillera Central to the east south east of the province of San Juan. For the Northern part comprises the southern slopes of the extension of the Black Mountains (Montagnes Noires) running in Haiti OE orientation to north-northeast of Vallejuelos, constituting human settlements (Hondo Valle, Juan Santiago and Vallejuelo) which are the most important of the Neiba mountain range.<sup>19</sup>

The sub-area is bounded on the north by the Municipality of Comendador, to the south by the province of Independencia, just east of San Juan province and west to the border with Haiti.

### 4.1 Climate condition and it's projections

The province of San Juan has a climate variability in harmony with its topography. On the territory of weather conditions are tropical, with a predominance of tropical savanna microclimate and dry, even if we can distinguish other microclimates in close relationship with altitude.<sup>20</sup>

In the mountainous area of the central mountain range the climate is moist, has a dry season in the first quarter of the year, ranging from mild to severe depending on the altitude of the area. The annual precipitation ranges from 1000 to 2000mm, the average annual temperature between 20 and 25 ° C in areas below 1200 m and 15-22 ° C in areas above this altitude. In the Sierra de Neiba climate is humid, with a distinct dry during the first quarter of season, with an annual rainfall ranging from 1.000 to 1.700 mm and annual temperature ranges from 20 to 25 ° C.<sup>21</sup>

In the San Juan Valley is semiarid climate with two distinct dry seasons in the first and third quarters. The average annual rainfall is 600-1000 mm and mean annual temperature varies between 22 and 24 ° C. There are some differences within the valley: in the western part of Las Matas de Farfán the climate is humid, with a marked dry season in the first quarter; in this area the annual rainfall varies from 1.200 to 1.700 mm and the mean annual temperature of 25-27 ° C.<sup>22</sup>

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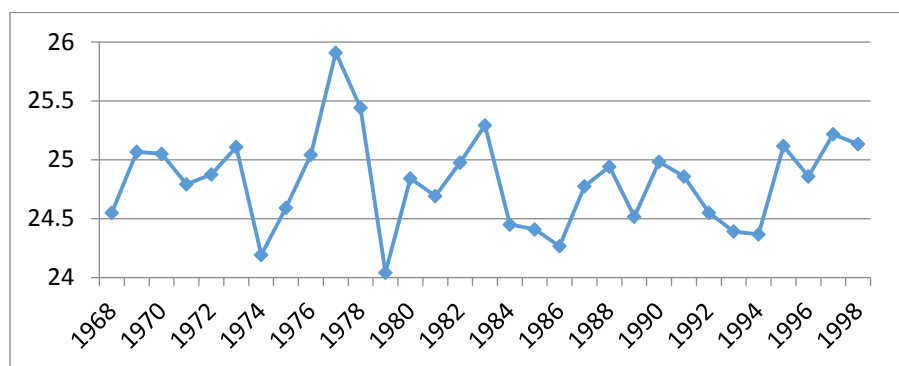
<sup>19</sup> EPTISA. (2004). Estudio Hidrogeológico de la sierra de Neiba.

<sup>20</sup> SEMARENA –ONAMET.2004.

<sup>21</sup> EPTISA. (2004). Estudio Hidrogeológico de la sierra de Neiba.

<sup>22</sup> EPTISA. (2004). Estudio Hidrogeológico de la sierra de Neiba.

**Figure 12** Average annual temperatures in San Juan de la Maguana(1968-1998)



Source: INDRHI.

There is great variability of climate in the area due to local factors such as altitude and exposure to humid winds on the slopes of the mountains: the Foehn effect is particularly present in this area, because it causes a large moisture the slopes directly exposed to the trade winds (windward), such as the southern slopes of the Central Cordillera. In the lowlands and those that are located downwind (as the northeastern slope of the Sierra de Neiba), humidity is lower and higher temperatures, leading to a semi-arid local climate.

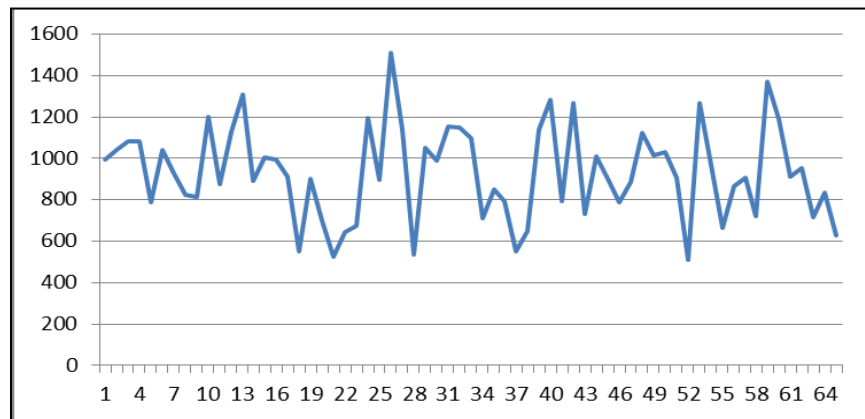
Therefore, the low areas of the San Juan Valley from the east to the edge of the Artibonite River Basin and the northeastern slope of the Sierra de Neiba, are characterized by an index of aridity in arid to semiarid. While other areas, ie the Artibonito and south of the Cordillera Central and Northwest Neyba Sierra slopes, are marked by an aridity index that goes from wet-dry to semi-moist.

The Hondo Valley Sub Area is part of the Elías Piña Province, which in the lowlands the climate is warm with average annual temperatures of 26.7 ° C and 25.4 ° C Commander in Banica. As the altitude increases in the province, both north and south, reaching the temperature drops to 21.2 ° C in the Hondo Valley and an average annual rainfall of 1717 mm per year.<sup>23</sup>

According to the same source cited (REDDOM, 2014), the average annual maximum temperature in the province of San Juan is 31.10 ° C, while the minimum is located at 18.40 ° C. Figure 14 shows the evolution of the minimum and maximum temperatures for this province.

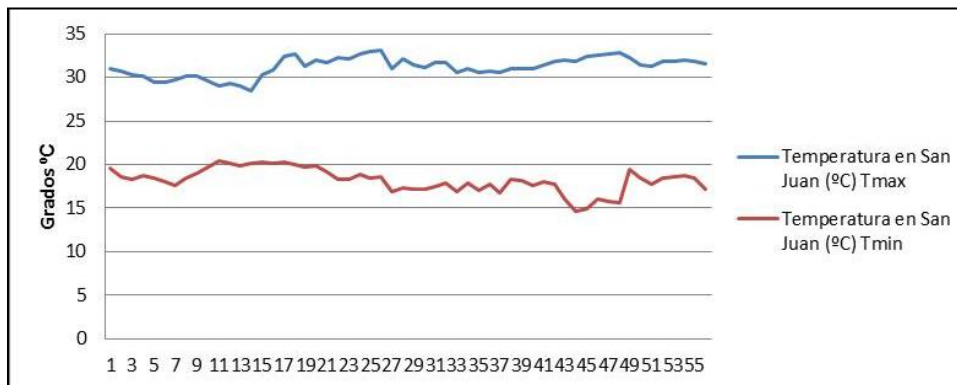
<sup>23</sup> Ministerio de Medioambiente y Recursos Naturales / GIZ. (2011) Caracterización Ambiental de la Provincia de Elías Piña. Programa "Gestión y protección de los recursos naturales en cuencas hidrográficas" PROGEREN III.

**Figure 13** Anual precipitation in San Juan (mm)



Source: Fundación REDDOM (2014). Estudio de viabilidad de seguros agrícolas. Zona de San Juan.

**Figure 14** Anual temperature, San Juan.



Source: Fundación REDDOM (2014).

#### 4.1.1 Rainfall Variability of past events

The following table illustrates the degrees of drought and heavy rainfall associated with standard deviation ranges.

**Table 2** Degrees of droughts and heavy precipitation associated with the ranges of standard deviation of Standard Precipitation Index (SPI).

Calculated Value	SPI	Corresponding grade
Superior to 2.0		Exceptionally humid
From 1.6 to 1.99		Extreamely humid
From 1.3 to 1.59		Very humid
From 0.8 to 1.29		Moderatley humid
From 0.51 to 0.79		Abnormaly humid

Calculated Value	SPI	Corresponding grade
From -0.50 to 0.50		Normal
From -0.51 to -0.79		Abnormaly dry
From -0.8 to -1.29		Moderatley dry
From -1.3 to -1.59		Very dry
From -1.6 to -1.99		Extreamley dy
Inferior to -2.0		Exceptionaly dry

Source: Fundación Plenitud, Compiled from data INDRHI season.

The SPI<sup>24</sup> was calculate over a period from 1968-1998 from the data on the INDRHI located in San Juan for periods of 1 month, 3 months and a year.

- **SPI of San Juan over a period of 1 month:**

In this case, we calculated the Standardized Precipitation Index -SPI-, comparing the values of monthly precipitation over the 30 year period, comparing each month with its equivalent for the entire period 1968-1998.

This analysis provides important information for agriculture, particularly in time of planting and plant growth because it allows us to relate the level of soil moisture and water stress. A particularly dry or rainy month posed no immediate threat but his behavior over time can be a useful guideline for agriculture and for human beings in a specific context.

The following table summarizes the results of the SPI calculated by month:

**Table 3 Amplitudes and return period of abnormal values of drought and high rainfall, by month**

Month	Amplitudes of events (moderate to exceptional)	Return period (years)	Return period of exceptional events (years)
January	4 events moderatley dry in 1976,1978, 1979 and 1991	Dry events: 7.5	Humid events: 30
February	3 events extreamely humid to exceptionaly humid in 1973, 1995 and 1996  4 events from moderatley dry to very dry	Humid events : 10 Dry events: 7.5	Humid events: 30
March	3 events from moderatley humid to exceptionaly humid  4 events from very dry and exceptionaly dry	Humid events: 10 Dry events: 7.5	Humid events: 30
April	4 eventos de moderadamente húmedo a excepcionalmente húmedo 4 eventos de moderadamente seco a excepcionalmente seco	Eventos húmedos: 7.5 Eventos secos: 7.5	Dry events: 30

<sup>24</sup> El Índice Estandarizado de Precipitación (Standarized Precipitation Index, SPI) se utiliza cada vez más debido a su simplicidad y flexibilidad para el estudio de la precipitación en varias escalas temporales

Month	Amplitudes of events (moderate to exceptional)	Return period (years)	Return period of exceptional events (years)
May	4 events moderatley humid 4 events moderatley dry to extreamley	Humid events: 7.5 Dry events: 7.5	-
June	5 events moderatley humid 8 events moderatley dry to exceptionally dry	Humid events: 7.5 Dry events: 3.75	Dry events: 15
July	3 events from very humid to exceptionally humid 4 eventos de moderadamente seco a excepcionalmente seco	Humid events: 10 Dry events: 7.5	Humid events: 30 Dry events: 30
August	3 events from very humid to exceptionally humid 2 very dry events	Humid events: 10 Dry events: 15	Humid events: 30
Septiember	3 events from very humid to exceptionally humid 4 events moderatley dry	Humid events: 10 Dry events: 7.5	Humid events: 30
October	5 events from moderatley humid to very humid 4 events from moderatley dry to exceptionally dry	Humid events: 6 Dry events: 7.5	Dry events: 15
November	4 events from moreatley humid to exceptionally humid 4 very dry events	Humid events: 7.5 Dry events: 7.5	Humid events 30
December	5 events from mormaltey humid to very humid 4 events moderatley dry	Humid events: 6 Dry events: 7.5	-

Source: Fundación Plenitud, elaboración propia a partir de los datos obtenidos de INDRHI.

This table was produced from the amplitudes of the calculated SPI and the return period; is the number of years of the period (30) divided by the number of abnormal events (above 1 or below -1 SD) and exceptional (above 2 or below -2 standard deviations).

As for abnormal events, most of the months are marked by several events of drought and high rainfall, which characterizes climate instability during the years analyzed. Abnormal events have a return period of between 7.5 and 10 years. Exceptional events, ie with a greater than 2 or less than -2 standard deviation have a return period of 15 to 30 years (or more), and are marked by seven months of exceptional rainfall (with a return period 30 years or more), and for 4 months in exceptional drought (April, June, July and October with a return period of 15 to 30 years). Therefore, these exceptional events are less frequent than abnormal events, and concentrated in specific months mentioned above.

- **SPI of San Juan in a 3 month period:**

The SPI for three months enables the analysis of drought and high rainfall at stations or seasons. Due to the climatic conditions of the wet and semi-wet tropics, which is divided between dry and rainy season, is considering the following periods: November to January and from February to April which corresponds to the dry season, while May -July and August to October corresponding to the rainy season.

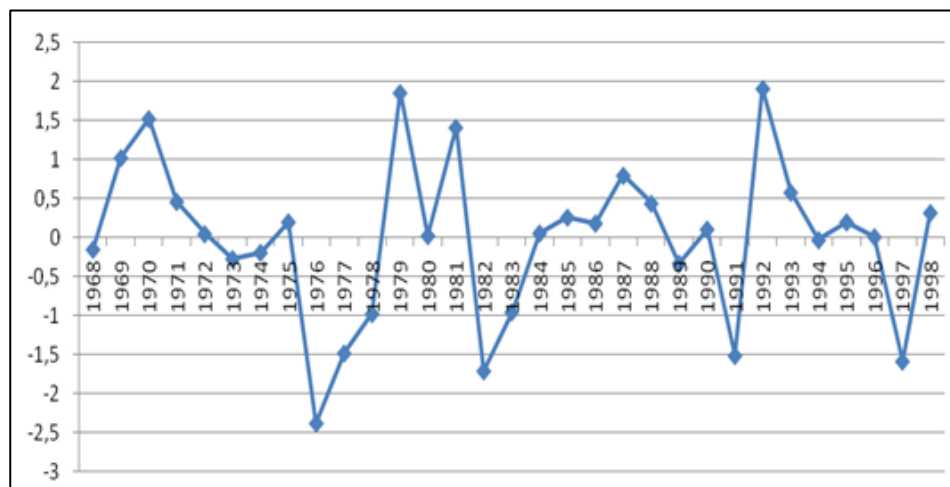
**Table 4**                      **Amplitudes and return period of abnormal values of drought and high rainfall, by quarters.**

Month	Amplitudes of events (moderate to exceptional)	Return period	Return period of exceptional events
Nov-January	5 events from moderate to exceptionally humid in 1969, 1976, 1993, 1995, 1997.  2 events from moderately to extremely dry in 1973 y 1977	Humid events: 6  Dry events: 15	Humid events: 30
Feb-April	3 events from moderate to exceptionally humid in 1972, 1986, 1992.  5 events from moderate to exceptionally dry in 1970, 1976, 1980, 1984 y 1997	Humid events: 10  Dry events: 6	Humid events: 30  Dry events: 30
May-July	4 events from moderately humid to exceptionally humid in 1970, 1979, 1987, y 1993  4 events moderately dry to exceptionally dry in 1976, 1990, 1994, 1996	Humid events: 7.5  Dry events: 7.5	Humid events: 30  Dry events: 30
Agu-October	8 events to moderate to extremely humid in 1970, 1979, 1981, 1990 y 1998  4 events from moderate to extremely dry in 1977, 1982, 1991 y 1997	Humid events: 6  Dry events: 7.5	Humid events: there were no exceptional events in this period Dry events: there were no exceptional events in this period

- **SPI of San Juan over 12 month periods:**

The SPI calculated here reflect changes in long-term rainfall. The following figure illustrates the variations of SPI per year during the study period of 30 years.

Figure 15 SPI of San Juan over a 12 month period



Fuente: Fundación Plenitud, elaboración propia a partir de los datos obtenidos de INDRHI.

There is a period of high drought (exceptionally dry period), which begins in 1976 and ends in 1978. This major event and year 3 will not play in the period considered, so that you can assess the period return of about 30 years or more, with a probability of 95%.

High humidity values do not exceed 2 standard variations, which means that there was unusually high rainfall during the period covered by the study (1969-1998).

In conclusion, the SPI calculated for 1 month and 3 months indicate that there is great variability in rainfall can significantly affect agriculture in the area. There are likely more than 95% have months marked by a severe drought during the growth of major crops in the area (May, June and July) with a return period of 15-30 years.

On the 1st and 2nd quarter of the year, there is also a high probability of having very dry or very wet events with a return period of 30 years or more. In both cases these events greatly affect rainfed agriculture in the area, and farmers who implement it as they are usually the poorest and weakest against economic hardship.

The SPI calculated over one year indicates that major drought events can occur (about 2.5 standard deviation) with a return period of 30 years or more, and may have a duration of three years, which represents a high risk to the population of the area and can thus severely affect agriculture and living conditions of the population that depends on it. There is also a high probability of having high rainfall events (classified as extremely wet) with a return period of 15 years; These events are a good indicator of threats of flooding and landslides.

#### 4.1.2 Projected rainfall levels.

From the available data, one can calculate projected levels of rainfall, which is the main factor of drought and flood and landslide events. However, the erroneous data and information gaps found

in the available series, they provide consistency in analyzes and especially the fact that the available data do not exceed a period of 30 years, prevented the realization of expected projections.

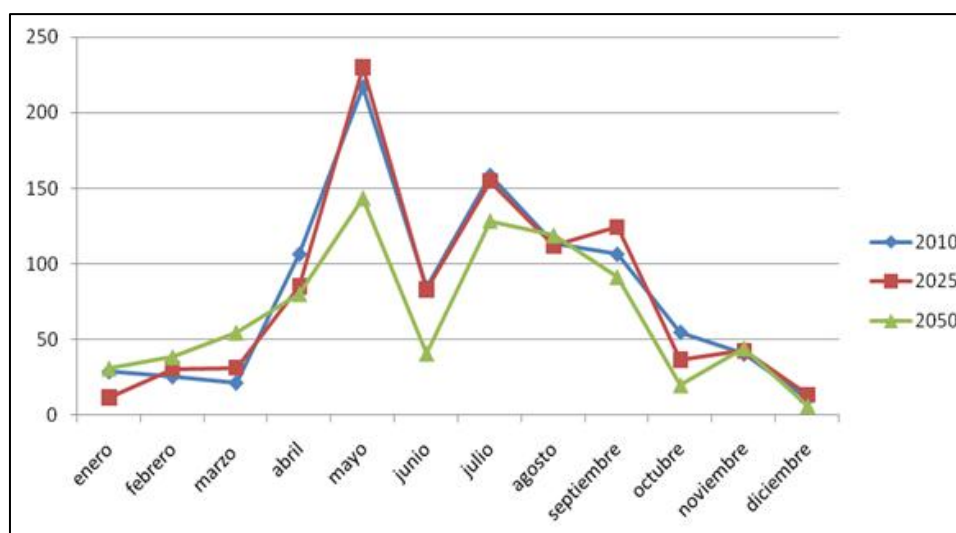
However, analysis of projected rainfall of studies by other authors at smaller scales, ie at regional and national level can confirm some information produced in this study.

The results refer to the projections at the regional level are oriented towards decreasing levels of rainfall and, therefore, increased drought<sup>25</sup>.

Projections at the national level, although they are highly variable, are also oriented towards increasing drought, with rainfall decreasing from 55 to 60% by the end of this century. Some models, however, also provide a slight increase in rainfall<sup>26</sup>.

For the study area, it is estimated that the annual rainfall could decrease by 18% in 2050<sup>27</sup>. However, as expressed by the authors of the above study, this estimate was based on a single climate model and emissions scenario, and should be interpreted with caution.

**Figure 16** Projections of maximum monthly rainfall for San Juan in mm (Meza, 2012)



#### 4.1.3 Temperature Variability

- Temperature variability of past events

**Temperature variability** was tested by calculation of the temperature anomaly presented by Blanquero percentage (2012).<sup>28</sup> The calculation corresponds to the comparison of the monthly

<sup>25</sup> Mimura et al., 2007

<sup>26</sup> McSweeney et al., 2009

<sup>27</sup> *Riesgos Climáticos para el agua y la agricultura en la República Dominicana*, PNUD, 2013

<sup>28</sup> Blanquero, R., Carrizosa, E., Pita, M.F., Camarillo, J.M. y Alvarez-Francoso, J.I. (2012): *Modelo estadístico para la predicción del Índice Estandarizado de Sequía Pluviométrica (IESP) en Andalucía*, En "Cambio

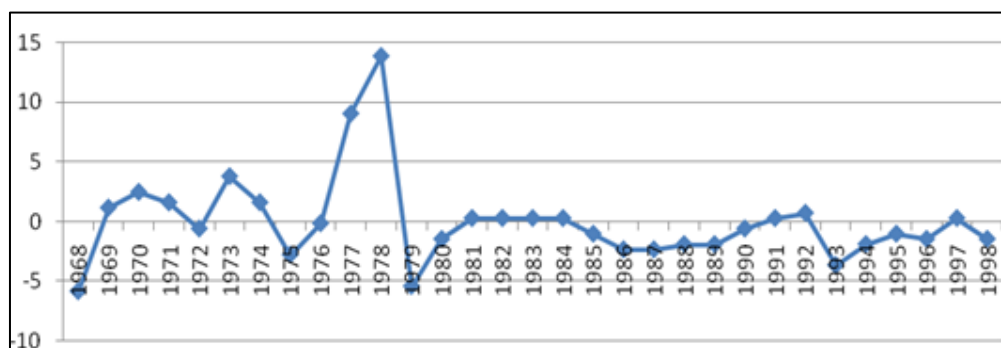
average of a given month with the monthly average for the period 1993-2013; This result is divided by the average monthly period and multiplied by 100. This calculation standardizes temperature anomaly values and generally eliminate the influence of temperature change over a long period of time.

The calculations were based in the data provided by the San Juan station of INDRHI

The results are marked by a high stability in temperature (change of less than 5 points) generally. However, some cases stand strong temperature variability such as:

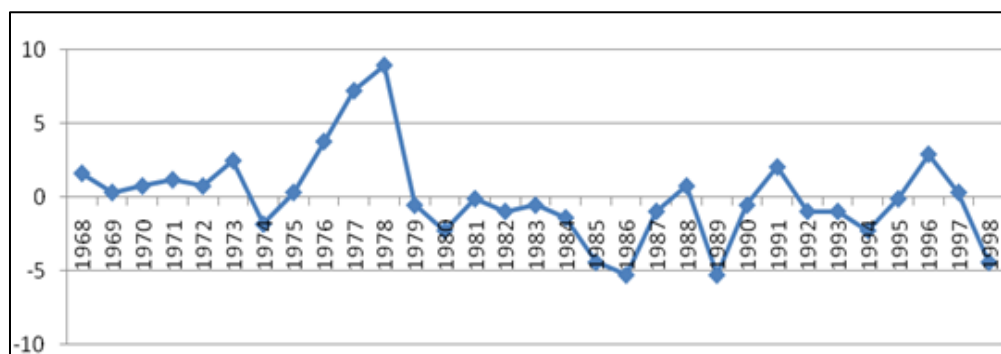
- The month of January 1977 and 1978, characterized by two years of high temperatures, with values of 9-13 points higher than normal (24.9 to 26 ° C, ie 2.1 to 3.2 ° C difference with monthly average) above normal in 1977 and 1978, as illustrated below, expressed in percentages. The return period of this event in January is 30 years or more.

**Figure 17** Temperature index from the San Juan station for the month of January



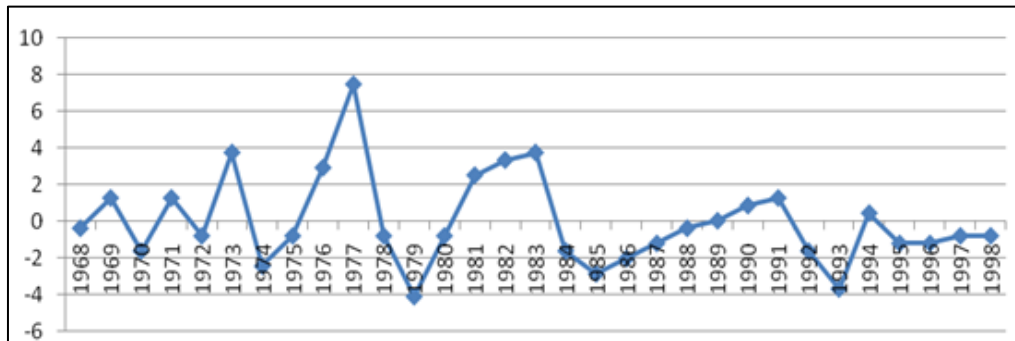
- In February 1977, also marked by high temperatures, 7 points above normal (24.9 ° C, ie 1.7 degrees difference in monthly average), in 1977.

**Figure 18** Temperature index in the San Juan station for the month of February



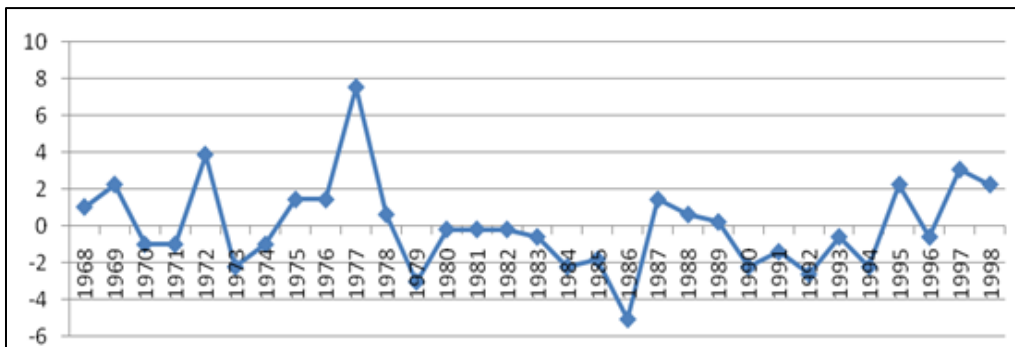
- The month of March also marked by high temperatures, 7 points higher than normal (26 ° C, ie 1.9 degrees above the monthly average), in 1977.

**Figure 19** Temperature index from the San Juan station for the month of March



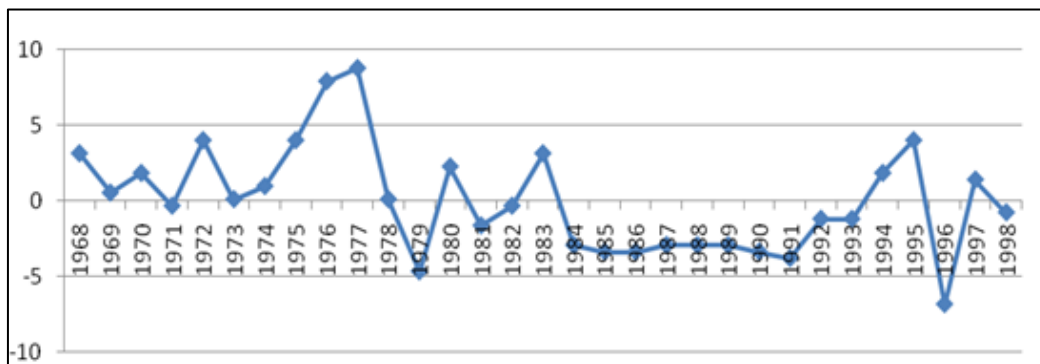
- The month of November marked by high temperatures in 1977:

**Figure 20** Temperature index from the San Juan station for the month of November



- The month of December with high temperatures in 1976 y 1977

**Figure 21** Temperatura index from the San Juan station for the month of December



These data clearly indicate a period of high temperatures above normal (from 7-10 points) in 1976 and 1978 during the dry months, with a return period of 30 years, with negative consequences on

agriculture as favors evapotranspiration of plants in the driest season. This index is particularly high temperature to be related to the very low rainfall recorded in 1976 and 1977 to identify a period of high water stress in the area over the years.

#### 4.1.4 Temperature Projection

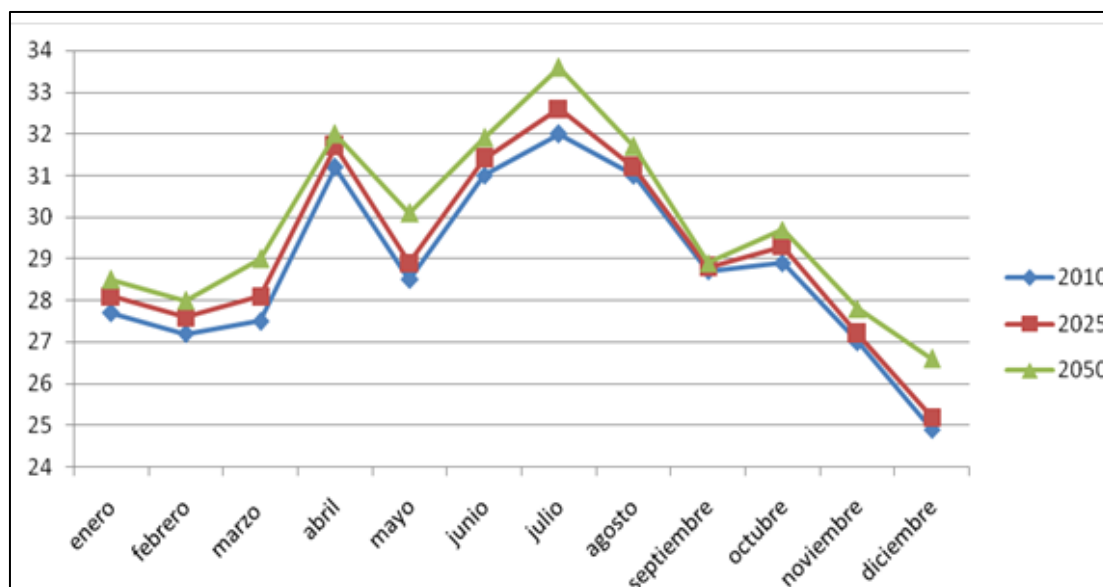
According to projections on a regional, national and local level, the temperatures are on the rise.

The report Climate Risks for water and agriculture in the Dominican Republic, UNDP, summed projections made over the area of interest. At the regional level, an increase in temperature of about 2 ° C by 2100 is projected.

Nationally, with different models used, an increase of about 2 ° C, also some models project an average temperature rise of between 0.7 to 4.2 ° C (Planes, 2001) is projected 1.1 to 3.6 ° C (McSweeney et al., 2009), while others project an increase of more than 2.5 ° C by the end of the century (Brown, Field, 2001).

Locally, the MARKSIM model projections were made from the data station San Juan de la Maguana<sup>29</sup>. The projections predict an increase in temperature of 1 ° C by 2050, reaching 29.8 ° C mean annual temperature, and a particularly high increase for the months of March, July and December (see below).

**Figure 22** Projected increase in maximum monthly temperature (° C) to San Juan (Meza, 2012)



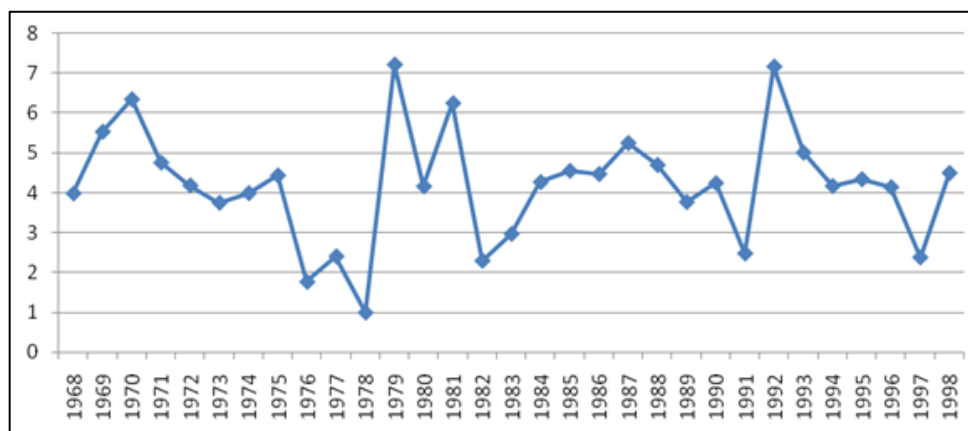
#### 4.1.5 Humidity Variability

As for humidity, rainfall data and temperature INDRHI were used to calculate the index of humidity, to avoid having to use moisture data whose number is not complete for Station San Juan.

<sup>29</sup> González Meza, 2012

The moisture content calculated here corresponds to the ratio between the values of precipitation temperature values, in order to evaluate the evolution of moisture over long periods. The more the index value 1 was the wettest period considered moving away.

**Figure 23** Humidity index from the San Juan station



Identifies the figure above two periods of high humidity (1979 and 1992) in excess of 7 points. These values are conducive to saturate the soil moisture, which can cause flooding by runoff and landslides infiltrations: That's what happened in 1979 in the San Juan after Hurricane David brought high levels of rainfall that caused flooding and landslides killing 1,400 people and estimated at about 150 million dollars damage. These risks have a return period of 15 years.

## 4.2 Geology and Geomorphology

According to the Atlas Geological and Mineralogical the Dominican Republic, prepared by the Directorate General of Mines in 1992, referred by EPTISA 2004 in Hydrogeological studies of the Central Cordillera, San Juan Valley and Sierra Neyba units, different geological materials are located .

In the upper middle part of the southern and southwestern slopes of the Central Cordillera, into the valley of San Juan (North Basin Strip) from structurally dominated volcano sedimentary formations of Cretaceous metamorphic and plutonic ages naming sockets ). They have usually folded and its thickness exceeds 800 m, less permeable hydrogeological.<sup>30</sup>

*"The Central Range has an area of 12,343 km<sup>2</sup> of which 60% (7,180 km<sup>2</sup>) of the total outcrop area consists of plutonic, volcanic and volcano sedimentary rocks of low permeability of scarce hydrogeological value and only 12% (1481 km<sup>2</sup> ) corresponding to different types of permeable formations."*<sup>31</sup>

The lower part (Valle de San Juan) is mainly composed of sandstones, shales and limestones, as well as deposits of low terraces, and alluvial fans.<sup>32</sup> The southern fringe of the study area (east and

<sup>30</sup> Eptisa 2004. Estudio Hidrogeología Cordillera Central pag. 135.

<sup>31</sup> Eptisa 2004. *Hidrogeología Cordillera Central*. pag. 143

<sup>32</sup> SEMARENA-UNESCO-TuDelft y otros 2000. Estudio deslizamiento de la cuenca del rio San Juan.

north slopes of the Sierra de Valle -Hondo Neyba -Vallejuelo) is constituted by a succession of limestones as banks interbedded with submarine volcanic rocks with ages between the Eocene and Miocene that reach more than 500 m thick. From the hydrogeological point of view, it is a permeable set by karstification and the other part of the assembly is formed by a series of marl with calcarenitas interactions ages Miocene Upper medium that can reach greater thicknesses of 500 m and a hydrogeological behavior primarily waterproof.<sup>33</sup>

### 4.3 Tectonics.

Given that the Dominican Republic is located between the edge of interaction of tectonic plates of North America and the Caribbean, and one of the 12 major regional faults is the failure of San Juan located in the study area are indicative a high tectonismo in the same.<sup>34</sup>

According to research by Lamb (2000), in the period since 1562 to 1979 there had been 11 major earthquakes, 6 of which have occurred in the region where the study area is located, so that the susceptibility is evident the occurrence of a seismic event that causes loss of life and property damage, especially below the respective catchment dams located in the study area (Sabaneta on the San Juan river basin, the Mijo river, Palomino and Sabana Yegua).

### 4.4 Biodiversity

#### 4.4.1 *Living areas*

As the available information on hydrology, during the performance of work, it was not possible to obtain a more current data regarding the conditions of life zones in the study area. The information to which we had access are referred to the classification system or Ecological Life Zones Zones L. Holdridge, held in the Dominican Republic (OAS, 1967). See Table 5.

The largest area is occupied Zones life Subtropical Rainforest (29.53%), and Lower Montane Rain Forest (23.90%), which are distributed over large areas of the north and west of the province. Meanwhile, Subtropical Dry Forest (19.69%) is more concentrated towards the center and east of the territory studied. These three life zones occupy almost 75% of the territory, while the remaining are presented rather interleaved or as patches within these broad areas as befits its status as transition zones either dry forest, rain forest or forest very wet.

**Table 5 Living areas in the are in study according to the Holdridge clasifiacton.**

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<sup>33</sup> *Op. Cit.* Eptisa 2004. Estudio Hidrogeológico de la Sierra de Neiba pag.97

<sup>34</sup> ITC-UNESCO-TUDELFT, et. all. 2000. Desarrollo de una metodología para la identificación de amenazas de deslizamientos de **la cuenca del rio San Juan. República DOminicana**

ZONAS DE VIDA	Area (Km2)	%
Bosque húmedo de transición a bosque muy húmedo Montano Bajo	0,98	0,03
Bosque muy húmedo de transición a bosque pluvial Montano Bajo	2,61	0,07
Bosque seco de transición a bosque húmedo Subtropical	5,76	0,16
Bosque húmedo de transición a bosque seco Montano Bajo	9,91	0,28
Bosque pluvial Montano Bajo	11,26	0,31
Bosque muy húmedo Subtropical	12,32	0,34
Bosque húmedo de transición a bosque seco Subtropical	102,96	2,87
Bosque muy húmedo Montano	137,11	3,82
Bosque muy húmedo Montano Bajo	681,67	19,00
Bosque seco Subtropical	706,51	19,69
Bosque húmedo Montano Bajo	857,56	23,90
Bosque húmedo Subtropical	1059,14	29,52
<b>Total</b>	<b>3587,81</b>	<b>100,00</b>

Source: Elaboración propia a partir del mapa de Zonas de Vida o Zonas Ecológicas de L. Holdridge, realizado en la República Dominicana (OEA, 1967).

At the top is basically highlights the lower montane wet forest (bh-MB) and lower montane wet forest (bmh-MB) with surface of 857.56 km<sup>2</sup> and 681 672 km<sup>2</sup> respectively. The bh-MB on the main mountain system of the country, the Cordillera Central, where the protected area Jose del Carmen Ramirez National Park is located. It is characterized by natural vegetation tree, highlighting the presence of conifers. The rainfall exceeds 1000 mm / year, although unevenly distributed, manages to keep moisture in the ground for much of the year. Temperatures range between 25oC and 27oC. The bmh-MB has average rainfall of over 2,000 mm / year; tree mixed with natural vegetation (conifer-broadleaf), easy natural regeneration and moderate growth. This area for its natural characteristics is of great importance as a productive source of water, as nearly 50% of rainwater is not evapotranspired, so carry water much of the year feeding aquifers. It is estimated that Hurricane George in 1998 affected over 30% of this area.

In the middle basin and part of the upper basin, covering the San Juan Valley and foothills of the Sierra de Neiba, predominantly Humid Subtropical (bh-S) Forest, with total area of 1059.14 km<sup>2</sup>. The rainfall varies from 1000-2000 mm / year and temperatures of 18oC to 24oC. The natural vegetation is arboreal and heterogeneous, moderately good growth and natural regeneration. Evapotranspiration is estimated at 60% below the average total annual precipitation.<sup>35</sup>

In the middle and lower basin, the prevailing climatic unit is subtropical dry forest (bs-S), with surface of 706.51 km<sup>2</sup>, located mainly in the foothills of the Sierra Norte Neyba and North Las Matas Farfan floors variables topographies, ranging from flat to hilly. This unit is characterized by clear sunny days during the dry and partly cloudy days during the rainy season. The average rainfall is 980 mm / year and the temperature 26 ° C, the upper potential evapotranspiration precipitation total during all months of the year. The areas that make up this unit were affected by secondary direct impacts of flooding in populated areas, which were devastated. There was also impacted by landslides and avalanches great consideration.

#### 4.4.2 Protected Areas

In the study area, four areas of National Parks are recognized, three in the area of the Central Cordillera is the Armando Bermudez National Park in the northern part of San Juan and Jose del Carmen Ramirez parks and Anacaona within the same range . In the Sierra de Neiba is Neyba

<sup>35</sup> PNUD (2004). Desarrollo de una metodología para la identificación de amenazas y riesgos a deslizamientos en la cuenca del río San Juan, República Dominicana.

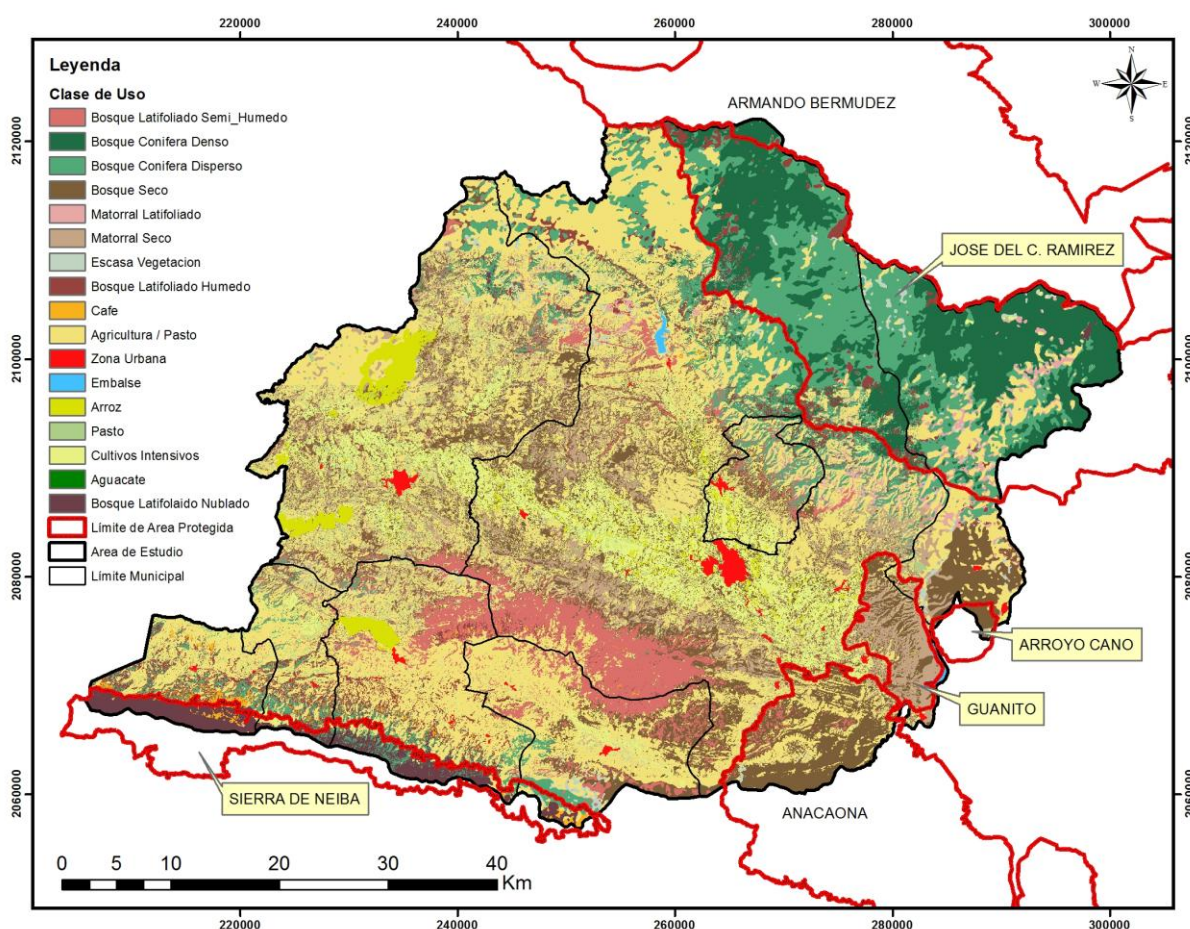
Sierra National Park. Under the category of Natural Reserve are smaller parks within the same systems as expressed in Table 6 areas.

**Table 6 Protected areas in the region in km2.**

Protected Area	Area (Km2)	System
<b>1-Parques Nacionales</b>		
Armando Bermúdez	8.43	Cordillera Central
Sierra de Neiba	85.56	Sierra de Neiba
Anacaona	118.22	Cordillera Central
José del Carmen Ramirez	612.32	Cordillera Central
<b>2-Reserva Natural</b>		
Arroyo Cano	5.81	Cordillera Central
Guanito	68.95	Sierra de Neiba

Source: Fundación Plenitud tomando como base mapa elaborado con información

**Figure 24 Ground use and protected areas.**



Of the total area of the province of San Juan (3,364 km2), an area of 1,020 km2, equivalent to 30% of that area is covered by protected areas of national parks (943.8 km2) and reserves (76 km2).

68% of the protected areas are national parks Jose del Carmen Ramirez (612.32 km2) and Anacaona (118.22 km2). Small portions Park Armando Bermúdez (8.43 km2) fall within the boundaries of the province of San Juan. The main nature reserve is Guanito province with an area of 68.95 km2.

Furthermore, within the province of San Juan, to April, 2013 are in force two mining exploration and 18 pending<sup>36</sup>.

#### 4.4.3 Endemic species, protected and endangered

Table 7 Biodiversity : Endemip species, protected and endangered

Protected Area	Biodiversity
Armando Bermúdez National Park	<i>Pinus occidentalis</i> , dominant species. According to Leon and Arias (2009), here has eleven threatened endemic amphibians, such as frogs <i>Eleutherodactylus schimidi</i> and <i>E. auriculatoide</i> s. Endemic reptiles are represented by several anolinos lizards, including <i>Anolis etheridge</i> and <i>A. fowleri</i> . It also houses the two endemic and endangered mammals solenodonte ( <i>Solenodon paradoxus</i> ) and guinea pig ( <i>Plagiodontia aedium</i> ). The avifauna is composed of about 104 species. The area is a critical habitat for currently common only in forest reserves threatened endemic species.(SEMARENA, 2004)
Sierra de Neiba National Park	Moist broadleaf forests dominate, broadleaf cloudy, coastal, transition from dry to wet and pine. <i>Begonia rotundifolia</i> with ornamental value, its beauty and easy playback. Judd and Beaman (1988) describe new species of shrubs in the family Melastomataceae. The herpetofauna has eleven amphibian species all endemic. There are 39 species of reptiles, with over 98% endemic to the mountains including frogs <i>Eleutherodactylus notitode</i> and <i>parabates E.</i> ; and two species of Anolis lizards placidus and <i>Sphaerodactylus schuberti</i> . The avifauna includes 85 species, 17 endemic. 25 species are considered threatened. In endangered mammals are the jutia and the solenodonte. The caves of the mountains are important for bats. Of the 18 species of Hispaniola, 13 have been reported here (MARENA, 2013).
José del Carmen Ramírez National Park	Pine forests dominate. Among the best known species are: Parrot ( <i>Amazona ventralis</i> ), crow ( <i>Corvus leucognaphalus</i> ), parakeet ( <i>Aratinga chloroptera</i> ), canary ( <i>Carduelos dominicensis</i> ) chirri duck ( <i>Calyptophilus frugivorus neibae</i> ) cigueta Julina ( <i>Vireo lullabies</i> ) Thrush La Selle ( <i>Turdus swalesi</i> ) cigueta of pine ( <i>Dendroica pinus</i> ) and Dominican subspecies <i>Dendroica pinus crysoleuca</i> restricted to the pine forests of the Cordillera Central and Bahoruco. 80 species have been inventoried 104 bird species recorded in the Cordillera Central. Mammals have 17 species of bat, a rodent, endemic jutia ( <i>Plagiodontia aedium</i> ) and an insectivore, endemic solenodonte ( <i>Hispaniolan solenodon</i> ) (SEMARENA, 2005).
Anacaona National Park	CUA ( <i>Coccyzus ruficularis</i> ) is reported, some park environments and includes an inventory of 33 species of birds. Protected areas of the province have been included as Important Bird Areas (IBA Important Bird Areas) in terms of regional conservation.

<sup>36</sup> ONE. Perfiles estadísticos provinciales. Con datos de Mapa de Concesiones Mineras y Áreas Protegidas, Dirección General de Minería (www.dgm.gov.do, abril 2013).

Biodiversity in the Elías Piña Province	According to the Environmental Characterization of Elías Piña Province, Ministry Environment and RN / GTZ (2011): Floristic Element of great importance in the biodiversity of the province is the rose called Bánica, <i>Pereskia marcanoi</i> . As regards fauna, at least for the National Parks and buttock Maco Sierra Neyba numerous bird species are known as endemic part of Hispaniola. Both protected areas are included within the Important Bird Areas (Important Bird Areas) in terms of regional conservation, as DO002 and DO004 IBA, respectively. These IBA have significant populations of restricted habitat protected by a national or international instrument.
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Source: Elaborated in accordance to Caracterización Ambiental de la Provincia San Juan, Ministerio MA/Oxfam/GEF/PNUD (2014)

#### 4.5 San Juan and Hondo Valle Soils.

The soils of San Juan and Hondo Valle correspond to the southwest division of the country. This geomorphological division includes the portion of the country south and west of the Continental Divide and includes all the Barahona Peninsula, Sierra de Bahoruco, Sierra de Martín García, Hoya del Lago Enriquillo, the Sierra Neyba Valley San Juan and Azua Plain. In this complex region soils are highly productive, such as the Valley of San Juan; large tracts of arid soils, particularly in the Plain of Azua and Enriquillo Hoya floors very limited agricultural value because of its shallow depth and high degree of rockiness and earings as in most of the southern portion of the peninsula Barahona and on the northern slope of the Sierra de Neiba (Hondo Valle-Vallejuelo); and soils with high salinity in most of the Hoya del Lago Enriquillo and the lower part of the plain of Azua and to a lesser extent in the San Juan Valley.

The soils of the province of San Juan and the Hondo Valley sub-area are part of the soils of the Central Cordillera Valley San Juan and La Sierra Neyba. Of these, the soils of the Valle de San Juan are the most important from the point of view of agricultural use, for floors with floodplains, low terraces with medium textured soils and other high, gravelly soils, as well as fans alluvial and low hills. While some of these are not usable for agricultural purposes, the valley and the province with significant areas of agricultural value. Below are the most common types of flooring framing Valley soils of the province are described:<sup>37</sup>

The San Juan Valley is a pit collapse and is framed by frontal systems failures -análogas to the Cibao- along the Cordillera Central and the Sierra de Neiba. These form its northern and southern limits respectively. To the west is continued in the central plain of Haiti and to the east is separated from the Plain of Azua by the foothills of the Cordillera Central and the Sierra de Neiba. The Valley has an elongated shape with an area of over 100 km and width of about 20 km. It is drained by two diverging river systems, the San Juan River major tributary of the Yaque del Sur which drains the eastern portion and the Macasía River, a tributary of the Artibonite River that drains the western portion. The boundary separating the two systems is 2.5 miles east of Peter Short.

The soils of this region include some of the most productive in the country, although in some areas the highest levels of management, particularly in rice cultivation. Other extensions, currently used for improved pasture or unimproved, have high agricultural potential, although its use is subject mainly to the availability of irrigation, particularly in the western part of the valley. In the northern

<sup>37</sup> Tirado, Gustavo (FAO). 2003. Los Suelos de la República Dominicana.

and southern edges of the valley floors are more limited value, particularly in the eastern part, because of the inherent low soil fertility and arid conditions that surround the Sierra de Neiba, extending to the southern margin of the San Juan river. In the northwest portion of the valley there is volcanic soil on source materials, but they occupy only limited extent. These soils and colluvial areas of both the Sierra de Neiba as the Cordillera Central are limited in their use, mainly due to the high degree of stoniness and slope.

#### **4.5.1 Description of the soil associations<sup>38</sup>**

The following description was subtracted from the study (compilation of papers) on the soil of the Dominican Republic Gustavo Tirado (FAO, 2003). According to this study, the soils of the Valley of San Juan (includes part of Elías Piña and Hondo Valle) were grouped into several associations including:

**a) Undifferentiated Recent Alluvial.** These alluvial soils of the first plane of the Yaque del Sur, Millet, Yacahueque, El Cano, and Commander Macasía rivers as well as the countless streams and creeks that form part of the drainage system of the valley are grouped. For the most part are deep, calcareous, productive, mainly limited by the risk of flooding usually affects these soils soils.

A notable exception is the alluvial soils of the Yaque del Sur, whose excessive stoniness, sandy texture and arid conditions prevailing in most of them, severely limit the usable area for agriculture.

**b) Association Elías Piña, Las Matas.** These soils occupy the western portion of the San Juan Valley. The parent material consists of deposits of basin fill, mainly conglomerates, limestone, marl and gravel, as well as by recent alluvial River system Macasía whose morphological characteristics are very similar to that of the other soils of the association. The topography is very irregular. It features small hills and depressions, particularly in the southern half of the partnership. North of the San Juan road - Elías Piña, ridged topography is more uniform, but the soils are less productive. The most typical soil corresponds to the Elías Piña series; has clay soil, dark brown, with structure well developed sub-angular blocks of calcareous clay yellowish light brown friable limestone with some gravel in the lower horizons.

In the higher parts accumulation occurs mostly gravel and even boulders that hinder agricultural use, but the soil in the plains and in depressions where the effective depth reaches up to 75 cm, is highly productive. Their use is limited by the availability of water. Westward arid conditions become more pronounced, showing almost savanna vegetation. Most of the soils used in pastures, but their productive capacity, availability of irrigation, is much higher and included in the Class II productivity. Closely associated soils are the Elías Piña, although lighter soils Las Matas, consisting of brown soils also that the above and 15, 20 cm deep a calcareous clay with gravel and boulders of small diameter, possibly product weathering of clusters. Soils Las Matas extend to the south of the town of the same name, the topography is increasingly ridged as it approaches the southern edge of the valley.

The dry conditions presenting this association reported transient soil hardness and make benchmarking difficult soils San Juan; subjecting the latter are cultivated irrigated almost entirely.

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<sup>38</sup> Tirado, Gustavo (FAO). 2003. Los Suelos de la República Dominicana.

The survey carried out suggests that the Elías Piña-Las Matas, association should have sufficient irrigation, offers the highest potential for development throughout the Southwest Division.

**c) Guanito Villarpanda Association.** This soil group has been formed under similar environmental humidity, presence of gravel and almost all the songs in their profile and low agricultural value, which is similar to most of the area of the association. Occupy high gravelly Quaternary terraces, east of the San Juan River and west of the Yaque del Sur River and calcareous and non-calcareous conglomerates in the eastern portion of the association.

The most representative soils of the association are those corresponding to the Guanito series, formed at the expense of gravelly terraces and is characterized by shallow sandy soil, dark brown or dark yellowish brown. The topography is flat in the lower positions and hump-shaped depressions and north of the road. In the higher portions the soil is shallow, grayish brown and yellowish brown subsoil, gravel with increasing elevation up to 70 percent of the soil mass in the highest positions.

The soils associated with Villarpanda series differ from previous ones in soil depth, which is higher in the sandy texture and dark brown soil on brown ground grizzly, both limestone and gravel and rock fragments both igneous as limestone. The soil and subsoil contain free carbonates, but possibly because of the dry conditions, more pronounced than in Guanito soils. These soils are highly erodible and unfit for agriculture, except in small areas of accumulation, require intensive irrigation and fertilization for exploitation.

**d) The Association Darn. Groups the colluvial soils San Juan Valley, both the Sierra de Neiba as the Cordillera Central.** The association is artificial, both in terms of geographical and pedological and is based on calcareous colluvial character and position of the associated units. The Darn Soils are formed at the expense of Oligocene limestones and Miocene forming the foothills of the Sierra de Neiba, occupying a narrow strip along the Rough Terrain Mountain. They are ridged soils, topography clay, dark brown, almost black, on gray-brown calcareous clay structure and strongly developed angular sub-block. Sometimes, in the highest parts, the soil is grayish brown, shallow, seated directly on highly calcareous colluvial material.

The Darn soils are limited for cultivation because of its topography, shallow depth and the presence of rock fragments. Its use appears to be more appropriate livestock, in the less hilly areas and logging.

**g) Association San Juan-Hatico.** It occupies the central portion of the San Juan Valley and is one of the most productive areas of the valley and of the Republic, both physical and chemical soil conditions, and the high level of management used in its operation. The parent material of these soils is high deposit gravelly terraces and balconies, but their relative position has benefited this partnership with the favorable influence of several factors. Indeed, the proximity of the river San Juan and millet, as well as the numerous streams that make up the system have facilitated the implementation of irrigation, while the influence of associations Elías Piña, Matas and Yabonico calcareous materials have provided clay that have significantly increased the productivity of these soils. The alluvial tracts of the rivers San Juan, Loro and Millet have contributed to the agricultural production of rice, but it is also utilized for growing onions, beans (green beans) and others, establishing a system of rotation, while has been built in many areas an efficient system of terraces and terraces for better conservation and use of water.

The topography is flat to gently rolling, becoming steeper slopes north of the association. The vegetation was originally clay savanna, but soil conditions, particularly in the savannah of Millet and around San Juan, has been extensively modified by irrigation. To the north, in the vicinity of Juan de Herrera, the soils are reddish brown on the surface and more crumbly texture. As soil association approach the Central Cordillera, the size of boulders increases and their number makes it impossible to grow in some areas.h) Terrenos escabrosos de montaña cordillera central.

This entry was grouped soils with very rough topography and generally have slopes greater than 100%, even if the source material is different. A topographical condition commonly joins the low effective depth of these soils to limit its use for forestry or recreational purposes.

The most important for its extension in the mountains, soils are in the group of non-calcareous rough terrain mountain, which have derived from metamorphic igneous rocks. These soils have different characteristics according to their source material, but generally shallow, low inherent fertility and susceptible to erosion. In many areas there is virtually no soil and bedrock outcrops extensively.

**i) Land rugged mountain Sierra de Neiba.** This association includes all the mountainous areas of the Sierra de Neiba, whose topography makes them unsuitable for cultivation except in the case of typical upland crops such as coffee, cocoa, etc. or for subsistence agriculture in small areas and isolated where local conditions of topography and soil depth allow. It has not attempted to separate the areas of rugged limestone mountains of origin of non-calcareous origin, due to lack of information from the field, but the importance of the topographic factor in such cases overrides all other considerations.

**j) Capulina Association.** This group of soils, consisting of a series of hills forming internal foothills of the Sierra de Neiba, derived from Eocene limestones, resulting in relative land productivity, but severely limited by topography, except in some valleys or depressions with colluvium stoniness and is most severe in the area. In the higher parts of the effective depth is a limiting factor. Typical soils are clayey, dark brown, with brownish yellow subsoil, also clay and abundant limestone fragments. In areas where the amount of surface rock is not excessive, are highly productive soils.

**j) Guama Association.** These soils also studied closely, are derived from colluvial deposition materials, particularly limestone and calcareous sandstones, leading to the first floor and second clayey, light-textured soils. They occupy a considerable area in the northern half of the Sierra de Neiba, topography, usually heavily ridged. The surface soil is dark brown on brownish yellow or yellow-brown subsoil. In some areas the soil is shallow, with abundant limestone fragments and exhibit typical conifer trees, possibly because of altitude and the drying characteristics of these soils.

**k) Soils of intermountain valley.** This geomorphological grouping is not a true partnership, but are included in the same soils in isolated valleys in the mountains of the Sierra de Neiba. For the most part these valleys are formed by the action of a stream of water through a group of rocks and therefore almost always present in the central part a band of small extension alluvium. The rest of the valley is generally formed by residual soils resulting from the weathering of local rocks and towards the edges of colluvial deposition of materials from the highlands surrounding the valley. Under these conditions, the limitations of these soils usually dependent accumulation of rock fragments that accumulate on the surface, but the floors themselves are very productive because of the deep weathering that occurs in consequence of moisture uptake . A typical example of

these soils as Los Pinos is the number observed in the valley of the same name northwest of Discovery.

**l) Guanita Association.** These soils occupy mostly low hills to the north end of the mountain range in its limits by Sierra Yamasá. Although their origin is different, they have been grouped into one association under its topography and limited agricultural use.

The predominant soils of this association are to Guanita series, which is characterized by shallow, low fertility, as well as its ridged topography. The soil is represented by a sandy loam horizon, dark brown on red clay, containing some gravel, supported by igneous material with high quartz content. At the foot of the hills are some red soils, clayey and granular structure, supported by more or less weathered acid igneous material, constituting the high colluvial soils Guanita series.

Most of the soils in the association are dedicated to pasture or forestry.

**m) Constance Association.** Expanded over soil deposition materials of volcanic origin. This ground is represented by a reddish-black clay (10R 2/1), which passes the 15 cm shaded red (10YR 2/2) with a fine gravel igneous. The ground gradually moves the material reservoir will rise, increasing the amount and size of the gravel with depth.

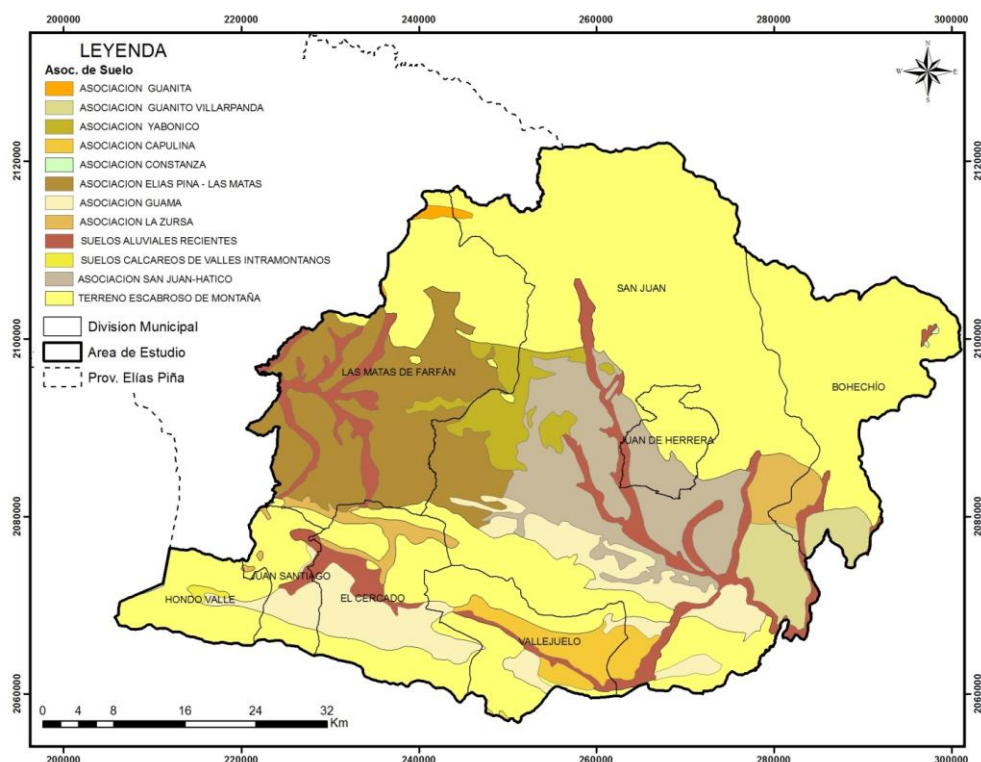
These soils are well developed in the upper horizons and subangular blocks at the bottom of the B horizon granular structure they are very productive soils not only because of its inherent fertility and excellent physical and topographical conditions, but also the high level of management that are exploited

**g) Yabonico Association.** This agency soils occupy areas nestled between associations Elías Piña-Las Matas and St. John Hatco. These soils developed at the expense of volcanic material, mainly andesites and basalts, soils are of little agricultural value, mainly because of its shallow topography and excess gravel on the surface.

**b) Asociación Cardón<sup>39</sup>.** This soil group occupies a position almost on the spur north slope of the Sierra de Neiba; consists essentially of a series of hills and low hills, small valleys or terraces, the lowest of which are actually extensions of the San Juan Hatco series. The Cardon soils have developed at the expense of limestone, sandstone, conglomerate and mudstone almost all Miocene and forming the southern edge of the San Juan Valley. Soils are mostly, at elevations shallower and deeper depressions on terraces and grayish brown and even gray, sandy loam and varying depth. Subsoil consists of a non-calcareous clay fragments and limestone, sandstone, and in some cases igneous gravel, particularly in the lower portions. Soils with little potential for agricultural development despite their physical, limited by arid conditions with thorny vegetation, though better soils extensions (in nearby rivers and streams) some crops are developed. Its best use is probably forest, with some areas suitable for grazing and limited agriculture. With its high susceptibility to erosion must be cultivated with great care.

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<sup>39</sup> This soil unit is not apparent at the scale of mapping handled in this study but it is characterized in the study used reference: Tirado, Gustavo (FAO). 2003. Los Suelos de la República Dominicana.



Map 4 Soil associations.

Source: OEA (1967).  
Suelos de la República Dominicana.

#### 4.5.1 Productive Capacity of the Soils

According to the classification of productive capacity of soils conducted in the Dominican Republic by the Organization of American States (OAS, 1967), we have that there are categories of soils ranging from Class II to Class in the study area VII since it according to this classification there are no floors classes I and VIII.

This classification considers different soil variables such as effective depth, structure, water availability, permeability, physiographic position of the land, among others.

In the Middle Environmental Characterization Study of San Juan (Ministry of Environment / UNDP, 2014), an extensive literature review is done and these soils grouped into two groups: a) The soils suitable for cultivation b) Suitable for permanent vegetation.<sup>40</sup>

Each of these groups in turn is subdivided into four branches indicating the intensity of risk presented by type of use for farm work. According to this criterion, **classes I, II and III** include lands with the highest vocation of farming on a regular basis; while **class IV** can be grown safely but in a limited and taking some steps. The **classes V, VI, VII** comprise lands that are not recommended for cultivation as its use is reserved for pasture and woodland. Class VIII is restricted for any type of use.

Table 8 shows the distribution of these soils in the study area is presented.

<sup>40</sup> Op. Cit. MA/PNUD /GEF/OXFAM (2014)-Pag.10

**Table 8 Type of soil according to it's productive capacity**

CLASE	km2	%
CLASE II	299.60	8.35
CLASE III	408.68	11.39
CLASE IV	325.37	9.07
CLASE V	247.35	6.90
CLASE VI	277.76	7.74
CLASE VII	2,028.64	56.55
Total	3,587.40	100.00

Source: Elaboración propia a partir del mapa de Inventario de Recursos Naturales. (DIARENA), 1985.

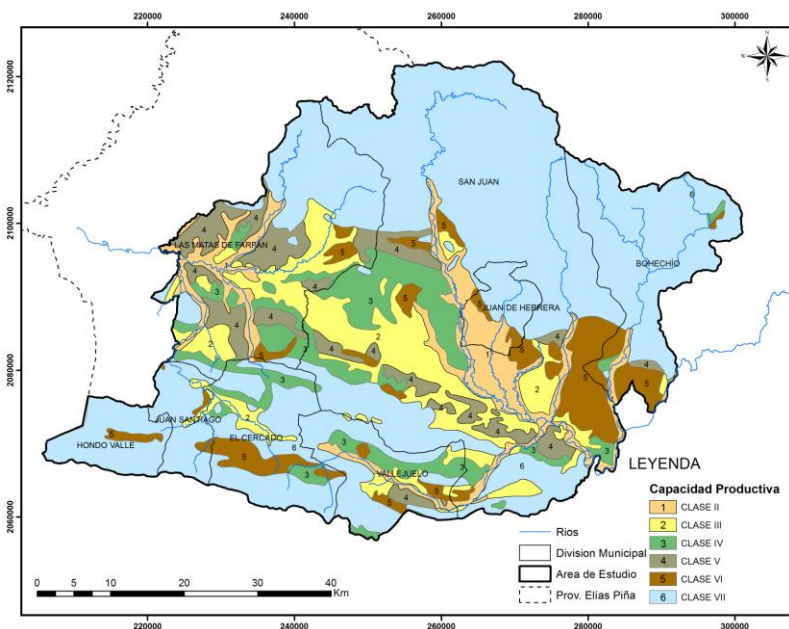
From the point of view of its productive capacity soils in this area with a vocation for cultivation (class II to IV) account for 28.81% of the total area, being the most important class III with 11.39%. In the second group, soils in classes V to VIII represent 71.19% of the land area being the most representative class VII to occupy 56.55% of the surface.

Soils with higher agricultural potential are located entirely in the Province of San Juan, specifically in the valley since these are sedimentary soils. The type II, more productive capacity are mainly associated with the recent alluvial types that take place in the plains of the major rivers in the area.

Class IV soils are mainly associated with soil associations Elías Piña-Las Matas, San Juan-Hatico and Capulina, located in areas of moderate slopes.

Dominated areas above 40% are characterized by outstanding VI and VII soil type.

Specifically subarea of Hondo Valle, soils occur only in category III, VI and VII, with a strong predominance of the latter type.



**Map 5 Soil Capacity**

Source: Inventario de Recursos Naturales. (DIARENA), 1985.

#### 4.5.2 Soil Use

The table below presents information collected from different studies conducted in 1996, 2003 and 2012 for different categories of land use in the province of San Juan. According to this information, land use categories have experienced significant changes in the use of relevance.

For data consistency presented for analysis, in general, it is observed that the area devoted to forest increased by 11%, from 1258.42 km<sup>2</sup> (37.40%) in 1996 to 1,678.20km<sup>2</sup> (48.40%) in 2012. this category broadleaf forest area declined cloudy 36%, from 113.90 km<sup>2</sup> (3.40%) to 41.30 km<sup>2</sup> (1.20%) in 2012; in a different sense, the area of semi moist broadleaf forest increased by 226%, from 97.20 km<sup>2</sup> in 1996 to 220 km<sup>2</sup> in 2012. Meanwhile the dry forest area also increased by 226%, from of 282.60 km<sup>2</sup> (8.40%) in 1996 to 637.70 km<sup>2</sup> (18.40%) in 2012. the other forest types within this category have changes, but less significance.

The categories of scrubs was highly variable in the area occupied, since in 1996 he was reported to 436.70 km<sup>2</sup> (13%) in 2003 recorded a significant increase in reported with 869.00 km<sup>2</sup> (25.80%), while for 2012 it is reported with a drastic decrease in the estimated surface 301.10 km<sup>2</sup> (8.70%). In this category, the dry scrub and scrub vegetation area are scarce use types that present the greatest variations.

The category of agricultural use also exhibit significant variations as in 1996 was reported with an area of 1662.10 km<sup>2</sup> (49.40%) in 2003 was reported at 1192.10 km<sup>2</sup> (35.30%) with a significant reduction, and by 2012 was estimated at 1415.10 (40.80%) but increased again by almost 10% from 1996. At registered search the area devoted to intensive crops (mixed), maintained an increasing trend, from 171.50 km<sup>2</sup> (5.10% ) in 1996 to 290.90 km<sup>2</sup> (8.40%) in 2012. the area planted to rice has had a considerable reduction going from 278.50 km<sup>2</sup> (8.30%) in 1996 to 63.40km<sup>2</sup> (1.80%), meanwhile the area planted to coffee and cocoa has been reduced to only 10% of that reported in 1996, going from 33.40 km<sup>2</sup> (1.00%) to 4.20 km<sup>2</sup> (0.10%) in 2012. in the case of surface area dedicated subsistence agriculture reported in 1996 1178.70 km<sup>2</sup> (35%) was reduced to 978.40 km<sup>2</sup> (28.20%) in 2012.

**Table 9 Soil use category Provincia de San Juan (km<sup>2</sup>)**

Categoría de uso	Superficie en el año 1996(1)	Porcentaje	Superficie en el año 2003(1)	Porcentaje	Superficie en el 2012(2)	Porcentaje	Cambio en el periodo (B-F)
<b>Bosques</b>							
Bosque conífero denso	397.50	11.80	402.30	12.00	295.70	8.50	101.80
Bosque conífero abierto	249.00	7.40	53.20	1.60	375.50	10.80	-126.50
Bosque latifoliado nublado	113.90	3.40	188.10	5.60	41.30	1.20	72.60
Bosque latifoliado húmedo	118.20	3.50	5.30	0.20	107.60	3.10	10.60
Bosque latifoliado semi húmedo	97.20	2.90	158.80	4.47	220.40	6.40	-123.20
Bosque seco	282.60	8.40	481.80	14.30	637.70	18.40	-355.10
bosque humedales salobre	0.02	0.00	0.00	0.00	0.00	0.00	0.02
<b>Sub-total bosques</b>	<b>1258.42</b>	<b>37.40</b>	<b>1289.50</b>	<b>38.17</b>	<b>1678.20</b>	<b>48.40</b>	<b>-419.78</b>
<b>Matorrales</b>							
Matorral latifoliado	16.60	0.50	19.60	0.60	37.20	1.10	-20.60
Matorral seco	245.30	7.30	845.60	25.10	263.90	7.60	-18.60
Matorral de humedales salobre	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sabana de humedales salobre	0.20	0.00	0.00	0.00	0.00	0.00	0.20
Sabana de pajón	10.10	0.30	0.00	0.00	0.00	0.00	10.10
Escasa vegetación /Área	164.50	4.90	3.80	0.10	0.00	0.00	164.50
<b>Sub-total matorrales</b>	<b>436.70</b>	<b>13.00</b>	<b>869.00</b>	<b>25.80</b>	<b>301.10</b>	<b>8.70</b>	<b>135.60</b>
<b>Uso agropecuario</b>							
Cultivos perennes o permanentes							0.00
Cultivos intensivos (mixtos)	171.50	5.10	232.50	6.90	290.90	8.40	-119.40
Arroz	278.50	8.30	1.00	0.00	63.40	1.80	215.10
Café y cacao	33.40	1.00	92.20	2.70	4.20	0.10	29.20
Agricultura de subsistencia (agri/pasto)	1178.70	35.00	0.00	0.00	978.40	28.20	200.30
Pastos	0.00	0.00	31.80	0.90	78.20	2.30	-78.20
Agricultura Mixta	0.00	0.00	834.60	24.80	0.00	0.00	0.00
<b>Sub-total uso agropecuario.</b>	<b>1662.10</b>	<b>49.40</b>	<b>1192.10</b>	<b>35.30</b>	<b>1415.10</b>	<b>40.80</b>	<b>247.00</b>
Presas	2.00	0.10	0.00	0.00	3.80	0.10	-1.80
Lagos y lagunas	0.60	0.00	0.90	0.00	0.00	0.00	0.60
Área poblada	4.90	0.10	13.80	0.40	20.30	0.60	-15.40
<b>Sub-total</b>	<b>7.50</b>	<b>0.20</b>	<b>14.70</b>	<b>0.40</b>	<b>24.10</b>	<b>0.70</b>	<b>-16.60</b>
<b>Total Genral</b>	<b>3364.80</b>	<b>100.00</b>	<b>3365.30</b>	<b>100.00</b>	<b>3418.50</b>	<b>98.60</b>	<b>-53.70</b>

Source: PNUD (2010). ODH San Juan. Estudio Uso y Cobertura del Suelo (MIMARENA)

**Table 10** Soil use category Sub Zona Hondo Valle, Provincia Elías Piña (km2).

Categoría de uso	Hondo Valle	Rancho de la Guardia	Juan Santiago
<b>Bosques</b>			
Bosque Conífero Denso	0.63	0.16	4.84
Bosque Conífero Abierto	2.10	0.42	1.11
Bosque latifoliado húmedo	0.58	0.25	0.18
Bosque latifoliado semi húmedo	0.00	0.00	3.01
Bosque Seco	0.20	0.10	1.66
<b>Sub Total Bosques</b>	<b>3.51</b>	<b>0.93</b>	<b>10.8</b>
<b>Matorrales</b>			
Matorral Latifoliado	18.96	3.47	6.68
Matorral seco	2.12	3.73	5.09
Escasa Vegetación	0.07	0.01	0.04
<b>Sub Total Matorrales</b>	<b>21.15</b>	<b>7.21</b>	<b>11.81</b>
<b>Uso Agropecuario</b>			
Cutivos intensivos (mixtos)	0.99	0.00	0.01
Arroz	0.00	0.03	0.06
Café y Cacao	9.25	6.76	15.10
Pastos	2.10	1.19	2.44
Agricultura mixta	29.21	19.95	50.88
<b>Sub total uso agropecario</b>	<b>41.55</b>	<b>27.93</b>	<b>68.49</b>
Área Poblada	0.18	0.18	0.19
<b>TOTAL (km2)</b>	<b>66.39</b>	<b>36.25</b>	<b>91.29</b>

Source: Elaboración propia a partir de datos presentados por Ministerio del Medio Ambiente y Recursos Naturales / GIZ. 2011. Caracterización Ambiental de la Provincia de Elías Piña.

Agricultural activities in the area of San Juan, is undoubtedly the greatest impact on deforestation even a cyclical nature in the territory of the province, as at the time of preparation of agricultural land (in the months of February to April) is when the most points indicative of burning heat and forest fires are reported each year.

Regarding the use of wood as an energy source in the province still largely rural population cooks with wood, contributing to further deforestation. In this province the most heavily deforested areas are on the northern slope of the Sierra de Neiba in El Cercado, Batista and Derrumbadero.<sup>41</sup>

According to Caracterización Ambiental de Elías Piña<sup>42</sup>, in the upper basins of the sub Hondo Valley area there are areas that are known for their intense deforestation, as it is on the northern side of the Sierra de Neiba. In the City of Hondo Valle, for example, in the headwaters of Cane, the basin is heavily deforested. The Sierra de Neiba is one of the mountain ranges of the country that is most damaged by deforestation, the most deforested areas, medium height, between 700 and 1,700 meters. The cloud forests of the firm saw and dry forests in the Southwest are those who have not been affected, but the dry forests of the lowlands are almost destroyed, because burning that is done for charcoal for many years , intensifying lately with rising petroleum gas such as propane.

A problem that severely affects the subzone of Hondo Valle and increasing their vulnerability is deforestation, according to data from the Ministry of Environment, in spite of the Sierra National Park Neyba on the slopes high rate of deforestation is observed. The municipality with the highest number of wildfires is Commander, followed by Hondo Valle and Juan Santiago. In the latter town, the area affected by fire is within the Protected Area National Park Sierra de Neiba. Most of these fires by conuquismo (slash and burn land for agricultural activities) have occurred.

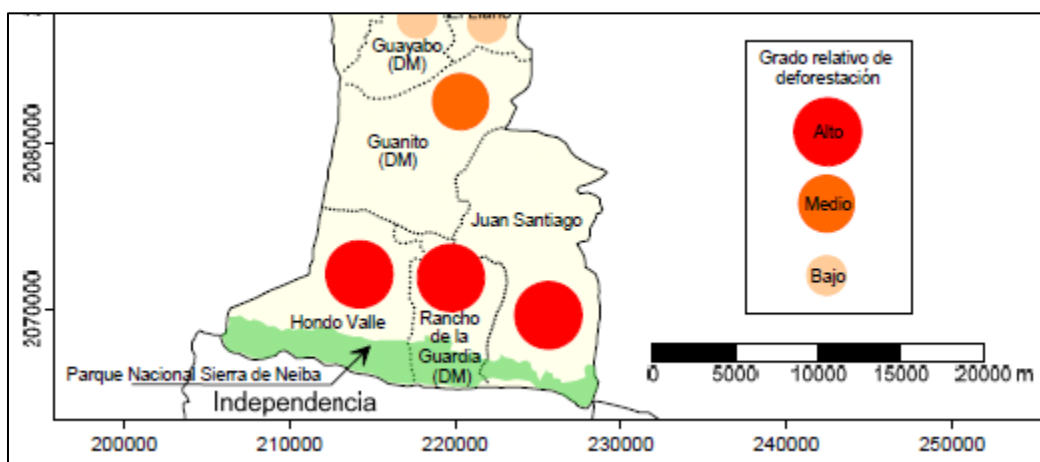
The Ministry of Environment and Natural Resources defined within the main environmental problems of Elías Piña Province overuse, erosion and transformation of soils, deforestation, and the destruction of vegetation cover, forest fires, the pressure on water resources and drought. The atmosphere is observed and become more impaired in the border area, mainly in the Haitian one, which might be occurring irreversible environmental degradation. There is a process of deforestation across the border and water pollution in various rivers, including the Artibonite and Macasías, near which, the conditions of poverty are more pronounced. There are no accurate data on the level of environmental degradation in the border area, but it is considered that there are higher levels of deforestation, soil degradation and biodiversity loss. One can see in it the presence of highly weathered soils, with a rudimentary and shifting cultivation without adequate conservation practices.

**Figure 25**      **Relative degree of deforestation in the municipalities of Valle Hondo, Rancho La Guardia and John James.**

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<sup>41</sup> ODH/PNUD, 2010. Informes Provinciales de Desarrollo Humano: San Juan. Oficina de Desarrollo Humano/ Programa de Naciones Unidas para el Desarrollo.

<sup>42</sup> *Op. Cit.* Ministerio del Medio Ambiente y Recursos Naturales / GIZ. 2011



Source: Ministerio Ambiente/GIZ. (2011) Caracterización Ambiental de la Provincia Elías Piña

#### 4.6 Hidrology

Most of the study area is part of the south side, in the southwest area of the Cordillera Central, where soils are mostly formed by aggregations of those defined as "sockets" of low permeability and act as a zone of little or no ability to recharge aquifers. Only formations "coverts", the more permeable the southern slopes of the Cordillera Central, aquifers have variable importance (by diffusion and extension) acting as sources of recharge of aquifers.

Meanwhile, the southern fringe of the study area, part of the catchment area of the Sierra de Neiba behaves hydrographically differently because it is a unit in much of its length consists of materials carbonate leading to karstic aquifers, grade medium to high permeability. The structural features of the Sierra Neyba unit and probably the difference in altitude between the valley of San Juan (300 meters) and Neiba Valley (-40 to 50 m) it is where the greatest groundwater discharges occur.

Consequently, groundwater is formed from the infiltration of rainfall and input from surface water courses. They move vertically by gravity, until a waterproof floor and then extend horizontally to download the inlets, which lead to the sea; in this passage, are housed in underground spaces and form deposits or underground water aquifers. Their existence and behavior depends on factors such as climate, topography, rock type and nature of the soils. The hydrogeological characteristics defined above characterize the developmental potential of groundwater in the study area.

**Table 11** Hydrographic characteristics and development potential of groundwater.

Divisional Basin	Geology	Development Potential
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Flanco Norte de la Sierra de Neiba	Beginning of the Tertiary limestones and alluvial valleys of the mountains	Aquifers virtually absent at low water of good chemical quality.
Valle de San Juan	Miocene marine sediments with alluvial valley floor	Aquifers medium to low hydrogeological importance.
Flanco Sur de la Cordillera Central	Limestone of early Tertiary and Cretaceous sedimentary and igneous formations.	Well springs and small capacity.

Source: Elaborado a partir de SEMARENA/PNUD/Secretaría Agricultura/CIDA (2004) Proyecto marco para las políticas de adaptación a la sequía en la región noroeste y suroeste de la República Dominicana.

#### **4.6.1 Basins, sub-basins and major rivers.**

As explained in previous sections, the study area falls within the area of influence of two major units hydrogeographic: Cordillera Central and the Sierra de Neiba. The southern part of the study area is under the influence of the Sierra de Neiba whose hydrographic network consists of three lines and areas of discharge related to the main systems of fracturing that drain the Sierra into three different watersheds, two of which drain Sierra to the study area and the other drains the highlands to the south Neyba Valley (outside the study area).

The dominant axis distribution is SN and SE-NW, located in the northwest of the Hondo Valle and Juan Santiago unit of El Cercado and Las Matas de Farfán, where riverbeds run on carbonate materials Eocene-Miocene and Miocene conglomerates and sandstones, ending downloading, in the Valley of San Juan in the Macasía river (the left bank), tax, also on the left bank of the Artibonite River.

The dominant axis of distribution secondary NW-SE and NE-SW and NS, located in the central-eastern area unit, the river system runs mainly on Quaternary fluvial deposits of the Miocene sandstones and conglomerates. Discharge occurs, mostly, to the main channels of the Yaque del Sur (which crosses the unit on its eastern sector) and San Juan (outside the boundaries of the unit), the most significant of the channels Vallejuelo this side the river-Los Baos. There are other small streams flow intermittently, such as Blanco I, Blanco II and the Cañada.<sup>43</sup>

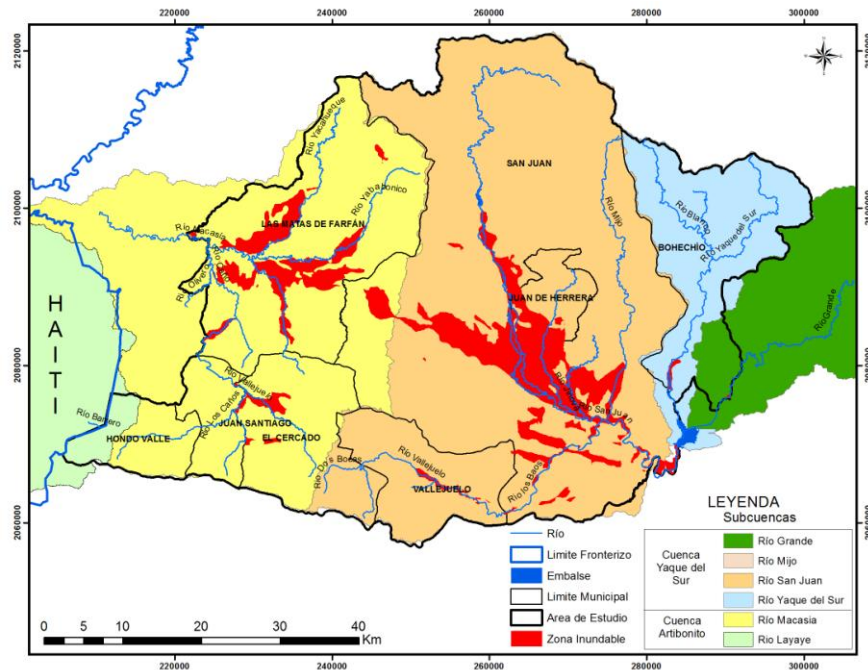
In the northern part of the study area, part of the hydrographic network of the Central Cordillera, is comprised of four main areas or discharge areas and 12 sub-basins, two of which influence the study area lapsing NS (Yaque del South) and EO (Artibonite).

The dominant axis NS and EW distribution of the upper basin of the Yaque del Sur, which is located in the southwest sector of the Cordillera Central, running over riverbeds volcano sedimentary rock mass, materials Flysch Facies of Cretaceous and Tertiary rocks massive volcanic. These channels discharging into the west end of the ridge across the upper reaches of the rivers San Juan High, Yaque del Sur Alto, Del Medio and Las Cuevas, and adjacent units to the San Juan Valley and the Sierra de Neiba .

<sup>43</sup> Op. Cit. Eptisa. 2004

In the upper reaches of the Artibonite river channels running on volcano sedimentary rocks massive, massive volcanic materials Flysch Facies of Cretaceous-Tertiary and Cretaceous limestones. These channels downloading west end of the unit through the basins of the Artibonite, Joca Bacon and rivers, which are transboundary basins with the Republic of Haiti. <sup>44</sup>

**Map 6 Basins and sub-basins contained in the study area.**



Source: INDRHI. S/F

The Yaque del Sur has an area of 5,062 km<sup>2</sup> (2389.30 km<sup>2</sup> within the study area) and is the main source of water resources in the South. The Yaque del Sur River rises in the southern slopes of La Loma Rusilla at a height of 2,707 meters, has a drainage area of 375.8 km<sup>2</sup> and a length of 186 km and an approximate flow rate of 20m<sup>3</sup> per second. It is the third largest river in the island and the main which empties into the Caribbean Sea. Its main tributaries are the Cañada Grande La Pelona and the White River.

The San Juan River, with a length of 121 km, was born in the northwestern part of the Pico Duarte, in the Cordillera Central and formed the main sub-basin in the province of San Juan with a surface area of 1,971 km<sup>2</sup> study. It has numerous tributaries including Los Arroyos Gajitos Lemon, Tenguereñgue, Sonador and Los Baños.

Most of the province of San Juan (San Juan area) falls within the catchment area of the basin of the San Juan River and its main tributaries of the river The river Baos and Mijo. This watershed in turn is the largest sub-basin of the Yaque del Sur, the second system, the country's largest.

<sup>44</sup>EPTISA. 2004. Estudio Hidrogeológico Nacional de la República Dominicana Fase II. Unidad Hidrogeológica de la Cordillera Central.

Millet River, with a distance of 48 km, is another important sub with 233.8 km<sup>2</sup>, rises in the Sierra de la Medianía 2,500 meters above sea level and descends toward the NS Mijo Slice of about 1,200 meters. The Middle Rio Grande and is one of the main tributaries of the Yaque del Sur River. Born in the mountain range of La Loma Stone Manuel, with an elevation of 2,260 meters and is 46.4 km<sup>2</sup> subbasin.

For its part, the basin of Macasías is the second largest in the study area 1139.3 km<sup>2</sup> and its tributaries, the Rivers Vallejuelo, Yabonico Reed, Liandro, Yacahueque and La Ceiba.

The area occupied by each basin and sub-basin can be seen in the following table:

The Mijo river, with a distance of 48 km, is another important sub basin with 233.8 km<sup>2</sup>, rises in the Sierra de la Medianía 2,500 meters above sea level and descends toward the NS Gajo de Mijo of about 1,200 meters. The Río Grande o del Medio is one of the main tributaries of the Yaque del Sur River. Born in the mountain range of La Loma Stone Manuel, with an elevation of 2,260 meters and is 46.4 km<sup>2</sup> subbasin.

For its part, the basin of Macasías is the second largest in the study area 1139.3 km<sup>2</sup> and its tributaries, the Rivers Vallejuelo, Yabonico, Caña, Liandro, Yacahueque and La Ceiba.

The area occupied by each basin and sub-basin can be seen in the following table:

**Table 12** Areas occupied by basins and sub-basins in the study area.

Basin	Sub Basin	Area inn km <sup>2</sup>	%
Artibonito	Rio Macasias y afluentes	1,139.3	31.9
	Rio Layaye	40.6	1.1
	<b>Sub-total</b>	<b>1,179.9</b>	<b>33.1</b>
Yaque del Sur	Rio San Juan	1,971.07	55.1
	Rio Yaque del Sur	369.6	10.4
	Rio Grande	48.6	1.4
<b>Sub-total</b>	<b>Sub-total</b>	<b>2,389.30</b>	<b>66.9</b>
<b>Total general</b>		<b>3,569.16</b>	<b>100</b>

Sourde: Elaboración propia a partir del Mapa de Cuencas (INDRHI. S/F)

According to this information, the study area (agricultural area of San Juan and sub Hondo Valley area) has an area of 1179.9 km<sup>2</sup> (331%) of its territory in the catchment area or basin Artibonite River in subbasins Layaye Macasías and the rivers; while 2389.30 km<sup>2</sup> (66.9%) of its territory is in the catchment area of the basin of the river Yaque del Sur.

#### 4.6.1 Hydraulic Infrastructures.

The main hydraulic infrastructure located in the basins of the study area are the Sabaneta, Sabana Yegua, Palomino and Rio Mijo prey. There are other less important works, especially for agricultural use, such as dam and levee Palma Sola on Bao River, of which no information was obtained. Of these infrastructure projects, the most important from the point of view of influence on the various productive activities (agriculture and human consumption) is Sabaneta Dam, which is the most important since the Sabana Yegua Dam has increased impact on production and human activities in the province of Azua and Palomino Dam is mainly focused on electricity generation.

The characteristics of the dams above can be seen in the table below:

**Table 13 Major dams in the study area.**

Name	River	Sup (km2)	Material	Height	Gen (Meg)	Cap/m/m3	Use
Sabaneta (1981)	San Juan	3.8	Tierra	70	13	77	Irrigation, human consumption to San Juan, electric generation.
Sabana Yegua (1980)	Yaque del Sur	21	Tierra	76	13	401	Irrigation, human consumption to Azua, electric generation..
Mijo	Mijo		Tierra	17.2		3.30 *	Irrigation
Palomino (2010-2011)	Yaque del Sur			65 *	80		Electric generation.

Fuente: PNUD: ODH-San Juan 2010 . Fuente: JICA - INDRHI, 1998.

\*Fuente: Ministerio del Medio Ambiente y Recursos Naturales, Oxfam, GEF, PNUD. 2014. Caracterización Ambiental de la Provincia de San Juan

**Foto 1. Views of the dams in the Province of San Juan: Sabana Yegua, Palomino y Sabaneta**



Source: Ministerio de Medioambiente y RN /PNUD/GEF/ OXFAM (2014)

#### 4.7 Description Agricultural Area and Sub Area San Juan Valle Hondo.

The province of San Juan has an agricultural productive vocation and primarily oriented traditional items such as bean (whose culture represents a 51% and 37% of national production for the black and red beans, respectively), rice (5% of the national production ), corn (26%), pigeon peas (27%), and onions (17%). These crops are mainly directed to the domestic market and are characterized by the predominance of small-scale production and low productivity. This reality coexists with a

highly tech small and medium enterprises vertically integrated horticultural export business with strong links to wholesale and retail markets in the US and Europe.<sup>45</sup>

The Ministry of Agriculture divides the country into regional agricultural and turn them into zones and sub zones. Usually, The Agricultural areas coincide with the boundaries of the provinces (province of San Juan de la Maguana and Elías Piña areas with their names); however, the demarcation of the municipality does not necessarily coincide with the sub-areas, and in some cases, a sub-zone can include the territories of one or more municipalities such as the sub-area includes the Valle Hondo Municipalities of Hondo Valle and Juan Santiago.

The study area is located in the South West Regional which includes three agricultural zones: Azua, San Juan and Elías Piña (which coincide with the territorial and political division of the provinces with the same name) in the case of Elijah Zone Pineapple, the only study area included the Sub area Hondo Valle integrated by municipalities Hondo Valle and Juan Santiago.

Sub Zonal division comprised the study area is presented in Table 14

**Table 14** Agricultural Region, Zones and Sub Areas within the study area.

Region	Area	Sub Area
Sur Oeste	San Juan	Sabana Larga
		Juan de Herrera
		Pedro Corto
		Las Matas de Farfán
		Arroyo Loro
		Vallejuelo
		El Cercado
		Bohechío
	Elías Piña	Hondo Valle

The Ministry of Agriculture, in addition to the abovementioned division, divide the area of San Juan (according to their geomorphological, climatic, soil and availability predominant irrigation infrastructure) in three areas:

- a) **Central Corridor**, which covers the northern, central and northeastern areas of the province, which include sub Sabana Larga, John of Blackfriars, Arroyo Loro, Peter Short and Las Matas de Farfán.
- b) **South Strip**, comprising the subzones Vallejuelos and Fencing; and
- c) **Eastern Region**, which covers Bohechío subzone.

The Central Corridor encompasses the 90.70% of the irrigated area in the San Juan area, which is the 9.70% of its total territory. Additionally, the cultivated area in this corridor, 86% is under irrigation. Instead, the South Strip, has only a 7.40% of the irrigated area of the zone, this being only 3.90% of the total area thereof. Meanwhile, the Eastern Region is the

<sup>45</sup> BID. 2014. Diversificación del Valle de San Juan.

smallest percentage of irrigated area has (1.90% to 33% of the cultivated area in this region).

**Table 15** Irrigation area distribution in the San Juan (año 2008),

Region	% del area bajo riego	% del area total bajo riego	% del area cultivada que es bajo riego	menor de 500 msnm
Region Central	90.70	9.70	86.00	33.50
Region Sur	7.40	3.90	30.00	0.00
Region Oriental	1.90	1.20	33.00	3.90
Total	100.00%			

Fuente: PNUD (2010). ODH San Juan.

#### 4.7.1 Irrigation System



In the study area there are several irrigation systems that use water from rivers and dams that feed the various canals and irrigation systems on which farming depends. The San Juan River and the river Macasía with their tributaries, with Sabaneta dams and river Millet, are the most important sources of supplies to systems operating in the study area. Of these, the irrigation canal Jose Joaquin Puello, who channels the waters of Sabaneta dam covers an area of approximately 11,000 Has (175,000 jobs). The construction of this canal was completed in 1978, together with the dam and is located about 300 m downstream from the outlet thereof.

The main channel is about 25 km long, runs along the side of a mountain with open cut and passes higher ground through a tunnel 2 km in length. It was built to expand the irrigated area of the valley and promote programs of land distribution by the government's agrarian reform '70s.

As shown in the diagram below, the San Juan area is irrigated by the systems derived from Sabaneta Dam and River Millet and systems Macasía Baos and rivers, composed of 44 channels carrying a flow rate of 31.5 m<sup>3</sup> / s, with 471.84 km in length (268.70 km and 203.14 km main channels subchannels) to benefit some 9,926 farmers.<sup>46</sup>

In general, by factors such as sedimentation in the headworks and major channels, lack of maintenance of the primary channels and distribution, inadequate irrigation types and the culture of the users, watering systems operate San Juan with significant levels of inefficiency (between 40-75%), as well as other systems in the country: Izura (78%), Mao (70%), and Monte Cristi (60%).<sup>47</sup>

The major irrigation systems in the country today are operated by the users through irrigation boards, since Decree No. 2588 of 20 December 1984, they established their operation and maintenance. Under this provision, in the Valley irrigators boards Mijo-Guanito-San Juan and water committee Valle de San Juan (See Figure 26).

<sup>46</sup> UNESCO-MIMARENA, -et al. (2000) Estudio Deslizamiento de la Cuenta del Rio San Juan.

<sup>47</sup> FAO-FIOMDM-CNC.-2011. Estudio para financiamiento de sistemas de riego para regionales productoras de banano.

Under the Irrigation Districts studio Dominican Republic INDRHI 1994 irrigation systems in the area of San Juan operating under the District of San Juan del Valle handle a flow of 51.47 m<sup>3</sup> / s, to cover an area of 31,727.00 hectares (504,462.00 Tasks) involving 9,926 users.

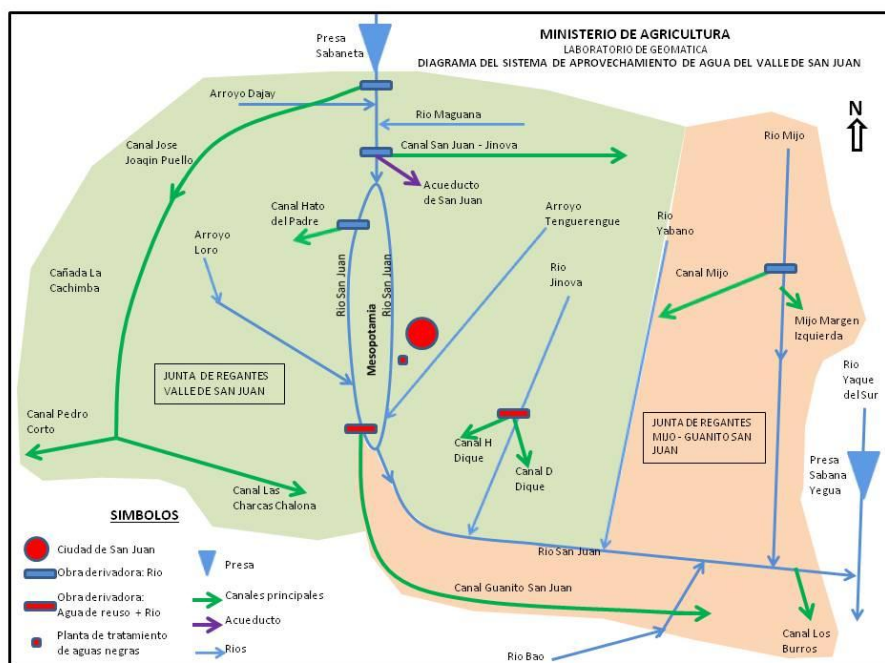
In general, agriculture in the San Juan covers an area that exceeds tasks 600,000.00 per year most of which is under irrigation, as can be seen in the following table. Meanwhile rainfed agricultural area recorded in 1998 263,600.00 tasks (accounting for 41% of total zonal), during ten years has been reduced to 139,800.00 tasks (22.70%) for 2008.

**Table 16** Planted, irrigated and upland area in the San Juan area. (Thousands of Tasks)

Year	Irrigated area	Unpland area	Total
1998-99	425.50	263.60	688.10
2000-2001	407.80	203.10	610.90
2002-2003	373.50	240.90	614.40
2004-2005	378.70	209.30	588.10
2006-2007	437.50	231.10	668.50
2008	475.90	139.80	615.70

Fuente: ODH San Juan. PNUD 2010

The following diagram shows the main irrigation of San Juan, as well as spaces corresponding to each of the Irrigation Boards that manage such systems.



**Figure 26** Diagram of water utilization system of San Juan del Valle.

Source: BID, 2014. Programa de Desarrollo Productivo de San Juan

The main features of the systems of water supply to San Juan indicated below, were taken from the Districts study Watering the Dominican Republic (INDHRI, 1994), under the authorship of Eng. Orlando Ramírez, whose data has not been updated upon the completion of this work. The Department of Hydrology INDRHI in Santo Domingo, accessed September 2014, the connection

that the updated data for the Irrigation District San Juan is captured and under development, thereby validating the data in the study of 1994 referred to above.

Sistemas de riego	Area	Usuarios	Fuente
Olivero	425	233	Arroyo Alondo
La Jagua Dajay	64	38	Arroyo Dajay
Arroyo Doña María	121	180	Arroyo Doña María
El Donao	61	26	Arroyo El Donao
Calabozo-La Piedra	725	166	Arroyo La Ceiba
Cercadilla-La Cruzada	70	33	Río Artibonito
Guarda	62	18	
Pedro Santana	62	36	
Río Bao (bombeo)	61	36	Río Bao
Vallejuelo I	231	100	
Vallejuelo II	227	184	
Vallejuelo (bombeo)	311	146	
Caña Matayaya	1754	470	Río Caña
Matayaya Viejo	221	56	
T.D Río Caña	37	27	
Río Caño (bombeo)	39	18	
Jinova I	1176	384	Río Jinova
La Maguana	205	181	Río Maguana
Los Santiles	672	536	
Rinconcito Macasías	609	178	Río Macasías
Macasías I	320	197	
Macasías II	563	252	
T.D. Río Macasías	209	58	
Mijo	3301	882	Río Mijo
Mijo margen izquierdo	332	130	
Río San Juan Oeste	492	259	Río San Juan
Guanito Sabana Alta	1106	436	

**Table 17** Water Supply Systems Irrigation District San Juan Valley.

Fuente: INDRHI, 2014. Distrito de Riego del Valle<sup>48</sup>.

#### 4.7.2 Main crops Zone

De conformidad con la información disponible hasta el año 2013, suministrada por la URPE Regional del Ministerio de Agricultura, de los diez principales cultivos de la zona de San Juan, en los últimos diez años el área sembrada se ha mantenido entre las 561,877.00 tareas sembradas en el año 2000, 669,178 tareas en el 2006 y 651,354 tareas en el año 2013. En ese periodo, el cultivo del arroz mantuvo un crecimiento hasta el año 2007 cuando alcanzó las 151,083 tareas sembradas, bajó a 125,208.00 tareas en el 2008 y luego aumentó a 167,062 tareas en el año 2009; desde ese año, se ha mantenido en descenso hasta alcanzar las 107,703 tareas en el 2013.<sup>49</sup>

Maize cultivation has remained oscillations in plantings in the period 2000-2013, since 2000 63.240 2003 increased tasks were planted in the year the surface to 153.553 tasks, tasks fell to 76.001 in 2010 and increased to 116.160 in 2013. the cultivation of pigeonpea, although reduced plantings in the period, in the last five years has remained around 60,000 jobs, registering in 2013 a work surface 63.889; ie, 33, 000 tasks unless planted in 2000. On this bean cultivation and environmental conflicts exist because most of the surface of it is grown in areas of fragile soils of the middle basin and high in the area. For its part, the cultivation of beans (Red, Black and White) has remained oscillations plantings, as in 2000 281,700.00 tasks under were seeded at 186.038 in 2008 and then record their highest planting in 2013 with 302.383 jobs.

Crops such as cassava, sweet potatoes and bananas while they are partly to income generation, mainly form the staple diet of many farmers in the area and from the point of view of the area planted no significant changes are recorded. The peanut crop that stayed behind, reaching 4,262 tasks planted in 2012, increased the acreage to 15,534 jobs in 2013. The onion crop grown mainly

<sup>48</sup> Op. Cit. Caracterización Ambiental de la Prov. San Juan

in the southern province of Gaza (Vallejuelos -The Cercado) has experienced some variations and in 2013 recorded a seeded 17385.00 tareas.

**Table 18 Planting in the San Juan Area 2000-2013(Tareas).**

CULTIVOS	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ARROZ	69,082	78,907	60,909	37,249	65,831	107,900	127,173	151,083	125,208	167,062	148,839	129,842	120,673	107,703
MAIZ	63,240	90,574	76,464	153,553	109,598	94,980	102,485	109,770	71,610	83,677	76,001	77,858	116,884	116,160
GUANDUL	96,573	68,662	118,284	92,447	61,619	56,262	94,294	63,618	56,965	63,290	55,653	55,018	61,615	63,889
<b>HABICHUELAS:</b>														
ROJAS, NEGRAS, BLANCAS	281,700	227,205	266,515	226,592	247,634	219,135	277,635	283,439	186,038	219,332	223,579	221,940	260,886	302,383
MANI	4,644	12,182	14,520	8,772	12,130	8,207	10,692	10,032	7,040	13,043	8,548	5,125	4,262	15,534
BATATA	22,894	29,439	24,186	19,091	14,400	19,709	17,577	11,755	33,463	14,284	14,168	23,897	18,977	16,722
YUCA	10,255	11,589	6,463	7,256	10,729	16,282	13,426	10,218	20,095	20,596	8,213	10,791	13,032	10,079
GUINEO	184	320	396	342	462	213	2,824	1,606	2,665	375	1,628	318	532	438
PLATANO	1,026	1,935	2,195	2,249	2,451	2,444	4,538	3,268	2,218	563	491	1,875	1,350	1,061
CEBOLLA	7,844	13,467	13,623	14,972	20,427	16,856	12,136	20,103	16,511	12,310	8,292	15,031	11,985	17,385
TOMATE IND.	4,395	3,483	3,333	3,230	6,614	64	6,398	31	5,354	461	299	121	70	n.d.

Source: Dirección Regional Agropecuaria Suroeste, URPE Regional San Juan de la Maguana, Ministerio de Agricultura, 2014.

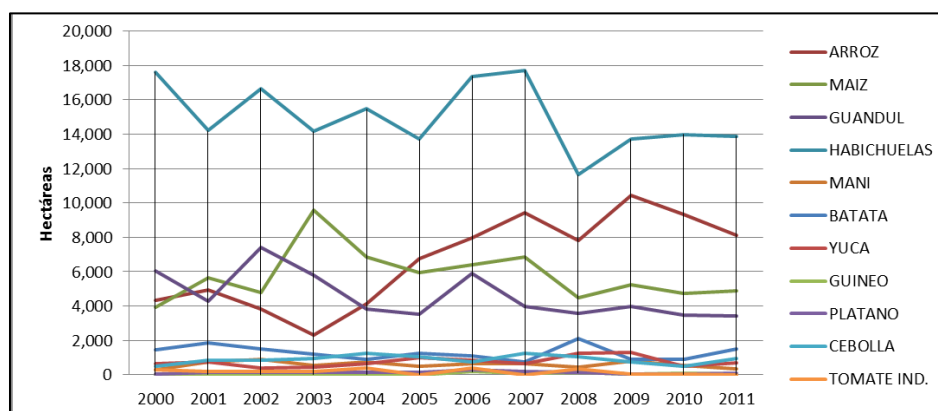
**Table 19 Production in the Zone of San Juan 2000-2013 (Tareas).**

CULTIVOS	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	UNIDAD
ARROZ	374,822	352,605	428,689	228,208	640,690	780,909	784,032	1,093,684	811,067	1,216,776	1,079,033	1,007,907	829,606	965,531	QQS.
MAIZ	62,822	172,040	93,452	164,715	183,717	269,044	198,486	315,728	181,950	309,843	248,017	192,805	297,465	258,380	QQS.
GUANDUL	94,954	89,372	139,063	186,199	83,593	142,928	202,244	218,252	161,810	143,702	266,505	180,971	131,079	93,094	QQS.
<b>HABICHUELAS:</b>															
ROJAS, NEGRAS, BLANCAS	336,164	323,314	281,477	366,515	223,556	343,953	391,181	390,102	320,517	410,117	292,267	322,031	313,416	375,725	QQS.
MANI	21,162	13,447	32,256	25,616	19,754	32,969	37,331	43,836	15,155	20,970	33,242	9,035	11,091	26,798	QQS.
BATATA	228,805	187,959	198,516	195,188	122,563	273,829	143,149	168,655	228,463	335,640	270,504	238,420	197,828	203,630	QQS.
YUCA	65,896	43,335	55,644	41,323	70,244	242,715	218,924	233,683	144,394	435,336	1,273,500	105,000	76,112	114,209	QQS.
GUINEO	41,242	229,508	161,539	118,909	128,727	14,654	117,443	76,554	35,579	33,482	99,792	46,080	16,794	9,810	RACIMO
PLATANO	17,162	12,130	7,760	8,476	11,380	15,418	3,971	11,605	2,770	1,245	2,342	777	4,903	3,698	MILLAR
CEBOLLA	91,399	114,769	161,916	189,541	165,986	278,049	136,661	408,140	299,479	233,172	186,175	396,650	213,098	207,463	QQS.
TOMATE IND.	246,963	211,207	213,589	161,099	180,427	3,095	14,024	1,499	5,116	12,545	16,065	10,470	3,068	n.d.	QQS.

Source: Dirección Regional Agropecuaria Suroeste, URPE Regional San Juan de la Maguana, Ministerio de Agricultura, 2014.

The graph below shows the acreage of the main crops grown in the province of San Juan until 2011.

**Figure 27** Plantings of the main agricultural areas in San Juan(Ha)



Source: Dirección Regional Agropecuaria Suroeste, URPE Regional San Juan de la Maguana, Ministerio de Agricultura, 2014.

From the point of view of production and value of production, rice production in San Juan looms large with an upward trend in the analyzed period, registering more than one million tons of rice in 2011 and more than RD \$ 2,500.00 million pesos a year value. The next most important crops of beans, onions, corn and pigeon peas, as can be seen in the table below. The other important agricultural areas remain relatively stable throughout the production period, the double condition that occurs in the generation of income and subsistence production.

In the San Juan, the five items with the highest production value are rice, beans, red onion, corn and pigeon peas, because according to the calculations of value shown below, these five areas represent 95% of production value of the ten most important analyzed. Taking into account the estimated from the information available for these crops gross margin, it can be inferred that corn-with an 8% margin Brutus has very low levels of profitability under current conditions of low technology and small farms. This situation is similar to the pigeon in general terms; However, pigeonpea cultivation under irrigation is different because the yields are higher. Rice, bean and red onion have volumes and attractive margins that could lead to establishing mitigation and risk transfer in search of safer investments.

**Table 20** Value of Production and estimated gross margin. Province of San Juan. 2011.

PRODUCTOS AGRICOLAS	PRODUCCION	PRECIO RD\$	UNIDAD	VALOR DE PRODUCCION	COSTO DE PRODUCCION	MARGEN BRUTO / UNIDAD	MARGEN BRUTO (%)
ARROZ	1,007,907	2,500.00	QQS	2,519,767,500.00	1,432.00	1,068.00	43%
HABICHUELAS	322,031	2,274	QQS	732,379,001.75	1842.35	431.90	19%
CEBOLLA ROJA	396,650	1,627.32	QQS	645,476,478.00	528.92	1,098.40	67%
MAIZ	192,805	1,070.00	QQS	206,301,350.00	987.29	82.71	8%
GUANDUL	180,971	800.00	QQS	144,776,800.00	680.00	120.00	15%
BATATA	238,420	461.00	QQS	109,911,620.00	319.12	141.88	31%
YUCA	105,000	698.00	QQS	73,290,000.00	326.65	371.35	53%
MANI	9,035	1,716.00	QQS	15,504,060.00	1092.41	623.59	36%
GUINEO	46,080	121.00	Racimo	5,575,680.00	38.77	82.23	68%
PLATANO	777	4,685.00	Millar	3,640,245.00	987.29	3,697.71	79%
TOMATE IND.	10,470	195.00	QQS	2,041,650.00	174	21.00	11%

Source: Fundación REDDOM, 2014. Estudio viabilidad seguros agrícolas.

According to the environmental characterization of Elias Pina<sup>49</sup>, in the province (within which lies the subzone of Hondo Valle), 30 cultures were recorded, of which eight of them are the most important for their commercial value and cultivated areas: black rice, corn, peanuts, red beans and , pigeon peas, sweet potatoes and cassava. Also important is the production of coffee and avocado, particularly greater extension properties.

**Table 21** Size of planting and harvesting. Sub Hondo Valley Agricultural Area (Tareas).

Cultivo	2010		2011		2012		2013	
	Siembra	Cosecha	Siembra	Cosecha	Siembra	Cosecha	Siembra	Cosecha
Arroz	440	500	128	128	98	73	45	75
Hab. Roja	17,316	18,625	14,408	13,686	12,034	16,034	12,551	12,598
Hab. Negra	22,335	20,321	19,420	17,218	18,565	19,096	11,169	20,232
Guandul	13,497	5,825	4,863	6,343	0	4,146	4,634	6,908
Batata	55	48	13	20	0	0	3	3
Yuca	59	0	53	0	47	53	0	47
Maiz	7,079	393	11,497	9,278	6,464	14,085	3,932	10,760
Plátano	75	0	0	178	0	3	0	5
Guineo	0	2,345	0	1,952	31	2,162	0	2,024
Aguacate	0	9,479	5,000	9,093	0	11,929	0	5,586
Cebolla	0	11	0	10	10	10	55	55
Café	0	9,646	0	12,132	0	21,690	0	0
<b>Total</b>	<b>60,856</b>	<b>67,193</b>	<b>55,382</b>	<b>70,038</b>	<b>37,249</b>	<b>89,281</b>	<b>32,389</b>	<b>58,293</b>

Source: Ministerio de Agricultura Sub Zona Hondo Valle. 2014.

**Table22.** Production. Sub Zona Agrícola Hondo Valle.

Cultivo	Unidad	2010	2011	2012	2013
Arroz	Fanegas	2198	640	367	344
Hab. Roja	Quintal	10076	8690	8803	9422
Hab. Negra	Quintal	10975	15239	11603	17326
Guandul	Quintal	5694	6373	4146	6908
Batata	Quintal	385	145	0	24
Yuca	Quintal	393	0	371	282
Maiz	Quintal	393	92789	14085	10760
Plátano	Millar	0	390	0.6	1
Guineo	Racimos	30366	29000	33365	26450
Aguacate	Unidad	3316	3560	2012	2088.6
Cebolla	Quintal	88	50	81	336
Café	Quintal	3593	8250	4875	0

Fuente: Ministerio de Agricultura Sub Zona Hondo Valle. 2014.

#### 4.7.3 Innovation and Credit

While the supply of credit in San Juan has shown steady growth in recent years, reaching US \$ 90.00 billion between 2012-2013 only 13% of this was directed to the agricultural sector, which reflects the low coverage of it. (Productive Development of the province of San Juan IDB, 2014).

The credit market imperfections such as information asymmetry, bias in monetary and financial law, coupled with the perceived risk associated with agriculture, limited access to credit for small

<sup>49</sup> Op. Cit. Ministerio de Medioambiente y Recursos Naturales / GIZ. (2011)

farmers. On the demand side, producers are faced with the lack of guarantee for the lack of titles (Only 15% own title), and the difficulties to meet the formal requirements established by financial institutions (states financial, business plans, investment plans, accounts and records of the company, etc.), due to its weak administrative and managerial capacity.

Consequently, small farmers in San Juan are mainly financed by loans from the informal market or trade credit for short-term working capital for businesses and people buying, and high interest rates. As a result, the levels of investment in technology and innovation between producers in the province are extremely low, limiting the possibilities of investment in productivity improvements and compliance with the requirements of volume and quality demanded by international markets. In the area have raised expectations with the visits of the president, and the ads reconversion project of San Juan, because if any intervention does not occur, the constraints and the cost of credit will continue its upward trend; however, to consolidate the process of productive restructuring credit needs particularly for technology investment (irrigation technology, production in controlled environments, etc.) may increase considerably in the area.

The following table illustrates the movement of the loan portfolio of the Agricultural Bank of San Juan.

**Table23. Lending. Branch San Juan de la Maguana. Agricultural Bank of the Dominican Republic.(Años 2009-2013).**

AÑOS	FORMALIZADO			PRODUCT. BENEF.	DESEMBOLSOS	COBROS
	CANTIDAD	SUPERFICIE (TAREAS)	VALOR (RD\$)		REALIZADOS (RD\$)	REALIZADOS (RD\$)
2009	976	64,291	171,217,693	1,135	162,625,953	195,262,595
2010	925	43,547	203,941,309	928	192,252,554	179,578,348
2011	798	36,281	193,596,011	798	191,476,891	192,295,524
2012	677	31,787	130,712,902	677	123,361,167	140,911,562
2013	2,035	72,120	405,034,983	2,035	377,174,253	186,216,192
<b>TOTAL GENERAL</b>	<b>5,411</b>	<b>248,026</b>	<b>1,104,502,898</b>	<b>5,573</b>	<b>1,046,890,818</b>	<b>894,264,221</b>

Source: Banco Agrícola de la República Dominicana. 2014. Boletines estadísticos.

#### **4.7.4 Limitations of accessibility to markets.**

The province of San Juan has good accessibility by road to major cities, ports, airports and border, but the poor condition of the local road network and productive ways serving production areas increases the cost and time of producers to access markets. The MA estimates that 63% of a total of 521 km of roads in inventoried San Juan, are poor or very poor condition. In consultations, producers indicate that freight costs for the areas of interest of the project doubled freight costs in other areas of the country with good road connectivity. Similarly, it is estimated that some communities (especially in the case of Hatico) travel times are up to three times greater than would result if the roads were in good condition. It was found with primary information that there is a significant lag in routine and preventive maintenance and, in the case of productive ways, lack of investment to equip them with the best features of engineering, especially to resolve issues of lateral and longitudinal drainage.

#### 4.7.5 Population dedicated to the productions under consideration.

The following table shows the number of farmers under IX Population and Housing Census conducted in 2010.

**Table24. Agricultural producers harvested area in the Province of San Juan.**

Provincia	Número de productores agropecuarios*	Hogares agrícolas*	Superficie en producción (Hectáreas)**	Tamaño promedio de fincas (Hectáreas / Productor)**
San Juan	16,071	6,906	41,893.00	2.61

Source: ONE. 2010. El entorno de los productores agropecuarios.

As can be seen by comparing the number of producers with production area, one can infer that the farms are mostly small. This is so, since the average San Juan is 2.61 hectares per farmer. The agricultural sector employs 12.5% of the area of San Juan.

Agricultural activity remains important in both provinces, since 27% of rural households have farming area in San Juan. In this sense, the family economy in these states depends significantly on the stability of agricultural production.

#### 4.7.6 Types of farms

According to data presented in the previous section, farms in San Juan are generally of small size, being on average 2.61 hectares per farmer. Although no recent data, the "National Register of Agricultural Producers, 1998" shows that 15% of farms in the Southwest Region has 3.12 hectares or less. Furthermore, 32% of the cultivated area under irrigation and the rest -68% - is handled in dry.

**Table25. Total are (Tareas) according to the size of the property**

Tamaño propiedad (Tareas)	Norte	Nordeste	Noroeste	Norcentral	Central	Sur	Suroeste	Este	Total	Distribución
1 a 5	16,525.00	9,743.00	4,983.00	9,560.00	15,048.00	3,675.00	4,415.00	5,870.00	69,819.00	0.50%
6 a 10	49,757.00	32,854.00	20,273.00	31,336.00	52,675.00	16,076.00	31,328.00	13,264.00	247,563.00	1.78%
11 a 20	124,535.00	91,227.00	74,697.00	79,652.00	133,530.00	53,844.00	133,853.00	31,752.00	723,090.00	5.21%
21 a 50	288,600.00	500,369.00	380,251.00	273,241.00	462,687.00	221,429.00	520,040.00	155,927.00	2802,544.00	20.18%
51 a 100	237,057.00	416,866.00	179,274.00	254,058.00	541,587.00	294,367.00	563,691.00	145,350.00	2632,250.00	18.96%
101 a 500	382,250.00	703,430.00	436,908.00	494,566.00	811,985.00	708,512.00	610,221.00	217,577.00	4365,449.00	31.44%
501 a 1000	60,330.00	237,100.00	112,122.00	136,279.00	180,337.00	143,339.00	74,507.00	80,397.00	1024,411.00	7.38%
1001 a 5000	80,155.00	256,838.00	129,587.00	117,674.00	200,526.00	193,713.00	71,488.00	155,864.00	1205,845.00	8.68%
5001 a 10000	8,000.00	21,630.00	5,500.00	7,000.00	50,830.00	35,250.00	14,610.00	44,000.00	186,820.00	1.35%
10001 y más	-	48,000.00	79,110.00	50,000.00	157,300.00	98,564.00	-	194,697.00	627,671.00	4.52%
<b>Total tareas</b>	<b>1247,209.00</b>	<b>2318,057.00</b>	<b>1422,705.00</b>	<b>1453,366.00</b>	<b>2606,505.00</b>	<b>1768,769.00</b>	<b>2024,153.00</b>	<b>1044,698.00</b>	<b>13885,462.00</b>	<b>100.00%</b>
<b>Distribución</b>	<b>8.98%</b>	<b>16.69%</b>	<b>10.25%</b>	<b>10.47%</b>	<b>18.77%</b>	<b>12.74%</b>	<b>14.58%</b>	<b>7.52%</b>	<b>100.00%</b>	

Source: Registro Nacional de Productores Agropecuario 1998. Ministerio de Agricultura MARD.

#### 4.7.7 Techonology Level

In San Juan, rice accounts for 50% of agricultural production and market value is within the traditional reflecting higher level of technology (use of seed, land preparation, use of inputs and mechanized harvesting), while other crops of importance are the beans, red onion, corn and pigeon peas, which form together with the rice more than 90% of the production of commercial value as discussed above. These items and according to the information obtained in the area,

maintain an above average national average, favored by hydroclimatic conditions and availability of water for irrigation.

The table below summarizes the technological level of the main crops from farm evaluations performed by the technical team REDDOM and information provided by the technical staff of the offices San Juan de la Maguana Hondo Valle and the Ministry of Agriculture. This is presented in conjunction with the yields achieved in San Juan for 2012 compared with the national average for the same year.

**Table26. Technological level of major crops from farm assessments**

PRODUCTOS AGRICOLAS	NIVEL TECNOLÓGICO CONSIDERADO	TECNOLOGIA UTILIZADA	RENDIMIENTO PROMEDIO NACIONAL (Tonelada/Hectárea)	Azua: RENDIMIENTO PROMEDIO	San Juan: RENDIMIENTO PROMEDIO
ARROZ	Medio - Alto	Se utiliza maquinaria agrícola para la preparación del terreno y la cosecha. Se aplican prácticas culturales con regularidad y de manera sistemática. Se trabaja en sistemas de riego por inundación. En general, se emplean semillas certificadas.	3.18	3.86	3.80
MAIZ	Bajo	Se mecaniza la preparación y siembra. Se suele utilizar sistemas de riego por inundación. Es un cultivo que se prepara en asociación o rotación con otros. Su recolección es manual. Aproximadamente, el 60 % de los productores utiliza semillas certificadas, mientras que el resto emplea semillas propias.	1.64	3.96	2.04
MANI	Bajo	Se trabaja principalmente en seco. Se emplea mecanización para la preparación del terreno y la siembra. Su recolección es manual.	1.53	1.75	1.82
HABICHUELA S (FRIJOLES)	Bajo - Medio	Las prácticas culturales suelen ser mecanizadas y generalmente se utilizan semillas certificadas. Se trata de un cultivo de rotación que se alterna con el arroz en la parte baja y con el guandul en la parte alta.	1.01	0.74	1.08
GUANDUL	Bajo - Medio	El guandul se cultiva en seco en las laderas de las montañas (70 %); mientras que en las llanuras se desarrolla con sistemas de riego por inundación, mecanización de algunas labores, y se emplean variedades mejoradas e insumos especializados. Estos últimos generan mayor rendimiento por área, pero incurrir en mayores costos debido a los insumos e implementos utilizados.	1.08	1.12	2.55
BATATA	Bajo	Este cultivo se trabaja en seco y con muy bajo nivel tecnológico. Se cultiva en asociación con el guandul en la parte alta, mientras que en la llanura se alterna con el arroz y se combina con el maíz. Las variedades empleadas son locales, sin enfoque sistemático de mejoramiento genético.	8.16	9.49	9.45
YUCA	Bajo	Este cultivo se cultiva en seco en asociación con el guandul. No se emplean insumos agrícolas en niveles significativos. No obstante, algunas fincas de la parte baja utilizan máquinas para las principales labores culturales y agroquímicos para el control de plagas y enfermedades. Las variedades empleadas son locales, sin enfoque sistemático de mejoramiento genético.	7.93	7.40	10.18
BANANO (GUINEO)	Bajo - Medio	Algunas labores del cultivo son mecanizadas, pero no se cuenta en general con sistemas de riego por goteo, cable-vías u otros implementos considerados necesarios para aumentar la eficiencia de las explotaciones. Las prácticas culturales son manuales, pero con un enfoque muy definido hacia el manejo inocuo, la calidad y la exportación. Muchos productores cuentan con certificación orgánica y algunos pocos con certificación Global GAP.	19.88	18.15	14.66
PLATANO	Bajo	Se mecanizan algunas labores, pero en general el trabajo se realiza manualmente. Se utilizan insumos agrícolas especializados para la fertilización y el control de plagas. El material de siembra se pasa de un productor a otro sin control de calidad.	14.55	14.72	19.08
TOMATE INDUSTRIAL	Medio	Se mecanizan las labores, se utiliza sistema de riego por goteo en algunas fincas y por inundación en las demás. También, se emplean insumos especializados y el material de siembra es certificado.	29.09	35.58	21.82
CEBOLLA	Medio	Algunas labores son mecanizadas, pero el cultivo depende significativamente del uso de mano de obra. Algunas fincas utilizan sistemas de riego por goteo, mientras que la generalidad emplea riego por inundación. Se emplean insumos especializados para la fertilización y el control de plagas y enfermedades. Se utilizan semillas certificadas.	17.75	14.21	18.18

Source: Viabilidad seguros agropecuario REDDOM.2014.

#### 4.7.8 Productive Cycles

The following table shows the production cycle and the time of harvest of the main crops and Hondo Valle San Juan corroborated from the consultation producers and technicians of San Juan and subzone Hondo Valley.

During the consultation it emerged that some crops like beans have been changes in traditional planting and harvesting, which in some cases delays to advances date up to one month, vegetables and onion combined cycles respecting closed seasons, the danger of spread of whitefly.

**Table27. Production cycle of San Juan y Hondo Valle.**

Cultivos	Siembra	Cosecha	Ciclo Siembra - Cosecha (meses)
ARROZ	Junio - Julio	Octubre - Diciembre	4
MAIZ	Escalonado todo el año		4
MANI	Junio - Agosto	Noviembre - Febrero	4
HABICHUELAS (FRIJOLES)	Octubre - Noviembre	Febrero - Marzo	3.5
GUANDUL	Zona alta: Junio - Julio	Zona baja: escalonado, todo el año. Zona alta: Noviembre - Marzo	4 a 7
BATATA	Octubre - Noviembre	Febrero - Marzo	4
YUCA	Escalonado, todo el año		10 - 12
GUINEO	Escalonado, todo el año		12
PLATANO	Escalonado, todo el año		12
TOMATE INDUSTRIAL	Septiembre - Noviembre	Diciembre - Febrero	3
CEBOLLA	Mayo - Julio	Septiembre - Diciembre	4

Fuente: REDDOM .2014 . Viabilidad de seguros agropecuario

#### 4.7.9 Tenure and land registration.

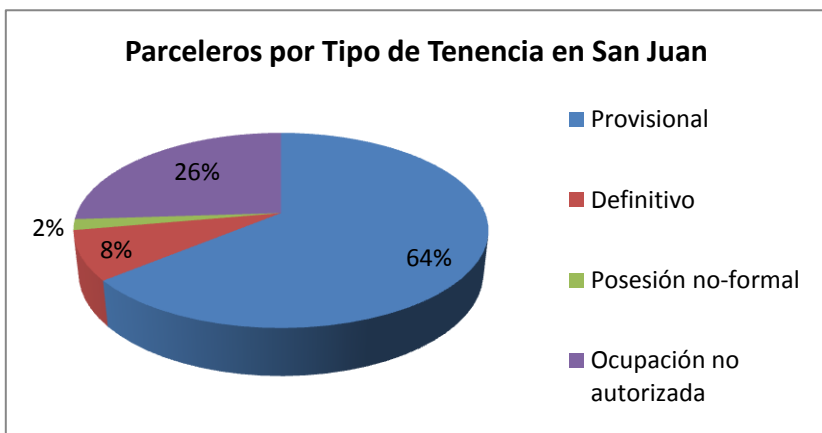
The situation in San Juan is very similar to that presented in Azua and Elías Piña, and in the subzone of Hondo Valle. Most farmers have plots of less than 2.1 hectares, while the overall average is 2.61 hectares. While land reform has had an impact on San Juan de la Maguana with land distribution programs for farmers, the condition of informality in the register of agricultural holdings as property persists. This is so, despite the fact that following the construction of the Sabaneta Dam and River Millet, the process of land reform had enough momentum to have a major impact on the province. So in most cases the material available to the farmer is not valid for mortgage purposes or legal transactions of any kind.



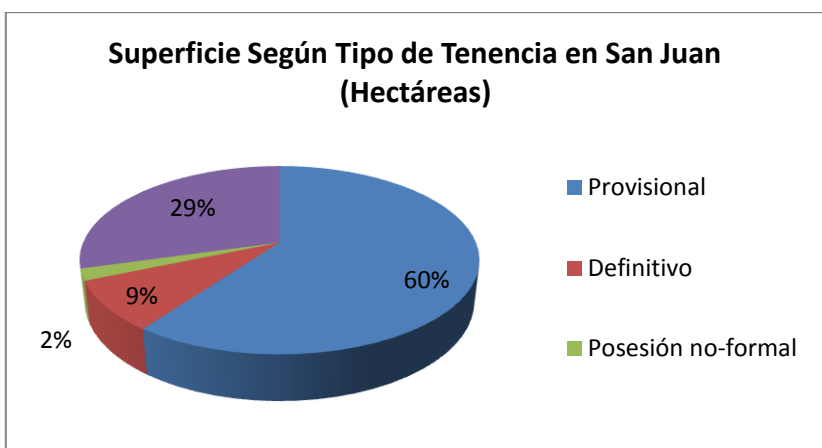
In this respect, the most relevant information are provided by the Regional Number 7 of the Dominican Agrarian Institute (IAD) in your inventory, 2008, and discussed below.

Excluding land and settled in the dry forest projects, the Regional Num. 7 IAD recorded to 2008, a total of 25 agricultural settlements in the Province of San Juan de la Maguana, benefiting 3,388 settlers in 7,004 acres for agricultural use. A total of 2,138 smallholders (60%) only have a provisional title and

only 272 farmers (9%) have permanent title. Other forms of ownership of land totaling 31%, with a remarkable 26% of unauthorized occupants of land. The following graphs illustrate this situation. Also, a summary of the data provided by the IAD in regard to the settlements in the province of San Juan de la Maguana presented.



Source: Estudio Viabilidad de seguro Agropecuario.



Source: Estudio Viabilidad de seguro agropecuario REDDOM. 2104

**Table 28. Parceleros by type of tenure according to records of the Dominican Agrarian Institute in San Juan.**

Asentamiento	Parceleros por Tipo de Tenencia en San Juan				Cantidad Total de Parceleros	Superficie Según Tipo de Tenencia en San Juan (Hectáreas)				Superficie Total (Hectáreas)
	Provisional	Definitivo	Posesión no-formal	Ocupación no autorizada		Provisional	Definitivo	Posesión no-formal	Ocupación no autorizada	
ANACAONA	81	7	0	3	91	141.75	9.25	-	5.25	156.25
CALABOZO	43	0	1	10	54	80.63	-	1.88	18.75	101.25
CANOA	58	0	0	0	58	102.50	-	-	-	102.50
CARRERA DE YEGUAS	109	0	2	0	111	206.00	-	3.13	-	209.13
CORRAL DE LOS INDIOS	127	0	0	1	128	238.13	-	-	1.88	240.00
EL HATO	19	20	0	3	42	23.75	24.38	-	3.75	51.88
EL PINAR	39	0	0	100	139	92.13	-	-	432.25	524.38
EL PROGRESO	17	0	0	16	33	29.25	-	-	27.50	56.75
GUANITO	46	0	17	337	400	149.50	-	55.25	1,095.25	1,300.00
LA ALTAGRACIA	70	4	6	5	85	87.50	4.88	7.50	7.50	107.38
LAS MERCEDES	15	0	0	5	20	22.50	-	-	7.50	30.00
MAGUEYAL	150	49	0	14	213	281.25	120.75	-	26.25	428.25
MATAYAYA	127	0	2	0	129	227.88	-	3.13	-	231.00
MOGOLLON	106	5	0	16	127	192.13	9.63	-	29.00	230.75
MOGOLLON II	237	28	15	31	311	414.75	39.69	26.25	41.75	522.44
PEDRO CORTO	403	121	14	90	628	1,133.44	336.19	39.38	273.38	1,782.38
SABANA SANTOME	300	7	0	14	321	468.75	9.19	-	21.88	499.81
SAN FCO. DE ASIS	3	0	0	2	5	5.63	-	-	25.00	30.63
SAN ISIDRO	51	0	1	3	55	63.75	-	1.25	3.75	68.75
SAN J. BAUTISTA	9	21	0	0	30	14.06	33.00	-	-	47.06
SAN MARTIN DE PORRES	16	0	0	13	29	20.00	-	-	16.25	36.25
SANTA LUCIA	54	1	2	13	70	67.50	1.50	2.50	16.25	87.75
VALLE JUELO	49	0	0	188	237	131.69	-	-	0.56	132.25
YABONICO	9	9	0	4	22	11.25	10.94	-	5.00	27.19
<b>Totales</b>	<b>2,138</b>	<b>272</b>	<b>60</b>	<b>868</b>	<b>3,338</b>	<b>4,206</b>	<b>599</b>	<b>140</b>	<b>2,059</b>	<b>7,004</b>

Fuente: Instituto Agrario Dominicano en San Juan. S/F

#### 4.8 Socio Economics Aspects

In this subchapter socioeconomic factors related to vulnerability and adaptive capacity to climate change in the population of the province of San Juan and subzone Hondo Valle-Juan Santiago, Elías Piña province are analyzed.

The objective of this analysis was to identify in those geographic areas and major social and economic vulnerability to adverse effects of variability of atmospheric phenomena and climate change capabilities.

The information is presented at the territory of the province of San Juan and disaggregated in the six municipalities that comprise more municipalities Hondo Valle and Juan Santiago, Elías Piña province. It also contains indicators of vulnerability and adaptive capacity at Borough.

It is assumed that there is a strong link between poverty and vulnerability to adverse weather conditions and the effects of climate change. In this regard, the analysis focuses on poverty indicators, both general and extreme poverty in monetary terms defined poverty as poverty Unsatisfied Basic Needs (UBN). We also used the Quality of Life Index (QLI).

Among the variables related to the living conditions of the population and, to a greater or lesser extent, linked to the environment, are the conditions of housing (floor materials, roof walls), paths to the same, overcrowding, exposure to pollution and risks of being affected by natural phenomena; availability of drinking water and power supply; consumption of firewood and charcoal for cooking; availability of health services and garbage collection; access to electricity and

information technology and communication; level of education and schooling; occupation by industry and other labor market indicators .

#### 4.8.1 Population

The population of the province of San Juan is 232 thousand inhabitants (2010 census), equivalent to 2.4% of the country's population and occupies an area of 3,364 km<sup>2</sup> (6.9% of the country), for a population density of 69.1 inhabitants / km<sup>2</sup>. 60% of the population is urban and 40% rural. The female population accounts for 47%, while the remaining male 53% of the total due to the higher concentration of people living in rural areas

76% of the province's population is concentrated in two of its six municipalities: the village San Juan 57% and Las Matas de Farfán 19%. The former occupies 51% of the province and the second 8%, with population densities of 76 and 160 inhabitants / km<sup>2</sup>, respectively. El Cercado is a district of the province with the highest population density (224 inhabitants / km<sup>2</sup>) and the lowest density is Juan de Herrera (20 inhabitants / km<sup>2</sup>). Agriculture is the mainstay of the resident population.

**Table29 Population Provincia of San Juan according to gender and residential area 2010**

Residential area	Total	Gender	
		Male	Female
<b>Total</b>	<b>232,333</b>	<b>122,550</b>	<b>109,783</b>
Urbana	139,620	71,113	68,507
Rural	92,713	51,437	41,276

Source: ONE. Perfiles estadísticos provinciales, 2010.

The core of the population of foreign-born residents in the province is about 5%, relatively lower than the national average percentage where according to the National Immigrant Survey, 5.4% of the population is immigrants estimated at about 450,000 people of which 87.3% are persons born in Haiti.

The Sub-area consists of the municipalities Hondo Valle and Juan Santiago, Elías Piña province has an area of 224.8 km<sup>2</sup> and a population of 14,947 inhabitants, for a population density of 66 inhabitants / km<sup>2</sup> (86 Hondo Valle and Juan Santiago 43 ).

**Table30 Population density in the municipalities of San Juan province and sub-area Hondo Valle-Juan Santiago. Año 2010**

Province and municipality	Male	Female	Total Population	Area (km <sup>2</sup> )	Ppopulation density (hab/km <sup>2</sup> )
<b>Provincia San Juan</b>	<b>122,550</b>	<b>109,783</b>	<b>232,333</b>	<b>3,364</b>	<b>69.1</b>
San Juan	69,329	62,848	132,177	1,728.0	76.5
Bohechío	5,334	4,351	9,685	406.1	23.8
El Cercado	11,312	9,531	20,843	92.9	224.4
Las Matas de Farfán	23,014	21,149	44,163	278.0	158.9
Juan de Herrera	6,891	6,171	13,062	637.1	20.5

Province and municipality	Male	Female	Total Population	Area (km <sup>2</sup> )	Ppopulation density (hab/km <sup>2</sup> )
Vallejuelo	6,670	5,733	12,403	221.7	55.9
<b>Subare HV-JS</b>	<b>8,032</b>	<b>6,915</b>	<b>14,947</b>	<b>225</b>	<b>66.5</b>
Hondo Valle	5,638	4,949	10,587	122.6	86.4
Juan Santiago	2,394	1,966	4,360	102.2	42.7

Source: ONE. Tu Municipio en Cifras.

<http://www.one.gob.do/index.php?module=articles&func=view&catid=252>

In recent decades, the province of San Juan has been a significant migration process according to NSO data (2014) show that in the period 2002 to 2010 más half, estimated around 150,000 people emigrated.

***"People started to migrate because it was not raining"***

According to the Office of the UNDP Human Development, "migrations caused depopulation and disappearance of distant communities. In Jorjillo (Vallejuelo place) there are communities that have disappeared, according to testimony collected in the field research ", which realize the story of people about the migration process was experienced:

"Of the 74 forwards began to take leave because those years around here were bad years that only those who had roots as breeds of animals in order to remain, because here no rain will put up with, I have a reminder of all those things."

"In Maisabel, not living people. Also Head Rodeo. Cañada de los Pinos. Ingenuity, Picano, all gone. Dubbo, few people still alive, and Pill. ""If it had not migrated many people this is a village, it was in the year 1974 when he started dating a lot of people. They were bad years, and people began to migrate because it was not raining ... "

Source: UNDP. Provincial Human Development Reports. San Juan Province. Dominican Republic.

Table 31 (based on recent incidence of the effects of climate change) scenarios showing how people behave in the province of San Juan and the town Hondo Valley in 2030 and 2050 under the following scenarios:

- A) the average annual growth rate of the population recorded in the period 2002-2010, which was -0.46% in the province of San Juan and 0.16% in the municipality Hondo Valle and Juan Santiago is maintained. That is, calculating the population potentially affected by future weather events under the assumption that they have not taken adaptation measures to reduce vulnerability (no change in poverty, health, education, production, employment, and other variables related to the degree of vulnerability)
- B) Both rates decreased 25% for recorded changes in those variables.
- C) Both rates increase 25% for recorded changes in those variables.

In scenario A, the population of the province would increase from 232,000 inhabitants in 2010 to about 212,000 in 2030 and 193,000 in 2050. In scenario C, the population was reduced to 207,000 in 2030 and 184,000 in 2050.

According to these three scenarios, the current population of the province would record a decrease between 16 000 and 25 000 inhabitants by 2030 and between 30 000 and 48 000 in 2050. In the case of Sub-area Hondo Valle Juan Santiago, whose collective population has

decreased over the period 2002-2010 at an annual rate of -0.16%, one would expect that the population of the sub-region is reduced from 350 to 600 inhabitants by 2030 and between 700 and 1,140 2050.

**Table31 Estimated population of the province of San Juan and the Sub-area Hondo Valle-Juan Santiago in 2030 and 2050 under three scenarios.**

Municipality	Population census	Population census	Annual rate growth avg.2002-2010	Population estimate scenario					
				A		B		C	
				Same growth estimate 2002-2010		Rate growth decreases 25%		Rate growth increases 25%	
				2030	2050	2030	2050	2030	2050
Provincia San Juan	241,105	232,333	-0.46%	211,774	193,034	216,745	202,203	206,911	184,271
Sub-zona Hondo Valle-Juan Santiago	15,138	14,947	-0.16%	14,480	14,028	14,595	14,252	14,365	13,806

#### 4.8.2 Vulnerability to poverty and unmet basic needs (UBN)

The vulnerability of the population in the study area to the effects of climate change is increased in the case of significant segment of the local population living in poverty, both in terms of monetary-based poverty as poverty Unsatisfied Basic Needs (UBN) .

For example, a very high proportion of the population in the study area do not have sufficient income to purchase a basket of food and other basic goods and services (line general or moderate poverty) and a large segment of monthly income are not sufficient to cover the cost of minimum food needs for one month (extreme poverty line).

Below is presented in more detail the behavior of a number of socioeconomic indicators.

##### • Poverty Level

Of the 63.519 households recorded by the census of 2010 in the province of San Juan, 40.209 correspond to families living in conditions of widespread poverty and are 15,534 households in extreme poverty or indigence. The percentage of poor households in the province is 63%, representing 22.6 points (56%) above the national average (40.4%); while the percentage of households in extreme poverty is 24.5%, more than double the national average (10.4%).

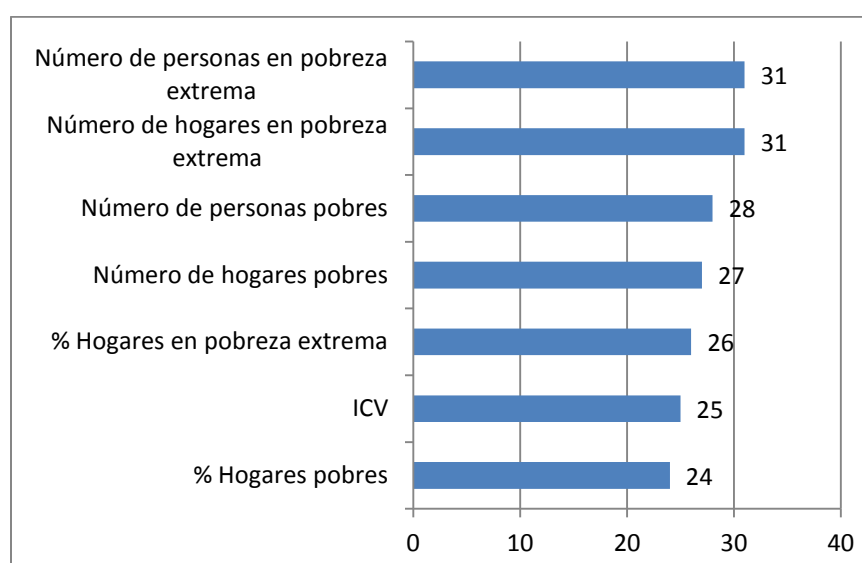
The poor in this province is 144.445 people, or 3.8% of the total poor in the country, while the number of people in extreme poverty is 52.687, accounting for 5.8% of the population in extreme poverty (Appendix 7).

In terms of number of households and people living in extreme poverty, San Juan province occupies position 31 among the 32 provinces of the country, surpassed only by the Santo Domingo province concentrating quarter of the population, in which the extremely poor households comprising 45.541 and 157.587 people. That is, San Juan is the second province with the highest number of homes and homeless people.

In number of households and people in general poverty situation, this province occupies the 27th and 28th places respectively, while their quality of life index (LCI) has been calculated at 59.7 (13.5 points below 73.2 is the national average) , occupying the 25th position among the 32 provinces (Figure 28).

On the other hand, the human development index (HDI) in the province has been calculated by UNDP in 0349, ranking 23rd in the provinces. The indices of the three basic components of the HDI of the province are: health 0.344 (position 20), education 0.400 (position 25), and income 0.310 (position 24). The national average of those indices is 0.399, 0.616 and 0.549, respectively. The level of per capita income of the province in 2010 dollars was estimated at RD \$ 18.967, equivalent to 65% of the national average (RD \$ 27.798)<sup>50</sup>.

**Figure 28** Position of San Juan Province among the 32 provinces of the Dominican Republic on indicators of poverty and quality of life. 2010



Source: MEPLYD. (2013) Atlas Nacional de la pobreza 2010 en la República Dominicana

In Sub-area Hondo Valle-Juan Santiago poverty level is much higher than in the province of San Juan. Of a total 3,740 households in the sub-region, 3,251 (87%) are poor and of these 1,982 households (53%) for families living in extreme poverty. The number of poor people in Sub-area is 12,970 people and 7,964 of them live in poverty or extreme poverty. The Quality of Life Index Sub-area has been estimated at 47.9 points<sup>51</sup>.

#### • Unmet basic needs (UBN)

This indicator can be analyzed more deeply the adaptability of the population lacking basic resources. Based on the methodology of NBI, a household is considered poor with 3 or more unmet basic needs of a total of 15 social deprivation included in the measurement. Under this

<sup>50</sup> Op.Cit., PNUD (2013). Mapa de Desarrollo Humano .

<sup>51</sup> Promedio de los ICV de Hondo Valle (49.1) y Juan Santiago (45.1) reportados por el MEPLYD en el Atlas de la Pobreza 2010, ponderado por la población del municipio.

criterion, 55.7% of households in the province of San Juan are poor, well above the national average (36.9%) percentage.

Among the most relevant indicators were analyzed: 1) Payment of housing infrastructure, 2) access to drinking water, toilets, trash collection and use of charcoal or wood to cook food, 3) availability of electricity and appliances, 4) levels of education and literacy 5) access to transportation and information technologies and communication.

- ***Vulnerability to bad housing conditions***

The quality of housing infrastructure is an important factor in the analysis of population vulnerability to weather events. Improper house, built of brittle materials and few lasting only represent a risk to certain natural phenomena, are more subject to fire risk for failure of the power system or the use of wood or charcoal for cooking, as is frequently in many poor families.

The poor quality of housing has a direct impact on the quality of life of a high proportion of households in the study area, not only because of the risks outlined above, also for the implications of an insufficiently protected household dust, temperature, humidity and other factors that affect health, such as overcrowding due to space limitations. Even the home environment becomes unsuitable for the development of studies and other capabilities of the family.

A significant proportion of households in the province of San Juan are built with inadequate materials (asbestos, cement, palm leaf, cane, etc.), or are part of barracks and tenements, or do not have the minimum space required.

As shown in Table 32, a fifth of households in the province of San Juan (about 12,800 households) live in homes with dirt floors, a proportion that is equivalent to more than 5 times the national average. It is estimated that 4.6% of households have inadequate roof materials, while 5.3% of houses have walls of unsuitable materials (such as table palm palm leaves, shingles). The national average is much lower in both cases, 1% and 2.6% respectively. In the rest of the study area, ie, in the sub-area Hondo Valle-Juan Santiago, the proportion of households with a dirt floor is much higher, and the lower the percentage of households in housing with inadequate materials on ceilings and walls.

**Table 32 Percentage of households in housing with inadequate materials and overcrowded dwellings in San Juan Province and sub Hondo Valley area**

Indicator	Indicator Value		
	Prov. San Juan	Sub-zona HV-JS*	Country
% Households with dirt floors	20.1	36.1	3.7
% Households in housing with inadequate roof materials	4.6	4.0	1
% Households in dwellings with walls of unsuitable materials	5.3	2.0	2.6
% Households with more than 3.5 persons per room	11	19.1	11.6
% Households living in barracks, row house, tenement, part behind	4.9	2.1	7.8
* Average of indicators reported by MEPLYD for municipalities Hondo Valle and Juan Santiago, weighted by the number of households.			

Source: MEPLYD. (2013) Atlas Nacional de la Pobreza en la República Dominicana 2010

Another indicator of risk and vulnerability is overcrowding, measured in terms of number of people per room. In San Juan province, 11% of households have an average of more than 3.5 persons per room ratio slightly lower in the province than the national average (11.6%). While the Sub-area Hondo Valle-Juan Santiago that percentage is much higher; about 19% of families live in overcrowded conditions.

Living in households located in barrancones in row houses, tenements or in part behind other houses, also a higher level of vulnerability and less able to cope with certain weather events or natural disasters. In San Juan province, nearly 5% of households (about 3,100) are located in areas with these characteristics, a percentage that is lower in Sub-area Hondo Valle-Juan Santiago (2.1%). Nationally, the proportion is higher (7.8%).

Regarding the access roads to housing, it should be noted that while nationally 46% of households have access via paved road in the province of San Juan this ratio is only half (23%) of the average. Instead, by the way you access the 13.3% of households in the province and to 4.2% nationally (Table 33).

**Table33 Percentage of households by type of access path, San Juan province, 2010**

Household access	% Province	% Country
Paved road	22.9	46.1
Paved main road	7.9	5.6
Unpaved	34.5	24.7
Unpaved main road	11.9	10
Alley	9.1	9.1
Road	13.3	4.2
Other	0.4	0.3
<b>Total</b>	<b>100</b>	<b>100</b>

Fuente: ONE. Perfiles estadísticos provinciales

The indicator of exposure to risk of collapse or landslide is higher in the province (12.3%) than the national average (10.7%) and the risk of wildfire, estimated at 5.7% in the province of San Juan and 4.9% nationally (Table 34). However, according to the census of population and housing 2010, the proportion of households that at some point has been affected by one of these phenomena has been lower in the province compared to the national average. In relation to the homes that have been affected by landslide or mudslide, the census reported 5.5% in the province and 6.7% in the country, and 6.4% and 7.3 fire%, respectively (Table 35).

**Table34 Number of houses according to their exposure to natural hazards, San Juan province, 2010.**

Type of risk	Province		% country
	Household	%	
Collapse or landslide	8,935	12.3	10.7
Subsidence	3,233	4.5	5.3
Rockslide	3,098	4.3	3.6
Forest fires	4,093	5.7	4.9

Source: ONE. Perfiles estadísticos provinciales

Hurricanes have affected a smaller proportion of households in the province of San Juan (32%) than in the whole country (50%), as well as storms and floods. However the impact of the drought has been a significant challenge has been much higher in the province, affecting 43% of households, nearly double the national average (23.5%). It is noteworthy that about 18% of households in the province have been affected by excessive cold, twice the national rate, while largely congruent with that percentage, the excess heat has affected about 9 % of households in the province and 24% at the country level.

**Table35 Number of households that have been affected by natural disasters, by type of disaster, provincia San Juan, 2010.**

Natural disaster type	Province		% country
	Houdehold	%	
Hurricane	23074	31.9	49.7
Tornado	6995	9.7	7.5
Storm	27009	37.3	56.7
Flood	10047	13.9	21.6
Heavy rain	22880	31.6	37.2
Excessive cold	12959	17.9	9.3
Excessive heat	6703	9.3	24.1
Drought	31112	43.0	23.5
Collapse or landslide	3994	5.5	6.7
Subsidence	1518	2.0	3.1
Fire	4650	6.4	7.3
Earthquake	814	1.1	4.3
Other	3,564	4.9	7.0

Source: ONE. Perfiles estadísticos provinciales (Con datos del IX Censo Nacional de Población y Vivienda 2010)

#### **- Limited access to clean water, sanitation and cooking gas**

Households in the study area have marked deficiencies in access to goods and services closely linked to environmental issues. Note that around 17,000 households in the province of San Juan and 1,600 Sub-area Hondo Valle-Juan Santiago do not have drinking water facility, representing 26.4% of all households in the province and 42% of the Sub - zona. These shortcomings are sized more in the case of access to health services in the province where approximately 24,000 households (34.6%) do not have adequate sanitation and 6.3% have no rubbish collection service. While the Sub-area proportion of households without adequate sanitation and no access to garbage collection service rises to 57% and 21%, respectively.

On the use of energy for cooking, lack of capacity over one third of households in the province and nearly 2,000 of the Sub-area Hondo Valle-Juan Santiago uses solid (coal or

wood) fuel to cook their food. In the province, 29% use firewood and charcoal over 5%. This is a factor directly affecting the population pressure on forests.

Table 36 shows the value of these indicators of environment in the study area compared to the national average. The data reveal that households in the province of San Juan have greater access to drinking water facility and garbage collection service than the national average, while the situation in the homes of the Sub-area Hondo Valle-Juan Santiago is much more precarious and vulnerable.

**Table36 Percentage of households without drinking water facility without basic sanitation without cooking gas**

Indicator	Indicator value			
	Prov. Juan	San	Sub-area HV-JS*	Country
% Of households without drinking water facility	26.4		42.2	32.8
% Of households without adequate sanitation	37.2		57.1	17.7
% Of Households without garbage collection service	6.3		20.7	9.6
% Of households that cook with charcoal or wood	34.6		53.1	11.5
* Average of indicators reported by MEPYD for municipalities Hondo Valle and Juan Santiago, weighted by the number of households.				

Source: MEPYD. Atlas de la pobreza 2010 en la República Dominicana

**Table37 Percentage of households by fuel used for cooking, San Juan province, 2010 \***

Fuel used for cooking	% Province	% total country
Propane gas	60.4	82.2
coal	5.5	3.2
Leña	29.1	8.3
Electricidad	0.3	0.5
Otro	0.1	0.1
No cocinan	4.7	5.0
*Table excludes shared households		

Source: ONE. Perfiles estadísticos provinciales

Only 31% of households in the province gets its water from the aqueduct into housing and 43% by pipeline installation in the courtyard. The 8% is supplied by spring, river or stream and the other key to another dwelling, public tap, borehole, tank truck and other sources (Table 38).

**Table38 Percentage of households by source of water supply, San Juan province, 2010 \***

Water source	% Provincia	% total country
Aqueduct inside the house	30.6	46.3

Water source	% Provincia	% total country
Aqueduct in the ard of the house	43.0	21.0
From another household	8.5	5.4
From public service	3.2	4.1
Street pipe	1.4	7.3
Stream, river	8.4	2.8
Rain	0.1	1.2
Water pit	3.8	7.6
Water Tank	0.3	3.7
Other	0.9	0.7
*The table excludes shared households		

Source: ONE. Perfiles estadísticos provinciales

As noted above, 37% of households in the province do not have adequate sanitation. Table 39 shows that 15% did not have any type of service, more than double the national average. 37% of households have private latrines and 10% shared latrine with other households, while 3% use shared toilet.

**Table39 Percentage of households by type of toilet, San Juan province, 2010 \***

Type sanitary service	% Province	% Nationwide
Own toilet	34.8	63.9
Shared toilet with other households	3.1	5.6
Particular latrine	37.1	16.5
Share latrine with other households	10.1	7.7
No sanitary service	15.0	6.2
*The table excludes shared households		

Source: ONE. Perfiles estadísticos provinciales

Between the fifth and fourth of the households in the province are contaminating streams, waste or stagnant water, and about two-fifths of the noise of vehicles, including motorcycles. Contamination are also loud music, scrap factories, factory or hospital, pigsty or farm, among others (Table 40).

**Table40 Percentage of households by type of pollution, San Juan province, 2010.**

Pollution type	% Provincia	% nationwide
Backwaters	21.9	27.1
Trash	22.0	32.4
Cañadas	26.0	24.0
Pigsty or farm	2.4	6.6
Factory smoke or gases	2.4	6.6
Waste or waste from factories, factory or hospital	8.4	5.7

Pollution type	% Provincia	% nationwide
Gas	5.0	6.9
Petroleum pump	1.9	4.3
Chemical plant	0.3	2.4
Noise from vehicles and engines	38.1	46.7
Noise factory or workshop	9.9	10.1
Noises or smoke from power plant	1.8	9.2
Loud music in bars, grocery stores or neighbors	21.3	33.2
Other	13.6	15.6

Source: ONE. Perfiles estadísticos provinciales

- **Poor access to electrical energy, information technology and other basic facilities.**

The unavailability of electricity and basic household electric equipment, are additional limitations to those mentioned above that deepen the vulnerability of the population to atmospheric phenomena. About 6,700 households in the province and about 840 of the Sub-area Hondo Valle-Juan Santiago have no electricity, no public system or plant itself. This represents 10.5% of households in the province and 22.3% of the Sub-region, both proportions well above the national average (4.2%). Furthermore, and closely associated with this deficiency, 28,000 households (44.4%) have two or fewer basic equipment (fridge, stove, TV, washing machine), the percentage is 26.8% nationally.

Two other factors that limit the responsiveness of the population to climatic events and, particularly, in emergency situations, is the lack of access to transportation and information technologies and communication. 30.9% of households in the province and 44.4% of households in the Sub-area Hondo Valle-Juan Santiago have no means of communication (no landline or cell phone, or computer). This is a restriction on intervention alert to the danger of natural disasters and information campaigns and public awareness on climate change.

Regarding the availability of means of transport, 61% of households in the province and 84% of households in the Sub-region do not have car or motorcycle, slightly above the national average (59%) proportion.

**Table41 Percentage of households without electricity, basic equipment and limited access ICTs.**

Indicator	Indicator value			
	Prov. Juan	San	Sub-zona HV-JS	Nationwide
% Households without electricity	10.5		22.3	4.2
% Household with 2 or less basic equipment	44.4		69.1	26.8
% Households without access to media	30.9		44.4	17.8
% Households without private transportation	61.1		83.9	59.2
* Average of indicators reported by MEPYD for municipalities Hondo Valle and Juan Santiago, weighted by the number of households.				

Source: MEPYD. Atlas de la pobreza 2010 en la República Dominicana

- **Human capital necessity**

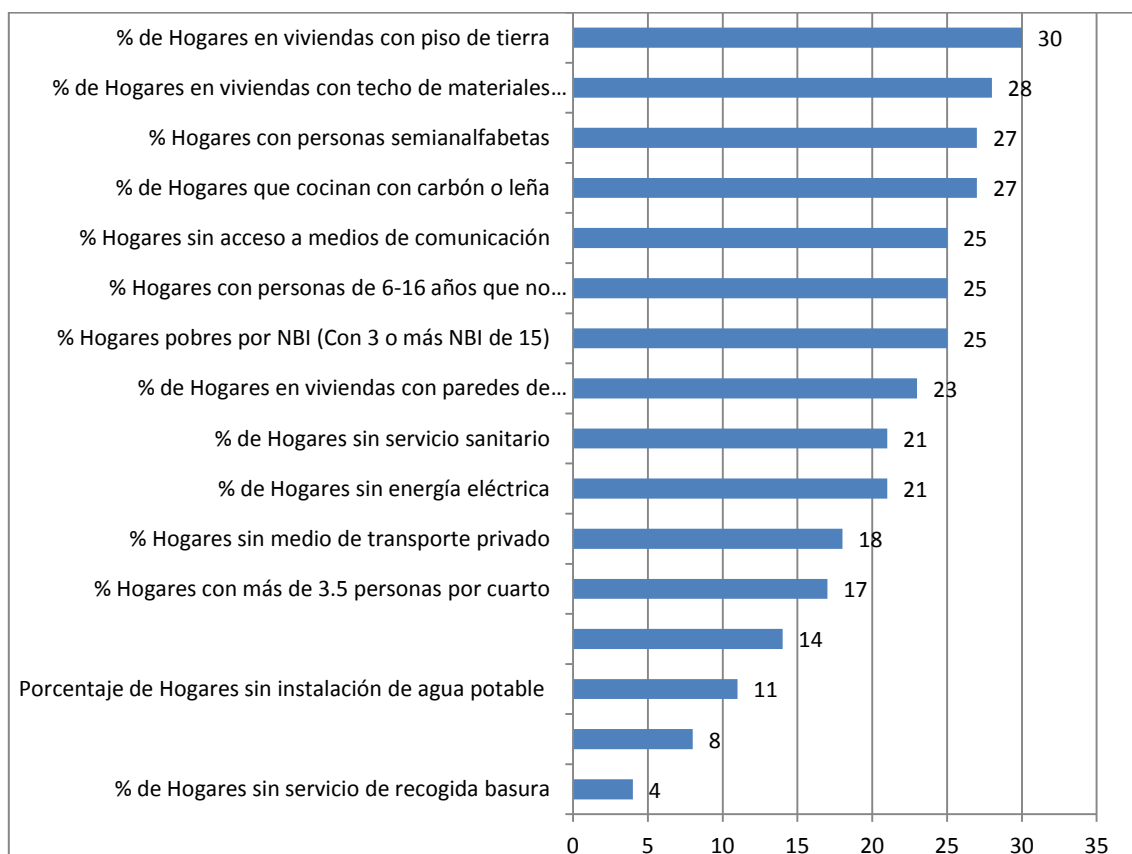
At high levels of poverty and unmet basic needs described above is added a very important element in the process of implementing related policies and proper use of natural resources and climate change interventions, the need to provide the population of more knowledge about these topics. A major barrier for these purposes is the high proportion of semi-illiterate people of the province, which reaches 42% in San Juan Province and 61% in Sub-area Hondo Valle-Juan Santiago, representing 17 and 36 percentage points above the national average (25%), respectively. This is added to the 4% of households in the province and 8.5% of the Sub-area has people aged 6-16 not attending school.

**Table 42 Two indicators of human capital in the province of San Juan**

Indicator	Indicator value		
	Prov. San Juan	Sub-zona HV-JS*	nationwide
% Household with semi illiterate people	41.9	61.3	25.3
% Households with people from 6-16 years that do not go to school	4	8.5	3.1
* Average of indicators reported by MEPLYD for municipalities Hondo Valle and Juan Santiago, weighted by the number of households.			

Source: MEPLYD. Atlas de la pobreza 2010 en la República Dominicana

**Figure 29 Indicators of poverty and NBI. Position San Juan province among the 32 provinces**



Source: MEPLYD. Atlas de la pobreza 2010 en la República Dominicana

#### 4.8.3 • Employment and livelihoods

##### • Level of employment in the province and municipalities

Employment gives people the ability to protect the achievements as well as cope with and adapt to adverse weather or other crisis. When the terms and conditions of employment are precarious, as in the study area, which is highly dependent on farming, generating low and unstable incomes, the vulnerability of the population tends to remain high and their responsiveness to low crisis.

The population of working age (PET) in San Juan Province is around 186,000 people, while the economically active population (EAP) is approximately 70,000 people, 50,000 men and 20,000 women. The total employment was estimated at 64,000, of whom 46,000 are women and 18,000 men.

Both the percentage of the labor force compared to PET or overall participation rate (37.7%) as the proportion of people compared to PET or employment rate (34.4%) are lower in the province than the national average, and record a wide gap between men and women. The occupancy rate in the province is 46.5% for men and only 20.6% in women, similar to that observed in the overall participation rate gap. The open unemployment rate in the province (8.7%) is higher than the national average, and lower in men (8.4%) than women (9.7%).

**Table 43 Labor market indicators in the province of San Juan. 2010**

Indicators	Province			Nationwide		
	Total	Male	Female	Total	Male	Female
PET	186,475	99,026	87,449	7,610,115	3,806,233	3,803,882
PEA*	70,212	50,247	19,965	3,264,618	2,066,281	1,198,337
Total inactive	113,056	47,094	65,962	4,202,556	1,668,501	2,534,055
Total unemployed	6,136	4,198	1,938	235,163	134,463	100,700
Total occupied	64,076	46,049	18,027	3,029,455	1,931,818	1,097,637
Tasa de open unemployment**	8.7%	8.4%	9.7%	7.2%	6.5%	8.4%
Overall participation rate	37.7%	50.7%	22.8%	42.9%	54.3%	31.5%
Occupation rate	34.4%	46.5%	20.6%	39.8%	50.8%	28.9%
* Not yet included in the workforce to discouraged people, ie those who are not working, not looking for work and do not declare other activity (study, housework, etc.) but are available to accept a job if it were offered.						
** The unemployment rate is calculated using the criterion of "open unemployment" does not count as unemployed people discouraged.						

Source: ONE. Perfiles Provinciales (IX Censo Nacional de Población y Vivienda 2010)

Table 44 contains the main labor market characteristics of each member municipality of the study area. It is observed that the highest occupancy rate corresponds to the municipality Juan de Herrera (39.2%) and lowest in El Cercado (25.4%), followed by Hondo Valle (26.4%). Instead, the lowest unemployment rate is recorded in Vallejuelo (6.5%) and the highest in Hondo Valle (11.1%).

The labor market indicators for each of the towns show a marked disadvantage women. For example, in Hondo Valle open unemployment rate for women is almost twice that of men, while in most of the municipalities in the employment rate of men is more than double that of women. As expected, municipalities with worse working conditions, such as El Cercado and Hondo Valle, are those who show higher levels of vulnerability in terms of poverty and unmet basic needs indicators. As discussed earlier, much of the 15 indicators of unmet needs are closely linked to environmental issues.

**Table 44 Labor market structure in the municipalities of San Juan province and municipalities Hondo Valle and Juan Santiago, by sex. 2010**

Indicator	Municipality of the San Juan province						Sub-area HV-JS	
	San Juan	Bohechío	El Cercado	Juan de Herrera	Las Matas de Farfán	Vallejuelo	Hondo Valle	Juan Santiago
<b>Working population (PET)</b>	<b>106,631</b>	<b>7,760</b>	<b>16,621</b>	<b>10,478</b>	<b>35,146</b>	<b>9,839</b>	<b>8,180</b>	<b>3,292</b>
Male	56,237	4,364	9,057	5,586	18,458	5,324	4,425	1,854
Female	50,394	3,396	7,564	4,892	16,688	4,515	3,755	1,438
<b>Economically active population (PEA)</b>	<b>42,777</b>	<b>2,819</b>	<b>4,737</b>	<b>4,536</b>	<b>11,385</b>	<b>3,958</b>	<b>2,432</b>	<b>786</b>
Male	30,091	2,165	3,382	3,345	8,229	3,035	1,682	596
Female	12,686	654	1,355	1,191	3,156	923	750	190
<b>Occupied population</b>	<b>39,159</b>	<b>2,578</b>	<b>4,223</b>	<b>4,111</b>	<b>10,304</b>	<b>3,701</b>	<b>2,161</b>	<b>696</b>
Male	27,727	1,991	2,986	3,034	7,462	2,849	1,463	534
Female	11,432	587	1,237	1,077	2,842	852	698	162
<b>Unoccupied population</b>	<b>3,618</b>	<b>241</b>	<b>514</b>	<b>425</b>	<b>1,081</b>	<b>257</b>	<b>271</b>	<b>90</b>
Male	2,364	174	396	311	767	186	219	62
Female	1,254	67	118	114	314	71	52	28
<b>Inactive population</b>	<b>61,996</b>	<b>4,729</b>	<b>11,573</b>	<b>5,808</b>	<b>23,189</b>	<b>5,761</b>	<b>5,484</b>	<b>2,426</b>
Male	25,183	2,075	5,512	2,180	9,920	2,224	2,592	1,211
Woman	36,813	2,654	6,061	3,628	13,269	3,537	2,892	1,215
<b>Global participation rate</b>	<b>40.1</b>	<b>36.3</b>	<b>28.5</b>	<b>43.3</b>	<b>32.4</b>	<b>40.2</b>	<b>29.7</b>	<b>23.9</b>
Male	53.5	53.5	53.5	53.5	53.5	57	38	32.1
Female	25.2	19.3	17.9	24.3	18.9	20.4	20	13.2
<b>Occupation rate</b>	<b>36.7</b>	<b>33.2</b>	<b>25.4</b>	<b>39.2</b>	<b>29.3</b>	<b>37.6</b>	<b>26.4</b>	<b>21.1</b>
Male	49.3	45.6	33	54.3	40.4	53.5	33.1	28.8
Female	22.7	17.3	16.4	22	17	18.9	18.6	11.3
<b>Unemployment rate</b>	<b>8.5</b>	<b>8.5</b>	<b>10.9</b>	<b>9.4</b>	<b>9.5</b>	<b>6.5</b>	<b>11.1</b>	<b>11.5</b>

Male	7.9	8	11.7	9.3	9.3	6.1	13	10.4
Female	9.9	10.2	8.7	9.6	9.9	7.7	6.9	14.7

Source: ONE. Tu Municipio en Cifras.  
<http://www.one.gob.do/index.php?module=articles&func=view&catid=252>

#### • Branch activities

The main livelihood of the San Juan province is agriculture, industry activity to which about 22 thousand people, of which about 1,500 are women engaged. As shown in Table 45, 34% of the working population of the province is engaged in agriculture, indicating the high dependence of employment this activity ratio in the country is less than 10%.

The second most important activity is trade, which is dedicated to the 19% of working people, or two thirds of the national average. Although no information is available on the composition of the business of the province, it is expected that a significant portion of it is closely linked to agriculture, primarily through the distribution of inputs and outputs of the sector. The third industry of importance is the public administration, which dedicates 11% of employed people in the province.

**Table 45 Number of persons employed in the province of San Juan, according to industry and sex. 2010**

Branch activities	Provincia			% nationwide	
	Male	Female	Total	%	
<b>Total</b>	<b>46,049</b>	<b>18,027</b>	<b>64,076</b>	<b>100</b>	<b>100</b>
Agriculture & Livestock	20,332	1,541	<b>21,873</b>	34.1	9.7
Industry and mining	2,778	517	<b>3,295</b>	5.1	11.9
Financial and real estate services	1,009	449	<b>1,458</b>	2.3	6
Transportation and related activities	2,826	111	<b>2,937</b>	4.6	6.7
Business and hospitality <sup>52</sup>	7,701	4,643	<b>12,344</b>	19.3	28.3
Domestic services	72	2,773	<b>2,845</b>	4.4	6.2
Public Administration	3,612	3,461	<b>7,073</b>	11.0	9.4
Construction	3,516	151	<b>3,667</b>	5.7	6.7
Other services	1,940	3,145	<b>5,085</b>	7.9	10
Undeclared	2,263	1,236	<b>3,499</b>	5.5	5.2

Source: ONE. Perfiles Provinciales (IX Censo Nacional de Población y Vivienda 2010)

#### • Households involved in farming

It is estimated that in San Juan province there are about 8,600 farmers. Based on this data (Table 46) and the number of jobs in the sector we saw earlier, we need each unit of agricultural production in the province generates an average of 2.5 jobs.

<sup>52</sup> Hospitality is not a relevant activity in the province. These data correspond almost entirely to the industry trade

**Table 46** Number province San Juan farmers as land tenure or animals in the twelve months prior to the census of 2010

Tenure or livestock	Province		% nationwide
	Producers	%	
<b>Total</b>	<b>8,626</b>	<b>100</b>	<b>100</b>
Declared land	3,890	45.1	49.8
Declared livestock	4,736	54.9	50.2
Note: Agricultural Producer is the natural person who decides and organizes regular activities of production and marketing are performed in the unit of agricultural production and exercises control and direction of these activities.			

Source: ONE. Perfiles Provinciales (IX Censo Nacional de Población y Vivienda 2010)

Another indicator related to the level of dependence on farming population is the number of households that have land under cultivation or animal husbandry. According to the census of 2010, about 14,000 households had land planted in the year before the census, equivalent to 22% of total households in the province. While some 7,700 households (12%) had cattle and about 12,000 households (19%) hens, chickens and guineas. (Table 47).

The municipality of San Juan, the largest in the province, is what has the lowest percentage of households (16%) with land under cultivation. In contrast, El Cercado and Vallejuelo 46% and 47% of households reported in 2010 having cropland. In the municipality Hondo Valle 1,251 households (46% of total households) had cultivated land, while in the municipality Juan Santiago this figure was 431 (42% of total households).

Importantly, according to this indicator, agriculture is a very important means of life for both the urban and the rural population of the province. 14 thousand households with land under cultivation, 5,000 and 9,100 urban households are rural. Although fewer in number, it is highly likely that corresponds urban households the majority of land under cultivation.

#### **4.8.4 Education for generating capacities and opportunities**

##### **• Level of education of the population**

There is no doubt that access to quality education, universal and inclusive, is a prime aspect in promoting capacity building, ie in building resilience. The available data on the province San Juan show that a high proportion of the population has been deprived of the right to education, making it more vulnerable and diminishes its capacity to address threats of events beyond their control and protect the standard of living reached.

It is estimated that about 17.5% of the population of 3 or more years never attended school, well above the national average, estimated at 9.6%. 58% of this population reached a level of education up to primary, eleven percentage points above the national average, but at secondary and university education the proportion is 21.9% and 10.5%, both significantly lower values than the national average.



**Table 47** Number of households with planted or harvested land or animals in the twelve months prior to the census of 2010 in San Juan province and its municipalities and the Sub-area Hondo Valle-Juan Santiago, by area of residence

Municipality and area of residence	Households with:		Hoguseholds with:					
	Land for harvestin g	Land harveste d	Cattle	Sheep and goats	Ducks, turkeys and geeses	Hens or chickens and guineas	Swine	Beehiv es
<b>San Juan Province</b>	<b>14,132</b>	<b>12,660</b>	<b>7,737</b>	<b>3,956</b>	<b>2,285</b>	<b>11,836</b>	<b>7,448</b>	<b>1,791</b>
Urban	5,005	4,567	2,441	1,016	887	3,309	1,996	760
Rural	9,127	8,093	5,296	2,940	1,398	8,527	5,452	1,031
<b>General municipality of San Juan</b>	<b>5,929</b>	<b>5,484</b>	<b>3,209</b>	<b>1,748</b>	<b>1,098</b>	<b>5,441</b>	<b>3,628</b>	<b>853</b>
Urbano	2,089	1,928	971	471	481	1,511	928	410
Rural	3,840	3,556	2,238	1,277	617	3,930	2,700	443
<b>General municipality of Bohechío</b>	<b>749</b>	<b>731</b>	<b>167</b>	<b>141</b>	<b>102</b>	<b>375</b>	<b>218</b>	<b>122</b>
Urbano	411	398	95	73	50	240	129	69
Rural	338	333	72	68	52	135	89	53
<b>General municipality of El Cercado</b>	<b>2,539</b>	<b>2,090</b>	<b>1,482</b>	<b>562</b>	<b>296</b>	<b>1,766</b>	<b>1,093</b>	<b>168</b>
Urbano	639	527	317	118	90	327	257	60
Rural	1,900	1,563	1,165	444	106	1,439	836	108
<b>General municipality of Juan de Herrera</b>	<b>854</b>	<b>806</b>	<b>400</b>	<b>161</b>	<b>167</b>	<b>686</b>	<b>611</b>	<b>104</b>
Urbano	322	316	111	40	46	159	173	44
Rural	532	490	289	121	121	527	438	60
<b>General municipality of Las Matas de Farfán</b>	<b>2,605</b>	<b>2,199</b>	<b>1,695</b>	<b>1,149</b>	<b>449</b>	<b>2,815</b>	<b>1,479</b>	<b>393</b>
Urbano	694	607	493	219	125	656	305	98
Rural	1,911	1,592	1,202	930	324	2,159	1,174	295
<b>General municipality of Vallejuelo</b>	<b>1,456</b>	<b>1,350</b>	<b>784</b>	<b>195</b>	<b>173</b>	<b>753</b>	<b>419</b>	<b>151</b>
Urbano	850	791	454	95	95	416	204	79
Rural	606	559	330	100	78	337	215	72
<b>Sub-area HV-JS</b>	<b>1,682</b>	<b>1,585</b>	<b>587</b>	<b>254</b>	<b>128</b>	<b>931</b>	<b>605</b>	<b>64</b>
Urban	608	570	191	85	52	278	197	27
Rural	1,074	1,015	396	169	76	653	408	37
<b>General municipality of Hondo Valle</b>	<b>1,251</b>	<b>1,178</b>	<b>381</b>	<b>177</b>	<b>79</b>	<b>694</b>	<b>432</b>	<b>40</b>
Urbano	489	461	127	62	30	222	145	14
Rural	762	717	254	115	49	472	287	26
<b>General municipality of Juan Santiago</b>	<b>431</b>	<b>407</b>	<b>206</b>	<b>77</b>	<b>49</b>	<b>237</b>	<b>173</b>	<b>24</b>
Urban	119	109	64	23	22	56	52	13
Rural	312	298	142	54	27	181	121	11

Source: ONE. Entorno de los productores agropecuarios. Datos del IX Censo de Población y Vivienda 2010

**Table 48** Population 3 years and over San Juan province as educational attainment, by sex. 2010

Level of instruction	Province				% total country
	Men	women	Total	%	
<b>never attended school</b>	<b>21,034</b>	<b>17,392</b>	<b>38,426</b>	<b>17.5</b>	<b>9.6</b>
<b>attended school</b>	<b>94,757</b>	<b>85,932</b>	<b>180,689</b>	<b>100.0</b>	<b>100.0</b>
Preprimary	9,475	8,327	<b>17,802</b>	9.9	9.1
Primary or basic	57,135	47,132	<b>104,267</b>	57.7	47.0
High or medium	20,232	19,408	<b>39,640</b>	21.9	28.6
University or superior	7,915	11,065	<b>18,980</b>	10.5	15.4

Source: ONE. Perfiles Provinciales (IX Censo Nacional de Población y Vivienda 2010)

The low level of education in each of the municipalities that make up the study area clearly shows the low capacity of the population to improve their quality of life and be more empowered to face the threats of climate change.

In the municipality of San Juan, which according to the indicators we observed before, has vulnerability levels below the average of the other municipalities of the province, the population 5 years and over who have never attended school was estimated at 14.5 %, a proportion that rises to 22.6% in Vallejuelo. In Hondo Valle, Elías Piña province, is even higher (28.5%).

Of the population of that age in the province San Juan that has had the opportunity to attend school, between 56% (San Juan) and 71% (Vallejuelo) reached the primary level. In Hondo Valle, the proportion is 65%. It was also higher in the municipality of San Juan the percentage of people who have attended school have achieved secondary level (23%) and university (13%), much lower proportions in the municipalities Hondo Valle, 17% and 5% respectively.

**Table 49** Population 5 years and over municipalities in the province of San Juan and the municipalities Hondo Valle and Juan Santiago by level of educational attainment or over, by sex. year 2010

Level of education	Municipalities in the province San Juan						Subzon HV	
	San Juan	Bohechío	El Cercado	Juan de Herrera	Las Matas de Farfán	Vallejuelo	Hondo Valle	Juan Santiago
<b>never attended school</b>	<b>17,436</b> 14.5%	<b>1,533</b> 17.5%	<b>4,166</b> 22.0%	<b>2,049</b> 17.3%	<b>5,872</b> 14.7%	<b>2,520</b> 22.6%	<b>2,706</b> 28.5%	<b>1,193</b> 31.0%
<i>Men</i>	9,707	908	2,232	1,131	3,069	1,410	1,373	647
<i>Women</i>	7,729	625	1,934	918	2,803	1,110	1,333	546
<b>attended school</b>	<b>102,518</b>	<b>7,250</b>	<b>14,805</b>	<b>9,809</b>	<b>33,962</b>	<b>8,635</b>	<b>6,775</b>	<b>2,657</b>
<i>Men</i>	53,364	3,967	8,085	5,164	17,730	4,635	3,679	1,479
<i>Women</i>	49,154	3,283	6,720	4,645	16,232	4,000	3,096	1,178
Preprimary	8,248	1,016	1,324	845	2,197	462	883	238
<i>Men</i>	4,504	559	714	449	1,196	241	458	138
<i>Women</i>	3,744	457	610	396	1,001	221	425	100
Primary or basic	57,558	4,354	9,766	6,089	20,383	6,117	4,392	1,922

Level of education	Municipalities in the province San Juan						Subzon HV	
	San Juan	Bohechío	El Cercado	Juan de Herrera	Las Matas de Farfán	Vallejuelo	Hondo Valle	Juan Santiago
<i>Men</i>	31,433	2,396	5,478	3,300	11,130	3,398	2,480	1,073
<i>Women</i>	26,125	1,958	4,288	2,789	9,253	2,719	1,912	849
High or medium	23,192	1,532	2,765	2,051	8,432	1,668	1,161	448
<i>Men</i>	11,741	843	1,480	1,043	4,293	832	601	240
<i>Women</i>	11,451	689	1,285	1,008	4,139	836	560	208
University or superior	13,520	348	950	824	2,950	388	339	49
<i>Men</i>	5,686	169	413	372	1,111	164	140	28
<i>Women</i>	7,834	179	537	452	1,839	224	199	21
<b>Total</b>	<b>119,954</b>	<b>8,783</b>	<b>18,971</b>	<b>11,858</b>	<b>39,834</b>	<b>11,155</b>	<b>9,481</b>	<b>3,850</b>

Source: ONE. Tu Municipio en Cifras.

<http://www.one.gob.do/index.php?module=articles&func=view&catid=252>

- **Educational Level**

The average educational level of the population is 6 years, significantly lower than the country schooling is 8 years. The education of women is higher than men, both in the province and nationally (Table 50). In the province there are 366 schools up to secondary level, with an enrollment of about 63,000 students, of which 89% is enrollment in public schools (87.4%) and semi-official (1.6%) and the remaining 11% of centers private. In two municipalities of the province, Bohechío and Juan de Herrera, education is entirely public (Table 51).

**Table 50** Average years of schooling for the population aged 15 and over San Juan province, by sex. 2010

Sex	Average years of schooling	
	Province	Total country
<b>Total</b>	<b>6.0</b>	<b>8.0</b>
Hombres	5.7	7.6
Mujeres	6.3	8.3

Source: ONE. Perfiles Provinciales (IX Censo Nacional de Población y Vivienda 2010)

**Table 51**      **Número de estudiantes matriculados en centros educativos públicos y privados en la provincia San Juan, por municipio. 2011-2012**

PROVINCE/MUNICIPALITY	PUBLIC enrollment	PRIVATE enrollment	SEMI-OFICIAL enrollment	Total Centers	Total enrollment
<b>PROV. SAN JUAN</b>	<b>63,394</b>	<b>7,947</b>	<b>1,194</b>	<b>366</b>	<b>72,535</b>
BOHECHÍO	1,905	0	0	15	1,905
EL CERCADO	7,447	617	0	52	8,064
JUAN DE HERRERA	4,123	0	0	21	4,123
LAS MATAS DE FARFÁN	12,036	812	261	87	13,109
SAN JUAN	34,896	6,144	599	172	41,639
VALLEJUELO	2,987	374	334	19	3,695

Source: ONE. Perfiles Provinciales (Con datos del Ministerio de Educación)

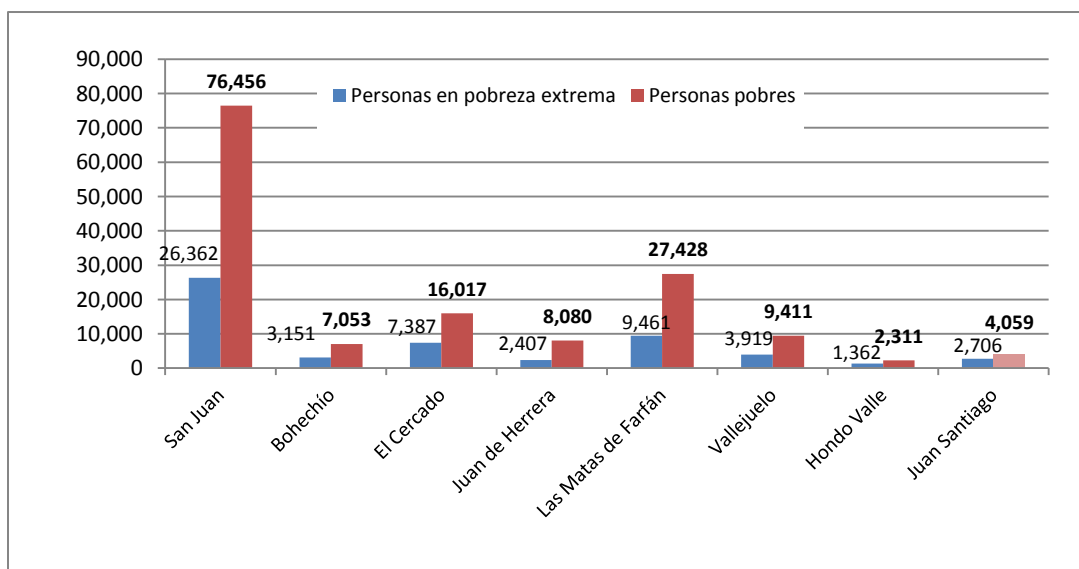
#### 4.8.5 Poverty and NBI (Unmet basic needs) in the municipalities of the study area

##### Poverty Level

Most of the poor in San Juan province is concentrated in the capital municipality San Juan. At the same there are about 76,000 people living in poverty generally equivalent to 53% of the total poor population of the province figure; while the population in extreme poverty head municipality is approximately 26,000 people, or 50% of the provincial total.

In correspondence with the total population of each of the five municipalities of the province, the rest of the poor and extreme poor are mainly distributed in Las Matas de Farfán and El Cercado. In the municipality Hondo Valle, Elías Piña province, poor population is about 2,300 people and the indigent population about 1,400, and Juan Santiago 4,100 and 2,700, respectively (Figure 30 **Error! eference source not found.**).

**Figure 30**      **The poor and extremely poor in the municipalities of San Juan province and municipalities Hondo Valle and Juan Santiago population. 2010**



Source: MEPLYD. Atlas de la pobreza 2010 en la República Dominicana

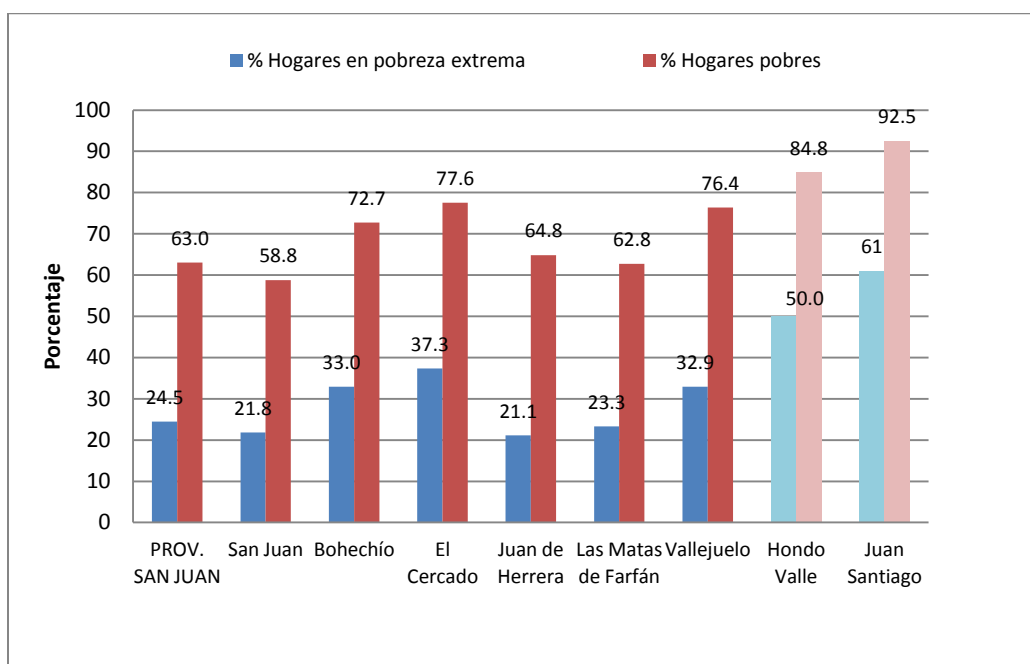
In Hondo Valle and Juan Santiago, the percentage of poor households in extreme poverty is significantly higher than in municipalities that make up the province of San Juan. In these



municipalities the proportion of households living in poverty is 85% overall and 92% in extreme poverty and 50% and 61% respectively. They are followed by the municipality of El Cercado, with 77% of households in general poverty and 37% in extreme poverty. The municipality of the province with less poverty is the capital municipality San Juan, with 59% of overall poverty and 22% in extreme poverty. In Juan de Herrera the lowest rate of extreme poverty, equivalent to 21%, slightly lower than the municipality San Juan is recorded (Figure 31).

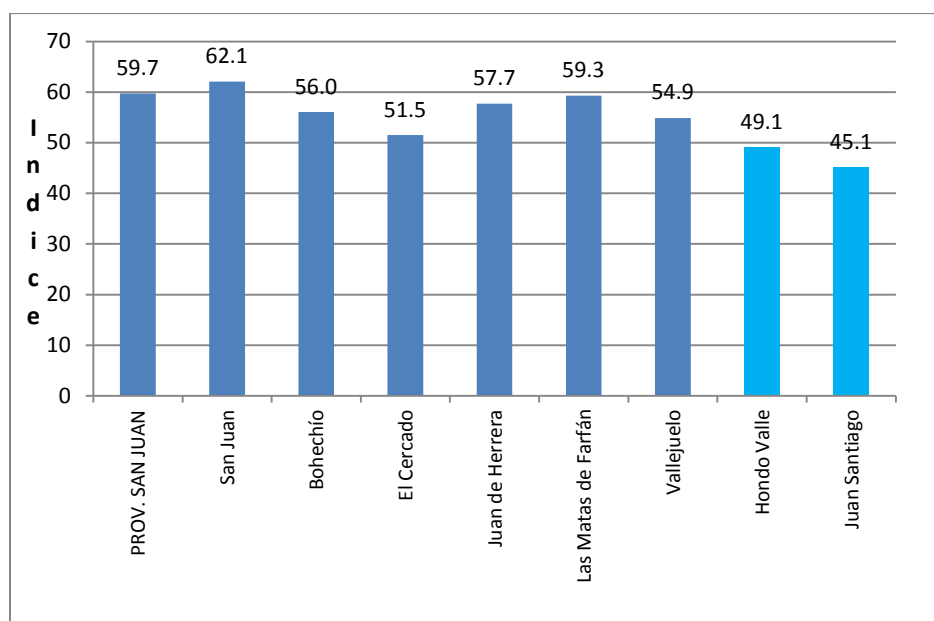
Consistent with poverty levels noted above, we note that in municipalities Juan Santiago and Hondo Valle an index of quality of life (ICV) of only 45.1 and 49.1 respectively, followed by El Cercado with 51.5 recorded; while the highest rate is the municipality San Juan 62.1, which exceeds by 2.4 points on average ICV province (Figure 32Error! Reference source not found.).

**Figure 31** Percentage of poor households in extreme poverty in the province of San Juan and its municipalities and municipalities Hondo Valle and Juan Santiago. 2010.



Source: MEPLYD. Atlas de la pobreza 2010 en la República Dominicana

**Figure 32** Average ICV province of San Juan and its municipalities, and municipalities Hondo Valle and Juan Santiago. 2010.



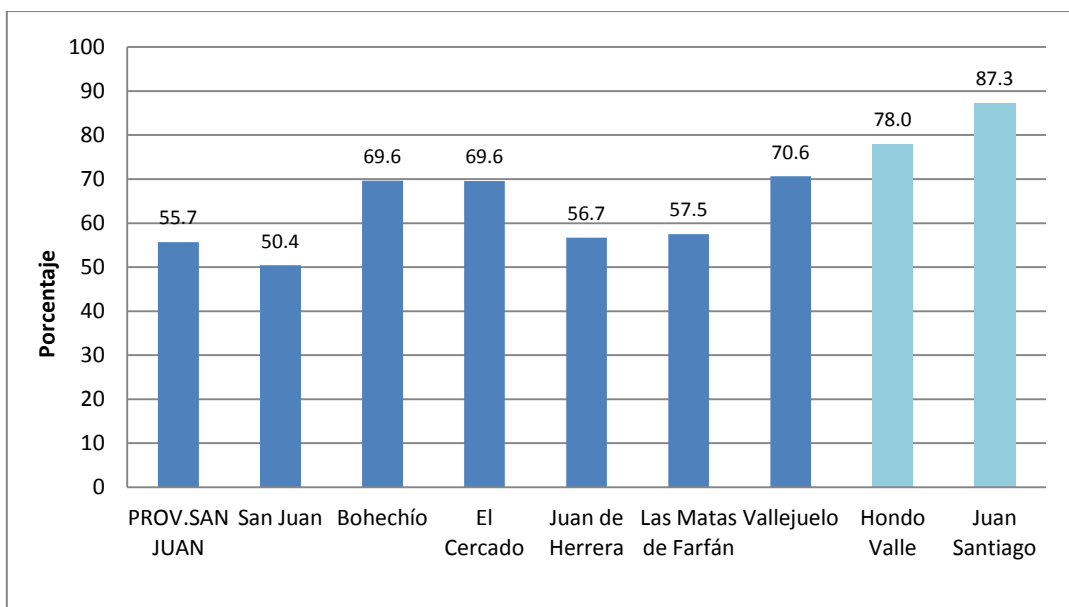
Source: MEPLYD. Atlas de la pobreza 2010 en la República Dominicana

- **Vulnerability due to Unmet Basic Needs (NBI) by municipalities**

Similar to the above at San Juan province and Sub-area Hondo Valle-Juan Santiago, below poverty levels are presented by municipality under the criteria of unmet basic needs (NBI) with census data so 2010 of each of the 15 indicators discussed above (Figure 33). This allows to know the gaps within the province of vulnerability indicators and responsiveness of the population to weather events, which would facilitate the design of policies and planning related variability and climate change interventions targeted territorially.

The Figure 33 shows poverty levels by NBI San Juan province and each of its municipalities and municipalities in Hondo Valle and Juan Santiago. In the capital municipality San Juan the percentage of poor households by NBI is 50.4%, more than 5 percentage points below the average of the province and, from the point of view of the NBI, the least vulnerable of the six municipalities that make up the province. In Bohechío, El Cercado and Vallejuelo this indicator is about 70%, while in Hondo Valle and Juan Santiago, Elías Piña province, is 78% and 87%, respectively.

**Figure 33** Unmet basic Needs (NBI) poor households in the municipalities of San Juan province and municipalities Hondo Valle and Juan Santiago. 2010. (With 3 or more NBI 15)



Source: MEPYD. Atlas de la pobreza 2010 en la República Dominicana

#### - Indicators of house vulnerability

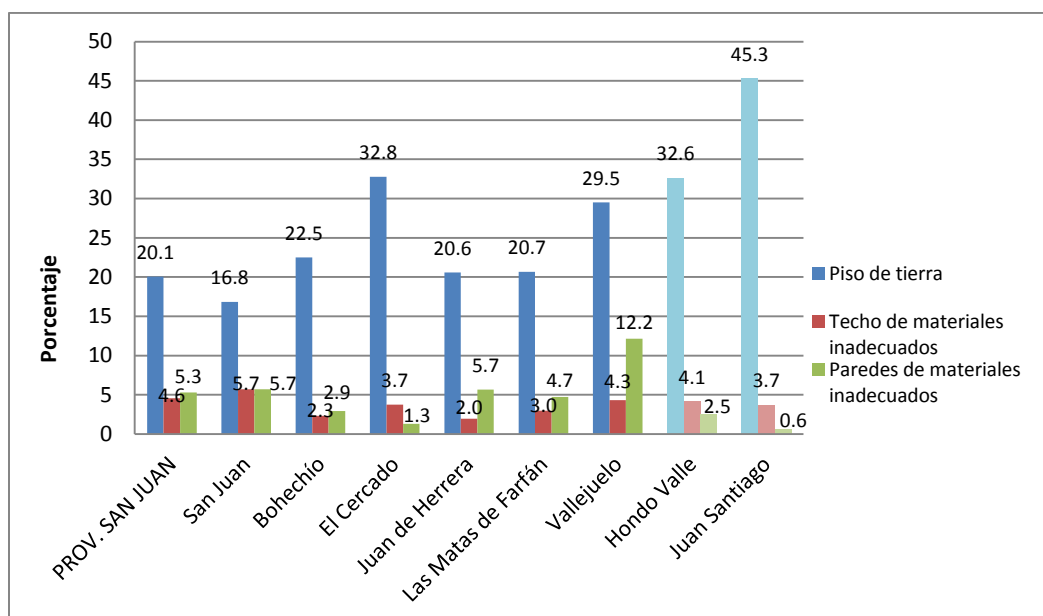
The safety and quality of housing show marked differences between municipalities regarding the main indicators. So, in El Cercado third of households live in houses with dirt floors, double the proportion of the capital municipality San Juan, where the percentage of households with this type of floor is the lowest compared to the other municipalities of the province. Similarly, in Hondo Valle third of households have floor, while Juan Santiago this proportion rises to 45% (Figure 34Error! Reference source not found.).

However, as to the walls and ceiling in the municipality San Juan the proportion of households living in houses with inadequate materials in these structures is higher (about 6%) than the rest of the municipalities, except in the particular case of the municipality Vallejuelo housing having walls of unsuitable materials representing 12% of total households in the municipality.

The overcrowding in San Juan province has the lowest level in Las Matas de Farfán, municipality in which households with more than 3.5 people per room average accounts for 8.4% of households, and the highest corresponds to Vallejuelo (14.8 %). In the main municipality, the most populous province, about 12% of households have a load of greater than 3.5 persons per room. In municipalities Hondo Valle and Juan Santiago, Elías Piña province, this proportion is 19% and 18%, respectively, much higher than that of the municipalities of San Juan province.

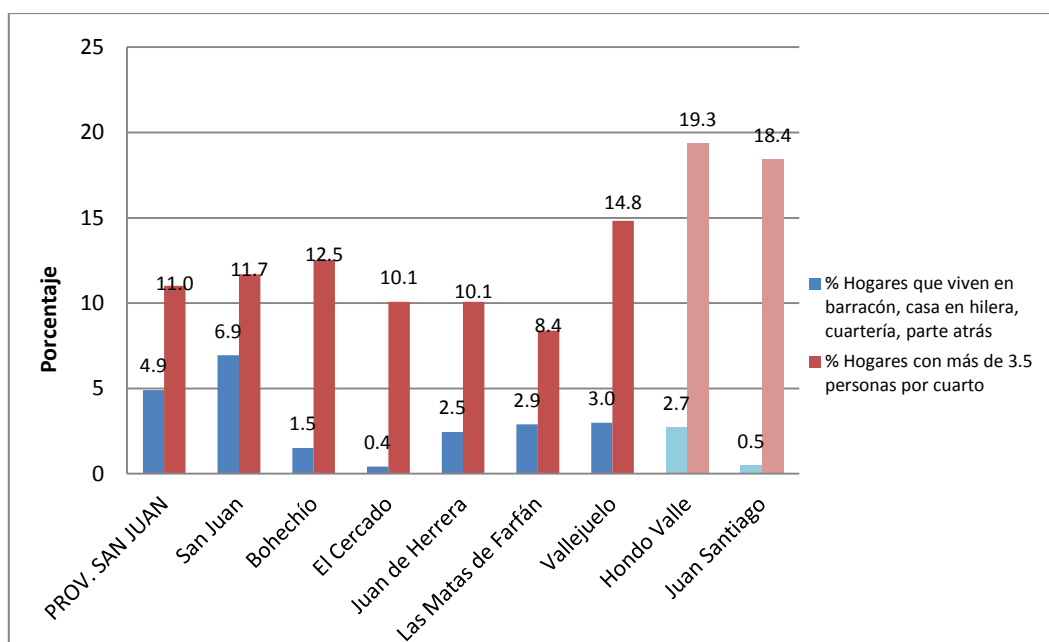
The largest proportion, and at the same time the most in absolute terms, households located in barrancones, rooming houses, some back and rowhouses, corresponds to the municipality San Juan, the number of inhabitants is much higher than other municipalities the province. In the municipality about 7% of households have the indicated feature, much higher than in the other municipality, ranging from 0.4% in El Cercado and 2.9% in Las Matas de Farfán proportion. The value of this indicator for Hondo Valle is 2.7% (Figure 35).

**Figure 34** % Of households in homes with floor, ceiling and walls with inadequate materials in the municipalities of the prov. San Juan and the municipalities Hondo Valle and Juan Santiago. 2010



Source: MEPPD. Atlas de la pobreza 2010 en la República Dominicana

**Figure 35** % Of households in the municipalities of San Juan province and municipalities Hondo Valle and Juan Santiago living in very poor and overcrowded housing households. 2010



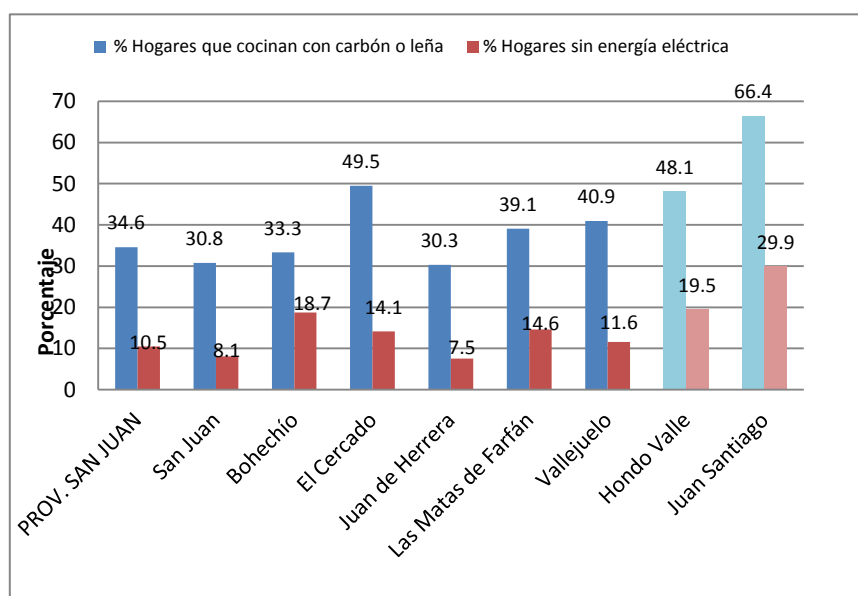
Source: MEPPD. Atlas de la pobreza 2010 en la República Dominicana

- **Use of solid fuels and electricity access.**

The ecological damage that would be causing the use of coal and wood for cooking differ between the municipalities of the province, according to their number of inhabitants and the proportion of households using solid fuels such food preparation.

The available data (Figure 36) indicate that the lowest proportion of households using coal or wood for cooking is recorded in the municipalities Juan Herrera (30.3%) and San Juan (30.8%, and the highest in El Cercado (49.5%). in absolute terms, the largest number of households cook with charcoal or firewood correspond to the municipality San Juan (about 11,200), followed by Las Matas de Farfán (4,700). While the municipalities of San Juan province with fewer households using these fuels are Bohechío (950) and Juan de Herrera (1150). in the town Hondo Valle, 48% of households (about 1,300) use coal or wood, this proportion rose to 66% (about 675 households) Juan Santiago in the town.

**Figure 36** % Of households in the municipalities of San Juan province and municipalities Hondo Valle and Juan Santiago without electricity and cooking with charcoal or firewood. 2010.

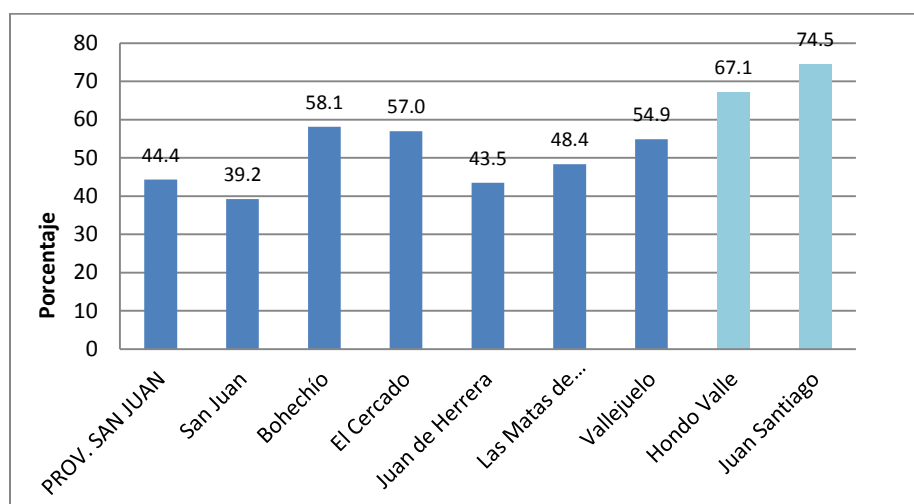


Source: MEPLYD. Atlas de la pobreza 2010 en la República Dominicana

Municipalities in the province with the lowest percentage of households without electricity service are Juan de Herrera (7.5%) and San Juan (8.1%), and those with a higher percentage of households without such services are Bohechío (18.7%) and Las Matas de Farfán (14.6%). In Juan Santiago this deficiency is greater; affects 30% of households, and Hondo Valle nearly a fifth (Figure 37).

And directly linked to lack of access to electricity, we see that between 39% (municipality San Juan) and 58% (Bohechío) of households in the municipalities of the province have 2 or fewer of these 4 basic appliances : fridge, stove, washer, TV (Figure 34). Households with limited access to these kits is much higher in Hondo Valle (67%) and Juan Santiago (75%)

**Figure 37** Percentage of Households in the municipalities of San Juan province and municipalities Hondo Valle and Juan Santiago with 2 or less basic equipment (fridge, stove, washer, TV). 2010

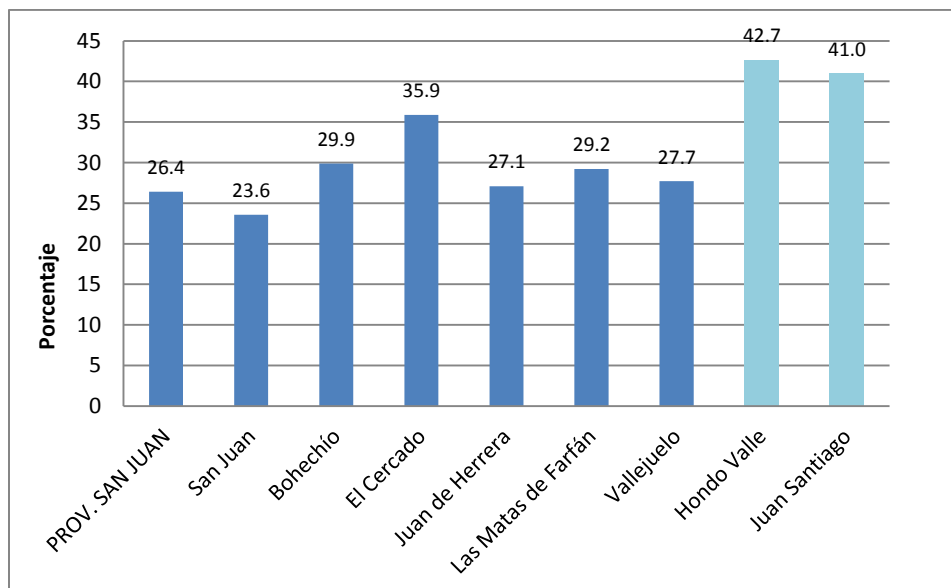


Source: MEPYD. Atlas de la pobreza 2010 en la República Dominicana

**- Availability of installation of potable water, sanitation and garbage collection.**

- The proportion of households without drinking water installation in homes is 23.6% in the capital municipality, the lowest percentage among the municipalities in the province. Instead, the municipality with the highest relative lack of this vital service is El Cercado (35.9% of households). In municipalities Hondo Valle and Juan Santiago, Elías Piña province, 42.7% and 41% of households do not have drinking water facility (Figure 38).

**Figure 38** Percentage of Households in the municipalities of San Juan province and municipalities Hondo Valle and Juan Santiago without drinking water facility. 2010

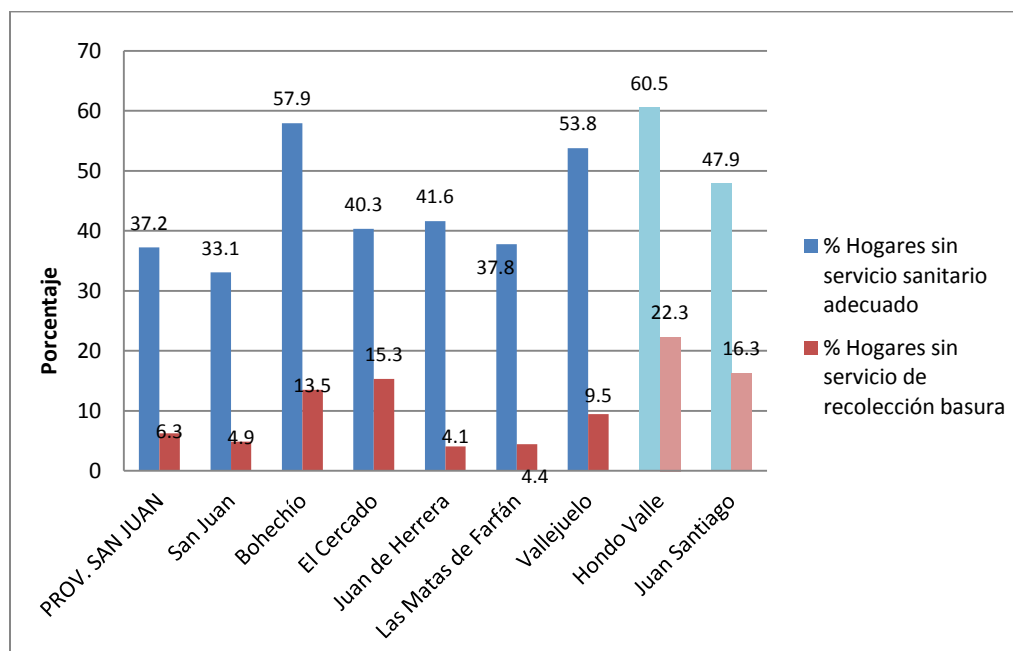


Source: MEPLYD. Atlas de la pobreza 2010 en la República Dominicana

Adequate excreta disposal is critical in environmental sanitation of communities and the protection of the health of the population. In all municipalities in the province the proportion of households without adequate sanitation is Elevated; ranges from one-third of households in the municipality of San Juan, and nearly 60% in the town Bohechío, similar to Hondo Valle municipality in the province Elías Piña (Figure 39).

Another important environmental indicator is the disposal of solid household waste. The municipalities of the province with the lowest percentage of households without garbage collection service are Juan de Herrera, Las Matas de Farfán and San Juan, indicator with a value between 4% and 5%. But in Hondo Valle proportion of households that do not have this service is much higher (22%), while Juan Santiago is 16%.

**Figure 39** Percentage of Households in the municipalities of San Juan province and municipalities Hondo Valle and Juan Santiago without drinking water facility. 2010.



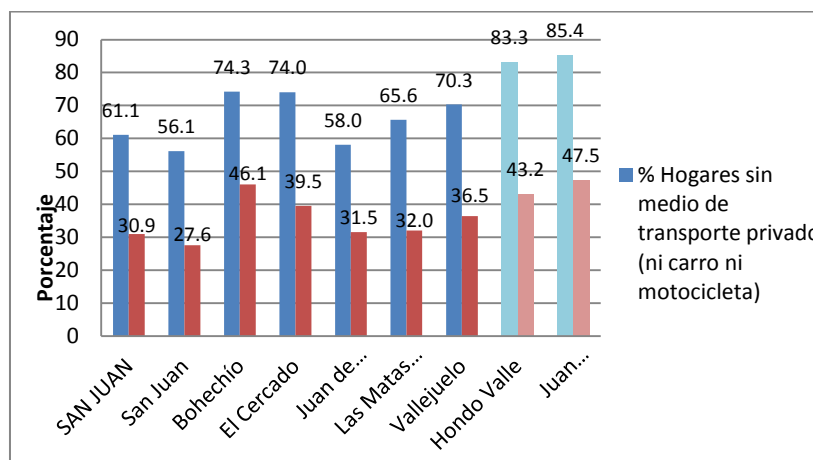
Source: MEPLYD. Atlas de la pobreza 2010 en la República Dominicana

- **Transport and communication**

Households without private means of transport (or car or motorcycle) in the municipalities of the province account for 56% of total households in the municipality of San Juan, and 74% in Bohechío and Fencing. In Hondo Valle and Juan Santiago, over 80% of households do not have either of Transportation said.

The lack of access to ICTs, measured as the proportion of households has neither landline or cell, or PC, is significantly higher in each of the municipalities in the province compared to the national average (17.8 %). The lowest value of this indicator was recorded in the municipality of San Juan (27.6%) and highest in Bohechío (46.1%). In Hondo Valle is 43.2% and 47.5% Juan Santiago.

**Figure 40** Deprivation of access to means of transport and communication in homes in the municipalities of San Juan province and municipalities Hondo Valle and Juan Santiago. 2010.



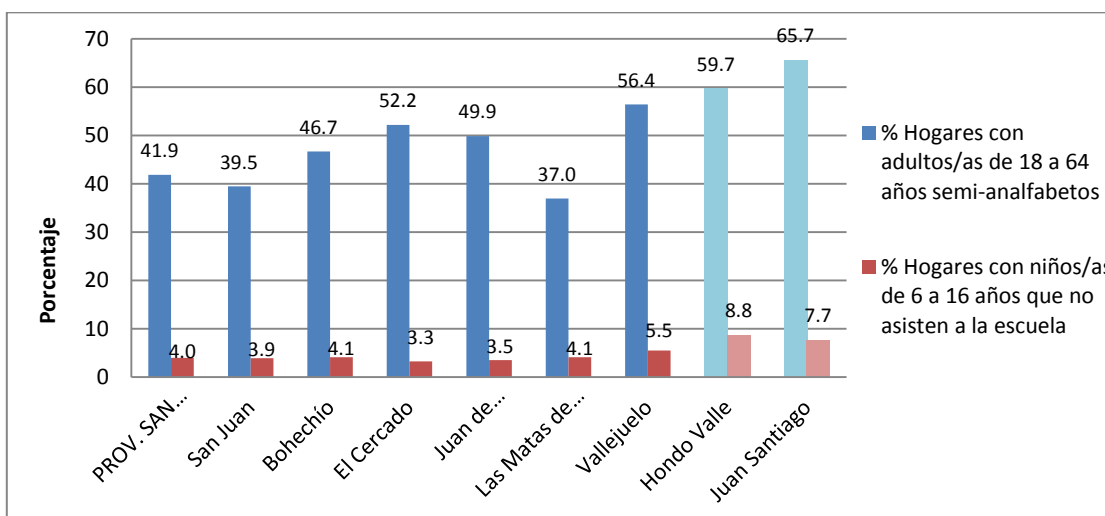
Source: MEPYD. Atlas de la pobreza 2010 en la República Dominicana

**- Households with semi-illiterate population and illiteracy**

As we have seen, households with semi-illiterate people account for 42% of total households in the province, well above the national average (25%). As shown in Figure 38, the town of the province with the lowest percentage of households with adults semi-illiterate is Las Matas de Farfán (37%), while in Vallejuelo the highest percentage (56.4%) is recorded. The proportion of children aged 6-16 who do not attend school varies between 3.3% (El Cercado) and 5.5% (Vallejuelo).

- In Hondo Valle, 60% of the population aged 18-64 years is semi-illiterate and about 9% of children between 6 and 16 do not attend school; Juan Santiago proportions achieved in 66% and 8%, respectively (Figure 41).

**Figure 41** Households in the municipalities of San Juan province and municipalities Hondo Valle and Juan Santiago with semi-literate and 6-16 years who do not attend school. 2010..



Source: MEPYD. Atlas de la pobreza 2010 en la República Dominicana

The illiteracy rate in the population over 15 years is very high in all municipalities in the study area. The lowest is 23.2% in Las Matas de Farfán and the highest 41.4% in Juan Santiago. While in the young population of 15-24 years illiteracy rate varies between 9.5% and 22.3%, extreme values also correspond to Las Matas de Farfan and Juan Santiago, respectively (Table 52).

**Table 52** Illiteracy rate per municipality. 2010

Municipalities	Illiteracy rate in population over 15 years	Illiteracy rate among young people between 15 and 24 years	Gender parity index illiteracy rate of women and men aged 15-24
<b>Provincia San Juan</b>			
San Juan	21.9	9.7	53.7
Bohechío	29.2	13.1	65.4
El Cercado	32.1	11.4	65.3
Juan de Herrera	23.2	9.6	67.6
Las Matas de Farfán	21.3	9.5	64.1
Vallejuelo	29.6	10.5	58.3
<b>Sub-zona HV-JS</b>			
Hondo Valle	39.7	20.3	99.5
Juan Santiago	41.4	22.1	73.3

Source: ONE. Tu Municipio en Cifras.

<http://www.one.gob.do/index.php?module=articles&func=view&catid=252>

## 4.9 Background Risk profile and adaptive capacity

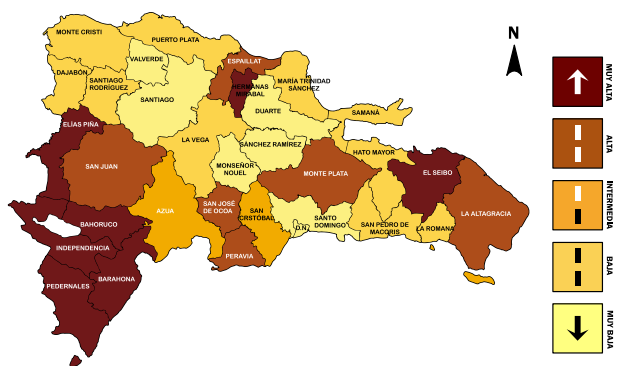
According to the report on the critical points of vulnerability to climate change made at national provincial level, the Province of San Juan has a high vulnerability of agriculture to drought. Critical Points of vulnerability to climate change and variability are: a) High level of exposure to drought,

b) High percentage of agricultural areas in steep slopes, c) High sensitivity to desertification, d) Low Human Development Index e) Percentage of irrigated areas reduced relative to f nationally) limited availability of stored water.

According to the report, Elías Piña has a **high vulnerability to climate change from agriculture to drought**. The climate of the province is extremely varied, presenting ranges ranging from dry areas in valley, perhúmedo of the highest areas of the Sierra de Neyba. From the geographical point of view, Elías Piña has a strategic role as host header Artibonite River, the main water source of the province and Haiti. The main threats associated with climate are drought and extreme events such as storms causing landslides. The province is characterized by low economic levels and low human development, being one of the poorest provinces. The main economic activity is agriculture, often associated with significant degradation of soil: the practices based on conuquismo (slash and burn), together with conditions of steep slopes, accelerated erosion of interest determined large areas of the Sierra de Neyba. The critical points resulting from Elías Piña: a) dry climatic conditions, b) High percentage of agricultural areas on steep slopes, c) High sensitivity to desertification, d) Low Human Development Index, e) Percentage reduced irrigated areas, f) Limited availability of stored water.

Figure 42 Vulnerability to climate change from agriculture to drought

#### AGRICULTURA frente a sequía

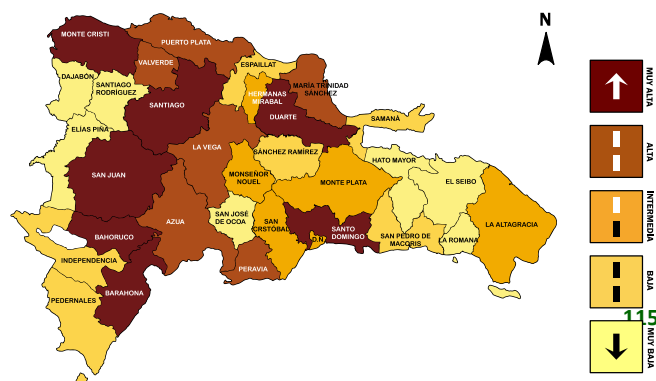


Source: USAID/TNC/IDDI/Fundación Plenitud (2013). Puntos críticos para la vulnerabilidad a la variabilidad y al cambio climático en la República Dominicana y su adaptación al mismo

#### ○ Vulnerability of the Dominican Republic against storms and floods in agriculture

The report on Investment and Financial Flows for Adaptation to Climate Change in relation to the Water sector in the Dominican Republic, recommend the following adaptation measures: Adopt integrated water resource as a state policy management, under a radical change paradigm, from the management model of supply on which rests the baseline scenario, towards a model of integrated demand. The results of the evaluation of the vulnerability assessment of critical points of vulnerability to climate change from floods and storms are

#### AGRICULTURA frente a inundaciones



The Records of damage caused by extreme precipitation events including those associated with the occurrence of tropical cyclones, show that the agricultural sector is extremely subject to receiving negative impacts related to flooding associated with them. Studies in some major basins in the country (ECLAC, 2004), the largest flood negative effects are observed in the productive sector (73% of total), mainly agriculture. In many cases, as reported by the Ministry of Agriculture, despite the small size of the affected areas, high economic losses occur because flooded areas are often occupied by export crops, such as the musáceas. Puntos críticos: La vulnerabilidad está expresada por indicadores en los cuales se destaca la población afectada por lo cual esta evaluación se enfoca en aspectos socioeconómicos además de biofísicos. Las provincias que resultan más vulnerables son aquellas cuyo territorio presenta altos porcentajes de áreas ocupadas por las cuencas bajas de ríos importantes, como son el Yaque del Norte, el Yaque del Sur, el Yuna y el Ozama, (USAID/TNC/IDDI/Fundación Plenitud (2013). Puntos críticos para la vulnerabilidad a la variabilidad y al cambio climático en la República Dominicana y su adaptación al mismo)

## 5 COMMUNITY CAPITALS FRAMEWORK

This approach called community capital framework was developed by Cornelia and Jan Flora <sup>[70]</sup> (Flora et al., 2004) as a method of analysis and recommendations for communities in rural and urban areas. Based on investigations carried out and the results obtained showed that more prosperous communities from the economic, social and environmental point of view, working with seven types of aspects who called *capital*. In addition to identifying the types of capital and its role in the development of the communities, focuses on the interaction between these capitals and as a capital expansion can impinge on the expansion of others. Capital of communities are not always evident, but when they are identified and designated to serve as a tool to motivate positive change actions (Flora et al., 2004).

**Natural Capital** refers to the natural resources available in the community, represented by all of those recognized as relevant to the ecosystem or the well-being of the population (land, water, ecosystems, and forests) and sets the limits to human actions. Examples of natural capital are Flora and wildlife, air, water, soils, biodiversity, landscape.

**Social Capital** refers to the formal and informal relationships between people, where various opportunities and benefits can be obtained. Refers to the relationships, interactions, connections and links between people in the community and the organizations present in the area that work for the welfare of people and the conservation of resources (Flora et al., 2004). Examples: Community organizations, reciprocity, group action, are the relationships that give cohesion to the community.

**Cultural capital:** reflects the way to "see the world" and how to act on it. Cultural capital includes the dynamics of which we know and feel comfortable with what are valued assets, the collaboration between races, ethnic groups and generations, cultural influences.

**Human capital** consists of skills, knowledge, health and education of people within a community. It refers to the people, the members of a community and his family. Example: Education, skills, abilities and health.

**Political capital** is related to the decision makers and institutions that comply with the function of taking or facilitating these decisions. It is the ability of a group to influence the decisions that affect them. Connections between the local organization and other institutions, and access to decision-making.

**Capital finance:** resources: savings in cash or liquid assets, pensions and other financial transfers. It is the sum of the economic resources available to the Community - internal and external-. Examples of financial capital are crops, machinery, savings, loans and credits. Investments, taxes and donations. There is consensus that the CF is much more than just money (Flora et al., 2004) by what he considered the resource of intensive farming as a resource within the capital.

**Physical capital** includes basic such as housing, services infrastructure and physical assets or assets that support livelihoods. Considered that the appeal of crops under irrigation as having irrigation infrastructure is built physical capital.

According to the framework of the community capital (MCC-Flora et al. 2004), analyzed the seven capitals of the Community (human, social, cultural, natural, financial, political, and physical), as

well as the interactions between them, to support the process of selecting indicators applying an adaptive and participatory approach. This approach enables a greater understanding of the processes of interrelation of the natural environment with the social and economic spheres and is used to make interdisciplinary assessments of the impact of agricultural research on the eradication of poverty (Flora to the. 2004).

Indicators	Framework of capital	Dimension of vulnerability
Climate class	Natural capital	Exhibition
Population density	Social capital	Exhibition
Sensitive agricultural area, area of cultivation of the total agricultural DM DM/surface area	Natural capital	Exhibition
Surface of agricultural area in flooded area in the DM / total area of DM	Natural capital	Exhibition
Agricultural area on more than 10% slope (surface of agricultural area on a slope exceeding the total 10%/Superficies of DM)	Natural capital	Sensitivity
Index of sensitivity to desertification (ESAI)	Natural capital	Sensitivity to drought
Agricultural area on more than 10% slope (surface of agricultural area on a slope exceeding the total 10%/Superficies of DM)	Natural capital	Sensitivity to flooding
intensive crops area % of District Municipal Vs total area of the Municipal District	Financial capital (CF)	Sensitivity to drought and floods
Area under irrigation (surface area under irrigation in the DM / DM agricultural surface)	Physical capital built (CF)	Adaptive capacity to drought
Index of quality of life	Human capital (CH)	Adaptive capacity to drought and floods
% Protected area in the borough / total Area protected in the study area	Natural capital	Adaptive capacity to drought and floods

Cornelia and Jan Flora (2008) developed the **Community Capitals Framework** as an approach to analyze how communities work.<sup>53</sup> (Flora et al. 2004)

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<sup>53</sup> <http://www.soc.iastate.edu/staff/cflora/ncrcrd/capitals.html>

## 6 INTEGRATED VULNERABILITY INDICATORS.

The conceptual framework of vulnerability to climate change and variability is described in Chapter 2. To choose the indicators, we use the concept called SMART, which consists in choosing specific, measurable, relevant and time-bound indicators was used as described in sections 3.4.5. and 3.4.6. where the development of vulnerability indicators described in the context of integration.

Once selected indicators according to the dimension of vulnerability they represent: exposure, sensitivity and adaptive and according to approach either drought or floods, we proceeded to perform the calculation according to the formula  $V = EXS / CA$  in order to obtain the integrated indicators of vulnerability. The methodological steps are described in detail below.

### 6.1 Methodology

The present study of integrated indicators of vulnerability to climate change applied to the area of study for the agricultural sector, has been tested in two major scenarios: the first related to drought events where water availability is important deficit for the normal development of the activities of the agricultural sector; the second scenario is one where rainfall presents a marked amount and intensity, potentially resulting in significant increases in runoff, floods of bodies of water, mudslides and floods in areas of low slope.

The vulnerability (V) is the conjugate expression of three variables: exposure (E), sensitivity (S) and adaptive capacity (CA)(Turner et al., 2003<sup>54</sup>; Downing, T. and A. Patwardhan<sup>55</sup> 2003;IPCC, 2007<sup>56</sup>):

$$V = f(E, S, CA)$$

According to the IPCC, the **vulnerability to climate change** is the level to which a system is susceptible to, or is not able to cope with, adverse effects of climate change, including climate variability and extreme events. The vulnerability is based on the character, magnitude and rate of climate variation to which is exposed a system, its sensitivity, and its capacity for adaptation, being defined each of these variables in the following manner:

**Sensitivity:** Level at which a system is affected, either negative or positive, by climate-related stimuli. The effect may be direct (e.g., a change in the crop production in response to the average, range, or variability of temperature) or indirect (damages caused by an increase in the frequency of coastal flooding due to an elevation of the sea level).

**Exposure:** The type and extent in which a system is exposed to climatic variations.

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<sup>54</sup> Turner, B.L., R.E. Kasperson, P.A. Matson, J.J. McCarthy, R.W. Corell, L. Christensen, N. Eckley, J.X. Kasperson, A. Luers, M.L. Martello, C. Polsky, A. Pulsipher, and A. Schiller (2003). A framework for vulnerability analysis in sustainability science. *Proceedings of the National Academy of Sciences*. Vol. 100(4)

<sup>55</sup> Downing, T. and A. Patwardhan (Lead Authors) (2003). *Vulnerability assessment for climate adaptation*. UNDP Adaptation Policy Framework Technical Paper No. 3

<sup>56</sup> PCC, 2007: *Cambio climático 2007: Informe de síntesis. Contribución de los Grupos de trabajo I, II y III al Cuarto Informe de evaluación del Grupo Intergubernamental de Expertos sobre el Cambio Climático* [Equipo de redacción principal: Pachauri, R.K. y Reisinger, A. (directores de la publicación)]. IPCC, Ginebra, Suiza, 104 págs.

**Adaptive capacity:** ability of a system to adjust to climate change (including climate variability and extreme changes) to moderate potential damages, take advantage of the positive consequences, or bear the negative consequences.

Based on this, the vulnerability is obtained from the following equation:  $V = (E \times S) / CA$

In the present study, those indicators that would make a differentiation of spatial behavior in which each of these variables acts in the area of study (San Juan province and Sub area Hondo Valley) under drought conditions or, on the contrary, rains and floods were identified for each of the scenarios evaluated.

Indicators for each of the scope of the vulnerability were selected by the technical team considering the availability of information at the level of district municipality area, which limited the methodology significantly since many of the indicators considered that they could be more representative of the conditions of sensitivity, exposure and adaptive capacity lack of data at this level of detail. This situation forced the use of those indicators that are available the data would allow us to visualize spatial answers different from the scale of work selected (Municipal District), offering criteria sufficiently solid to establish priorities for care based on the results of vulnerability resulting.

Indicators used for the scenario of "Drought" and "intense rainfall and flooding" exposure and sensitivity were evaluated considering values from 1 to 5, being the more damaging value 5 and the more favorable the 1. Each of the indicators is assessed considering only the interval of values present in the study area, while it could have values higher or lower if you will be assessed on a regional or national context in order to establish priorities for attention in the objective geographical space.

#### Exposure:

- **Climate Class:** was used the average obtained for each Municipal District on the basis of the information presented in the map of climatic classification at the national level by the national Office of meteorology (ONAMET) and the Ministry of the environment and natural resources (2011)<sup>57</sup>, which is based on the climatic classification of Thorn Thwaite, which is used to a greater degree for biological and agronomic being applications based on potential evapotranspiration and the balance of steam water.

Climate class	Exposure value
Per-humid A (> 100%)	1
Wet B4 (80-100%)	1
Wet B3 (60-80%)	2
Wet B2 (40-60%)	3
Wet B1 (20-40%)	4
Humid wet C2 (0 - 20%)	4
Subhumid dry C1 (- 33 to 0%)	5
Semiarid D (- 33-67%)	5

<sup>57</sup> Izzo M., Aucelli P.P.C., Maratea A., Méndez R., Pérez C., Roskopf, C.M., Segura H., 2010. A new climatic map of de Dominican Republic base on the Thornthwaite classification. Physical Geography, 32(5), 455-472.

- **Population density:** refers to the average number of people in an urban or rural area in relation to a given surface unit. Its formula is the following:  $\text{density} = \text{population} \backslash \text{superficies (inhabit/Km}^2\text{)}$ . Data presented at the National Bureau of statistics of the Ministry of economy, planning and development (2010) were used for the elaboration of this map.

Population density (inhabitants/km <sup>2</sup> )	Exposure value
0-50	1
50-100	2
100-150	3
150-200	4
> 200	5

- **Intensive cultivation area:** this index reflects the percentage of the area occupied by intensive crops (rice, beans, vegetables, vegetables and peas) in each Municipal District in relation to the total area of the district, using as a basis the information contained in the map drawn up by the Directorate for environmental information and resources natural (DIARENA) of the Ministry of the environment (2010).

Area of area intensive cultivation in the DM / surface DM	Exposure value
0-16	1
16-30	2
30-43	3
43-57	4
57-70.3	5

#### SENSIBILITY:

- **Agricultural area with a slope greater than 10%:** It refers to the percentage of agricultural area located in soils with slopes greater than 10% of each Municipal District in relation to the total area of the Municipal District. Farming on slopes greater than 10% is considered sensitive by the undersized presenting these soils retain water, draining much of the same coming of rainfall.

Agricultural area on a slope greater than 10% in	Value of sensitivity
--	----------------------

the total DM DM/surface	
0-14	1
14-25	2
25-36	3
36-47	4
47-58.3	5

- **Index of sensitivity to desertification (ESAI)**: this index value depends on four main components: the climate, vegetation, soil and the management of the territory. The areas with highest ESAI are the most susceptible to desertification. Values for the study area were extracted on the map of the country (ESAI<sup>58</sup>) from which data were obtained by District averages, using geo-processing tools in ArcGIS.

Index of sensitivity to desertification (ESAI) of DM	Sensitivity value
< 1.20	1
1.20-1.35	2
1.35-1.50	3
1.50-1.65	4
> 1.65	5

- **Surface covered by intensive crops of each Municipal District in relation to the agricultural area of the District**: Refers to the percentage of the areas of intensive crops (rice, vegetable, bean, etc.) of the district, with respect to the entire agricultural area from included in this. These data were collected on the map included in the study of use and coverage of the soil 2012 (2014 DIARENA).

intensive crops area % of District Municipal Vs agricultural area Municipal District	Sensitivity value
0-10	1
10-20	2
20-30	3
30-40	4
< 40	5

#### ADAPTIVE CAPACITY:

<sup>58</sup> Izzo, M., Araujo, N.A., Aucelli, P.P.C., Maratea, A., Sánchez, A. (2011). Land sensitivity to desertification in the Dominican Republic: an adaptation of the ESA methodology. Land Degradation and Development (submitted to).

For both scenarios the indicators used to assess adaptive capacity were used equally values from 1 to 5; However, the most damaging value was assigned a value of 1 and the more favorable the 5 since this component is the one that allows to counteract exposure and sensitivity of a system to climate change and variability. For this reason, unlike the other two components (exposure and sensitivity), districts with very low values in the selected indicators should be considered with greater care than those with high values, marking is therefore on the map with color-coded inverted in relation to the other two components.

- **Area under irrigation:** reflects the relationship of the space in each Municipal District presented irrigation system, in reference to the total area of the district. The used map comes from the database of the Dominican Republic of the INDRHI irrigation systems, shape file of the areas under irrigation and the provincial limits.

Area under irrigation (surface area under irrigation in the district / district agricultural surface)	Heat of adaptive capacity
79-63	5
63-47	4
47-32	3
32-16	2
16-0	1

- **Quality of life index:** weights system that integrates a set of dimensions and relevant variables in the definition of the material conditions of life of the population, structured with a total of 17 variables related to housing, schooling, illiteracy, fountain water, health services, availability of equipment for the home, among others. Obtained values of the ICV in a scale of 0 to 100, which highlights the multidimensional poverty grade measurement. A value close to zero indicates lower quality of life and more about 100 indicates a higher quality of life.<sup>59</sup>

Quality of life	Value of adaptive capacity
> 64	5
56-64	4
48-56	3
40-48	2
< 40	1

- **Protected areas:** the resulting index of the surface allocated to protected areas in each borough in relation to the total area of the district.

Protected in the borough area /	Value of adaptive
---------------------------------	-------------------

<sup>59</sup> MEPLYD, 2013. Atlas Nacional de la Pobreza en la República Dominicana 2010.

total Area protected district	capacity
> 80	5
80-60	4
60-40	3
40-20	2
< 20	1

The results were integrated through GIS tools (Algebra of maps), then resulting in the following equation for the vulnerability to climate change for the drought scenario

EVALUATION STAGE DROUGHTS	
<b>Exposure (s) =</b>	[Class climatic + density + population (surface covered by farming intensive of the DM/total Area of DM)] / 3
<b>Sensitivity (Ss) =</b>	[Agricultural areas with a slope greater than the 10% + index of sensitivity to desertification (ESAI) + (area covered by intensive farming agricultural DM DM/Area)] / 3
<b>Adaptive Capacity (CAs) =</b>	[(Areas under riego deel DM/Area total deel DM) + index of quality of life + (surface of Area protected of the DM/total Area of DM)] / 3

$$\text{Vulnerability to drought (Vs)} = (Is * Ss) / CAs$$

In the case of the second scenario evaluated "Rains and floods", were used the same assessment criteria for each of the indicators:

**EXPOSURE:**

- Climate class: we used the same information from the previous stage and the same endpoint.
- Surface of agricultural area located in flood zone: this indicator presents the surface of each DM dedicated to agricultural activities located in flood-prone areas in relation to the total area of DM. The data come from the map of uses of soil 2003 prepared by the Ministry of the environment and natural resources and the National Institute of hydraulic resources (INDRHI).

Surface of agricultural area in flooded area in the DM / total area of DM	Exposure value
< 3	1
3-6	2
6-9	3
9-12	4
> 12	5

**SENSITIVITY:**

- Agricultural area with greater than 10% slope: we used the same information from the previous stage and the same endpoint.
- Surface covered by intensive crops of each Municipal District in relation to the agricultural area of the Municipal District: we used the same information from the previous stage and the same endpoint.

**ADAPTIVE CAPACITY**

- Index of quality of life: we used the same information from the previous stage and the same endpoint.
- Protected areas: we used the same information from the previous stage and the same endpoint.

The results were integrated through GIS tools (Algebra of maps), then resulting in the following equation for the vulnerability to climate change for the drought scenario:

<b>EVALUATION STAGE</b>	
<b>HEAVY RAINS AND FLOODS</b>	
<b>Exposure (IE) =</b>	(Population density + acreage in flood areas) / 2
<b>Sensitivity (Si) =</b>	(Agricultural areas with greater than 10% slope + surface covered by intensive farming agricultural DM DM/Area) / 2
<b>Adaptive CAPAC (CAi) =</b>	(Index of quality of life + protected Area) / 2

$$\text{Vulnerability to intense rainfall and flooding (Vi)} = (Ei * if) / Cai$$

The summary of the indicators presented, the Community capital framework to which they are associated

**Table 53.** Summary of Indicators used organized by the community capital framework and scenario to which they are associated.

Indicators	Framework of capital	Dimension of vulnerability
Climate class	Natural capital	Exposure
Population density	Social capital	Exposure
Sensitive agricultural area, area of cultivation of the total agricultural DM DM/surface area	Natural capital	Exposure
Surface of agricultural area in flooded area in the DM / total area of DM	Natural capital	Exposure
Agricultural area on more than 10% slope (surface of agricultural area on a slope exceeding the total 10%/Superficies of DM)	Natural capital	Sensitivity
Index of sensitivity to desertification (ESAI)	Natural capital	Sensitivity to drought
Agricultural area on more than 10% slope (surface of agricultural area on a slope exceeding the total 10%/Superficies of DM)	Natural capital	Sensitivity to flooding
intensive crops area % of District Municipal Vs total area of the Municipal District	Financial capital (CF)	Sensitivity to drought and floods
Area under irrigation (surface area under irrigation in the DM / DM agricultural surface)	Physical capital built (CF)	Adaptive capacity to drought
Index of quality of life	Human capital (CH)	Adaptive capacity to drought and floods
% Protected area in the borough / total Area protected in the study area	Natural capital	Adaptive capacity to drought and floods

## 6.2 Limitations and explanatory

The methodology used in this study of vulnerability to climate change for agriculture, has been proposed as an initial proposal to establish a system level evaluation Municipal District, this being the first time that this scale of analysis is reached in the country for this type of study. It is considered that the results generally reflect the actual dynamics of the area, sensitivity and degree of exposure to events involving climate change and variability.

It is important to clarify that the indicators used were evaluated considering the relationship between them, without including in the analysis the total scale of each indicator, or its value in relation to other contexts. This methodological procedure allowed to then assign the highest values of sensitivity and exposure to those DM of the study area, that reflect the worst condition within the geographical context evaluated, as was assigned the greater capacity of adaptation to DM with the most favorable condition for each indicator, and can take individual values that

would have valuations other than those presented in this study to be assessed in a broader spatial context.

By the above, this methodological procedure is very useful for evaluating and designing policies and strategies to be implemented in the area, serving for the ranking of priorities and efforts required in it.

Serious deficiencies were found in relation to the information based on climatological data, losses associated with weather events that have occurred in the past, agricultural farming, safe loans, agricultural investment, etc., were a major constraint for this evaluation. The lack of availability of the same district scale prevented incorporate important indicators in the calculations made, being one of the greatest contributions that may be made to the methodology presented in this study to optimize its replication in other parts of the country and even in other countries of the region.

On the other hand, some available data used were drawn up at national level, by which reduce to scale provincial and/or municipal, generates lower levels of detail in them.

### 6.3 Results obtained

Following are the results of the evaluation of indicators for each of the scenarios evaluated.

#### 6.3.1 Drought Scenario

Meteorological drought, defined by the World Meteorological Organization (WMO) as 'a period of weather conditions abnormally dry, long enough as to the lack of rainfall cause a serious hydrological imbalance'. According to WMO, "there is agricultural drought when the amount of precipitation and its distribution, the reserves of water from the soil and losses due to evaporation combine to cause significant decreases in yield of crops and livestock".

- **Drought Exposure**

The results obtained from the various indicators used to evaluate the sensitivity setting of drought are as follows:

- ***Climate Class***<sup>60</sup>

Climatic differences in the area are mainly due to orographic changes of the study area, noting the areas more arid or moisture deficit in the San Juan Valley dominated by heights of 260 to 500 meters above sea level (in the Valley) and annual average precipitation of 961 mm according to the Ministry of Agriculture coinciding with a very high value (5) the municipal districts of MatayayaLas Matas de Farfán, Pedro Corto, Hato del Padre, Jinova, Vallejuelo, Juan Santiago, El Rosario, Sabana Alta, Guanito & Bohechio.

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<sup>60</sup> Izzo M.,Aucelli P.P.C., Maratea A.,Méndez R.,Pérez C.,Roskopf,C.M., Segura, H., (2010) A new map of the Dominican Republic based on the Thornwaite classification.Phidical Geografy, 32 (5), 445-472.

In these areas of reduced availability of humidity and rainfall, coinciding with the landscapes of Valle, elapse between the rivers Macasia and San Juan, being these DM presenting higher proportion of flood-prone areas for their outstanding low.

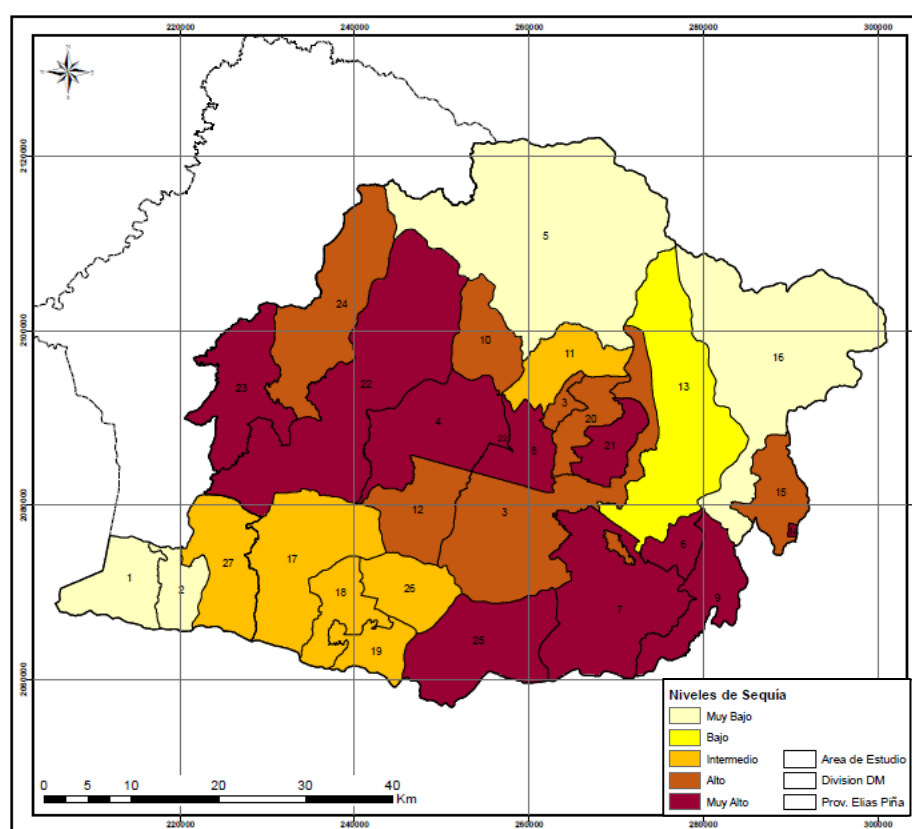
(4) high value, are those DM which possess the largest area in the Valle but also, to a lesser extent, include area of foothills that reach the 1000 m, such as: race Mare, La Jagua, Las Charcas de Maria Nova, San Juan and Arroyo Cano.

The intermediate value (3) are districts that have Valley landscapes, but include within its surface heights to 2,500 meters corresponding to the sierra de Neiba (Juan Santiago, Lima, Derrumbadero, Batista, and Jorjillo) and of the Central Cordillera (Las Maguanas).

Las Zanzas is the only district that received the low value (2) and very low (1) those districts located mainly in the highlands where the predominant heights are from 1000 to 2500 in the South as Hondo Valley and Rancho de la Guardia, and 1000 to 3100 those located in the North of the Cordillera Central as Sabaneta and Yaque.

Map of the valuation of drought according to class of exposure presents the values of this indicator for each district.

**Figure 44 Climate Class.**



Source: Oficina Nacional de Meteorología (ONAMET) y Ministerio de Medio Ambiente y Recursos Naturales, 2011.

### **- Population density**

This indicator presents the degree of exposure depending on the distribution and concentration of the population according to the number of inhabitants per square kilometer average in each district.

The highest value obtained in districts San Juan and Bohechio, placing in them the largest urban population of the municipality of San Juan in the towns of the same name with values of 314 people per km<sup>2</sup> and 2,392 inhabitants/km<sup>2</sup> respectively well above the national average (193.6 people per km<sup>2</sup>). In the specific case of Bohechio high-density responds to the entire surface of the district corresponds to urban area, while in San Juan, large tracts of its territory correspond to uses rural, thereby decreasing the district average.

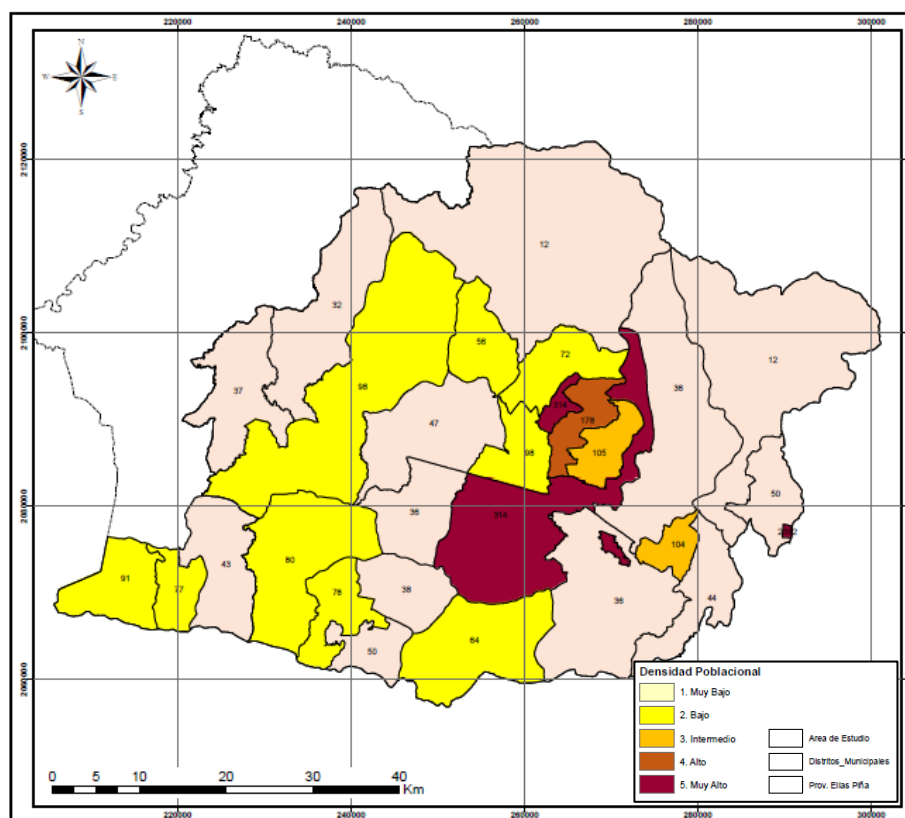
Juan de Herrera, followed in exposure with a high value (4) with 178 inhab/km<sup>2</sup> density and intermediate value (3) Jinova (105 inhab/km<sup>2</sup>) and high (104 inhab/km<sup>2</sup>).

Those of low value (2) correspond to Las Matas de Farfan and Hato del Padre with 98 people per km<sup>2</sup>, Hondo Valle (91), El Cercado (80), Derrumbadero (78), Rancho de la Guardia (77), the Maguanas (72), Vallejuelo (64) and La Jagua (56).

The rest of the DM feature a very low density (less than 50 inhabitants/km<sup>2</sup>) reaching the lowest, Sabaneta and Yaque (12 inhab/km<sup>2</sup>) for its extensive protected area.

Map of the assessment of exposure to drought according to population density presents the values of this indicator for each Municipal District.

**Figure 45 Population Density**



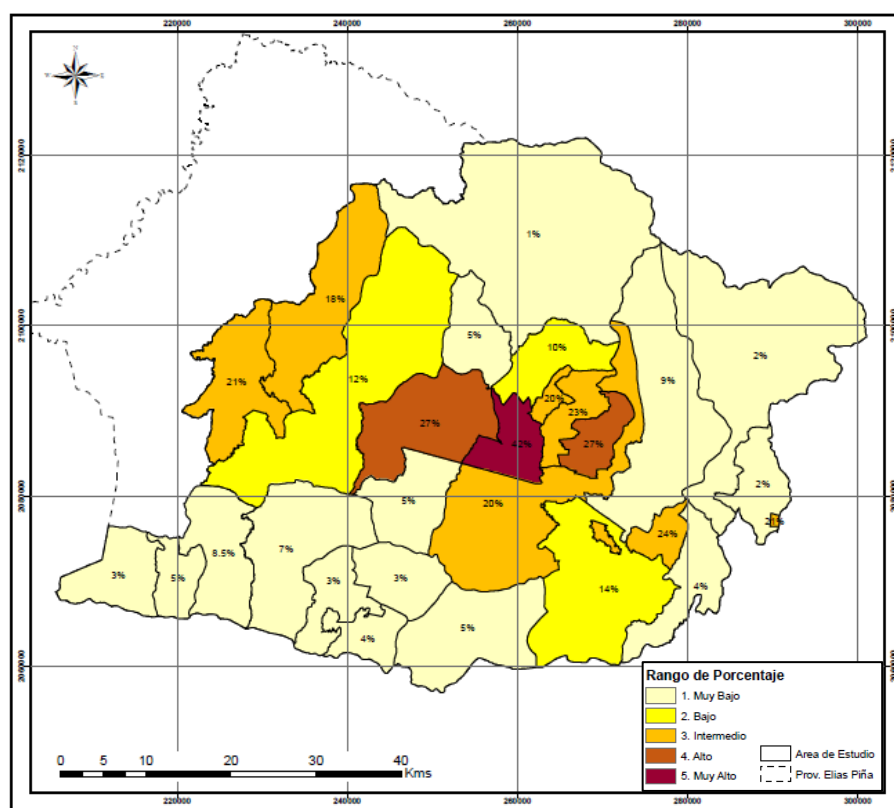
Fuente: Oficina Nacional de Estadísticas. Ministro de Economía, Planificación y Desarrollo, 2010.

### - *Area of Intensive cultivation*

Intensive cultivation, mainly crops of rice, beans, vegetables, etc., have greater incidence in the area of the Valley, by their demand for water and the availability of irrigation systems. As you can be seen on the map, the highest percentages of area covered by this activity, in the districts, with respect to its full extension, are precisely the DM that are located in the areas the study area lower, or that if it relieve is predominantly flat, as they are cases of Hato del Padre, which has 48% of its territory under intensive culture considered as too high, followed by Pedro Corto and Jinova with 27%, at a high level. With intermediate values are the districts of San Juan (20%), Juan de Herrera (23%), Sabana Alta (24%), Bohechío (21%), Matayaya (21%) and Carrera de Yegua (18%).

With rates low to very low intensive crops are all the other districts, which have higher relief, and/or have high percentages of Protected Areas, where human activity is lower incidence.

**Figure 46** Intensive cultivation.



Source: Dirección de Información Ambiental y Recursos Naturales (DIARENA).  
Ministerio de Medio Ambiente y Recursos Naturales. 2010.

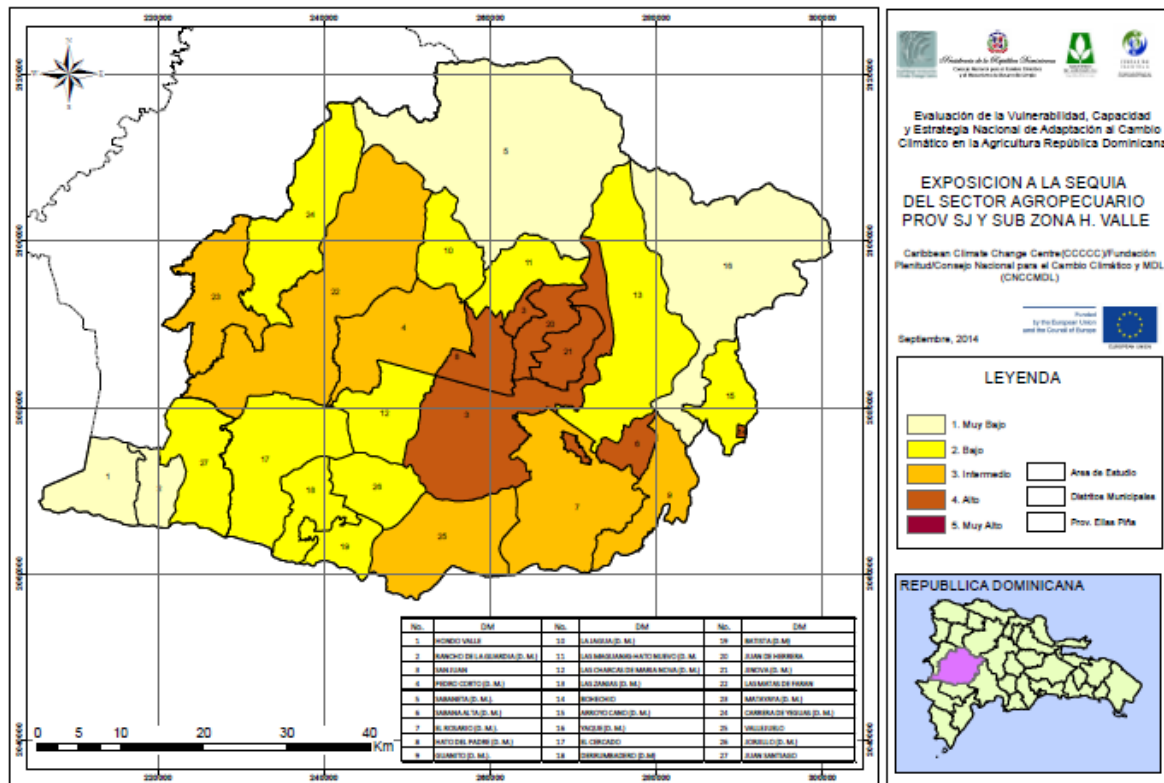
### - *Integrated results of the Exposure*

The result of the integration of these indicators showed exposure values that are those presented in the Drought Exposure map.

In the values it emphasizes the fact that none of the districts achieved a very high exposure index, placing the value of high exposure to the DM mostly located in the Valley of San Juan, being located in the climatic zone of greatest moisture deficit, present the highest population densities of the study area and combined with higher surfaces of intensive farming. All these factors demonstrate the high exposure facing intense drought events these districts.

,

Map 7 Drought Exposure.



Follow in importance the districts located in the Valley but with low densities and minor extensions of intensive agriculture such as: Matayaya, Las Matas de Farfán, Pedro Corto, Vallejuelo, El Rosario and Guanito.

Those who are mainly characterized by low population densities, 36-80 inhabitants/km<sup>2</sup>, with low percentages of surface of intensive farming in relation to the total area of the district are districts that exhibit low values were obtained: Guanito, La Jagua, Las Maguanas-Hato Nuevo, Las Charcas de Maria Nova, Arroyo Cano, El Cercado, Derrumbadero, Batista, Jorjillo and Juan Santiago.

Lower exposure value obtained it districts who presented the three indicators with values under (low density, climate class with excessive water and very small size of intensive farming): Hondo Valle, Rancho de la Guardia, Sabaneta, Las Zanjias and Yaque.

- **Sensitivity to drought**

Evaluation of sensitivity to drought, we examined the level in which the various municipal districts can be affected due to a severe drought and in particular related to the agricultural activities in the area.

- ***Agricultural area with greater than 10% slope***

This indicator was selected by the sensitivity that appear before the drought events crops located in high slope, this due to low retention of water presenting the soils to be associated with more rapid runoff and reduced infiltration process. Additionally, cultivated sloping areas do not have irrigation of collective management systems and in most cases even have irrigation system responsible for the planting, being thus more sensitive to prolonged drying processes.

In this sense the districts with very high values are those that possess important tracts of agricultural land areas with steep slopes in relation to the total area of the districts; associating these features with districts located south of the study area, on the Neiba mountains:

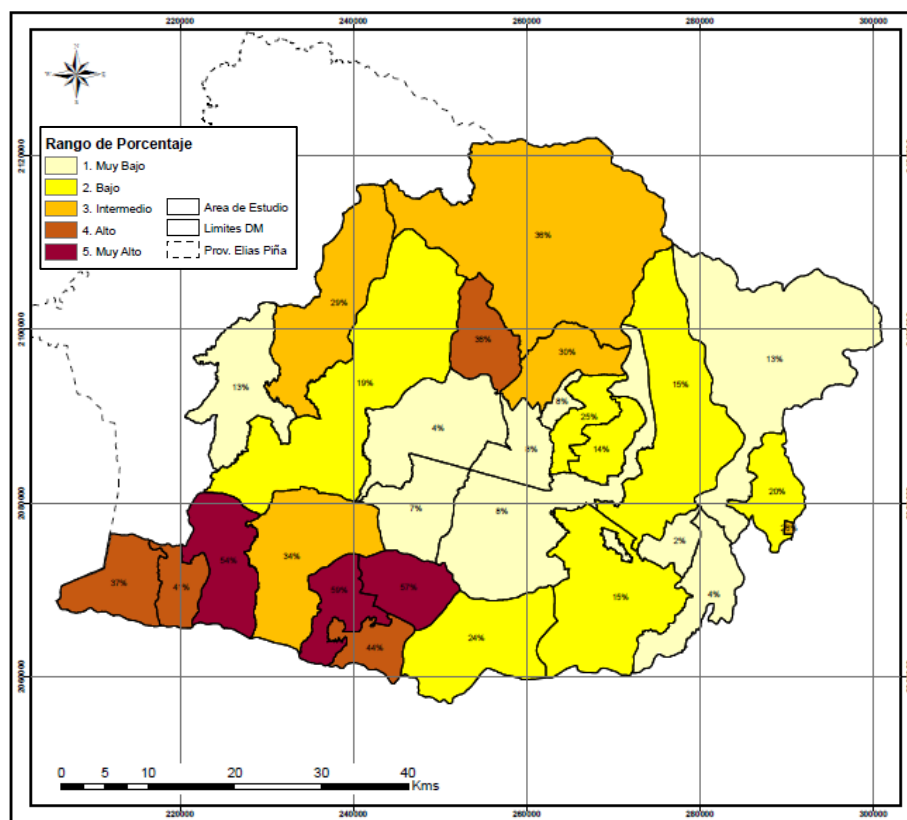
Derrumbadero (59%), Juan Santiago (54%) and Jorjillo (57). Continue you with high value close to these districts: Rancho de la Guardia (41%), Batista (44%) y Hondo Valle (37%).

Intermediate value are those who, despite having large tracts of land on slopes greater than 10%, the total area of the district is proportionately larger: the Sabaneta (36%), Cercado (34%), Las Zanjias (30%) and Carrera de Yegua (29%).

Low value obtained it those districts, which, despite having part of its agricultural areas in areas of steep slopes, sharing large tracts of the land in the Valley of San Juan: Juan de Herrera (25%), Vallejuelo (24%), Arroyo Cano (20%), Las Matas de Farfán (19%), Las Zanjias (15%), El Rosario (15%) and Jinova (14%).

The districts where almost all its extension is characterized by low slopes located in the valley floors, are those who obtained a very low value: Matayaya (13%), Yaque (13%), Hato del Padre (8%), San Juan (8%) Las Charcas de María Nova (7%), Pedro Corto(4%), Guanito (4%).

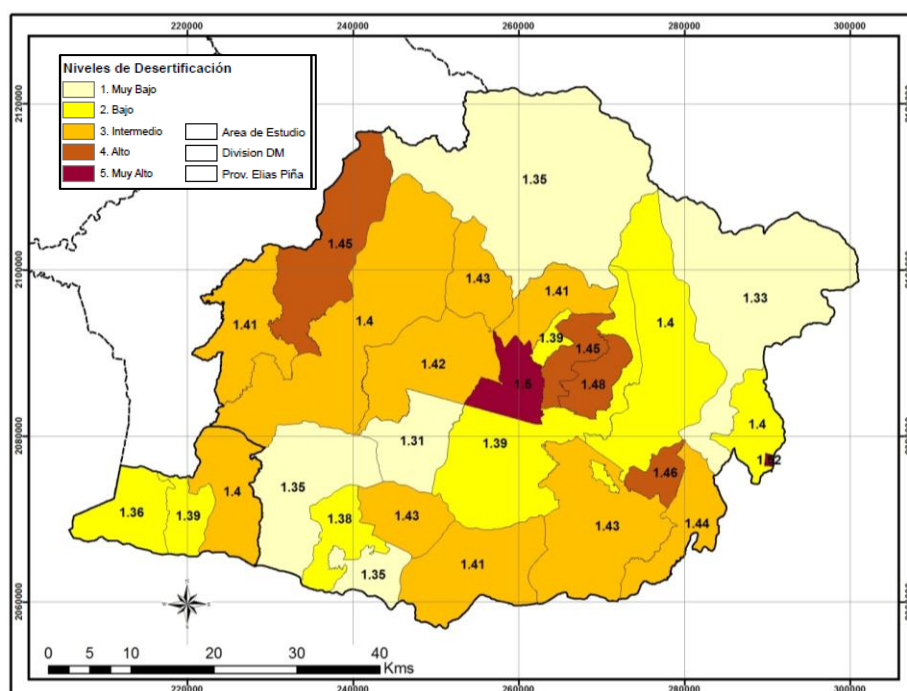
Figure 47 Agricultural area with a slope greater than 10%.



**- Index of sensitivity to desertification (ESAI)**

Bohechío (1.52) and Hato del Padre (1.5), followed in relevance Jinova (1.48), Sabana Alta (1.46), Carrera de Yeguas(1.45) and Juan de Herrera (1.45) with High sensitivity values, placing all of these in the region of the Valley of San Juan where rainfall is the smaller and lower elevations were districts with very high levels.

**Figure 48** Index of sensitivity to desertification (ESAI)



**- Surface covered by intensive crops of each Municipal District in relation to the agricultural area of the District**

This indicator evaluates the sensitivity that has each district to prolonged drought climate events when the proportion of the agricultural area in the district is mainly associated with intensive farming which are much more vulnerable to water stress than those extensive or perennial. The main intensive crops existing in the study area are: Beans, rice, pigeon peas, corn, onions, sweet potatoes, peanuts, cassava and vegetables.

The only high retrieved value corresponds to Sabana Alta with 70% of the area of the district dedicated to the agricultural activity in the form of intensive, being the main category beans and, secondly, pigeon peas..

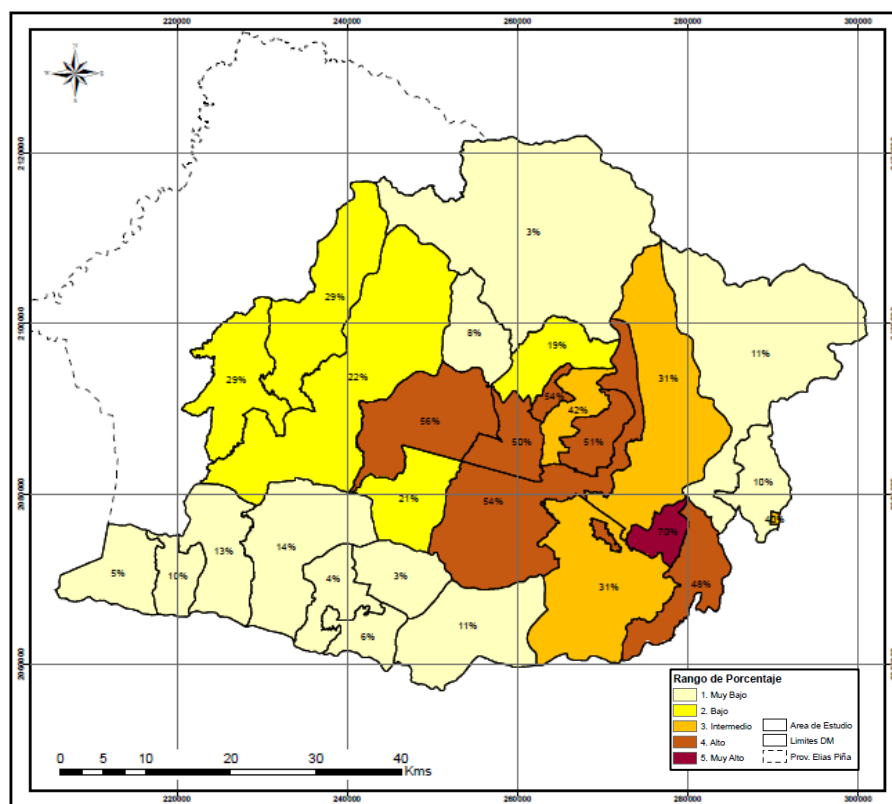
Followed, with a high value, Pedro Corto (56%), San Juan (54%), Jínova (51%), Hato del Padre (50%) y Guanito (48%). In these districts intensive crops are mainly rice, pigeon peas, corn, vegetables and beans.

Those who obtained an intermediate value are Juan de Herrera (42%), Las Zanjás (31%) and El Rosario (31%), where the main intensive crops are associated with rice, beans, pigeon peas and vegetables.

The rest of the districts located in the Valley of San Juan received a low value: Matayaya (29%), Carrera de Yeguas (29%), Las Matas de Farfán (22%), Las Charcas de María Nova (21%) and Las Maguanas-Hato Nuevo (19%).

Districts located towards the Sierra de Neiba and the Central Cordillera large tracts of land in steep slopes, protected areas and permanent crops like avocado, and coffee are present. However this condition in Hondo Valley, Juan Santiago and part of Batista and Derrurrumbadero, beans, pigeon peas, and corn are grown, resulting this indicator with Very Low value for its relative small areas.

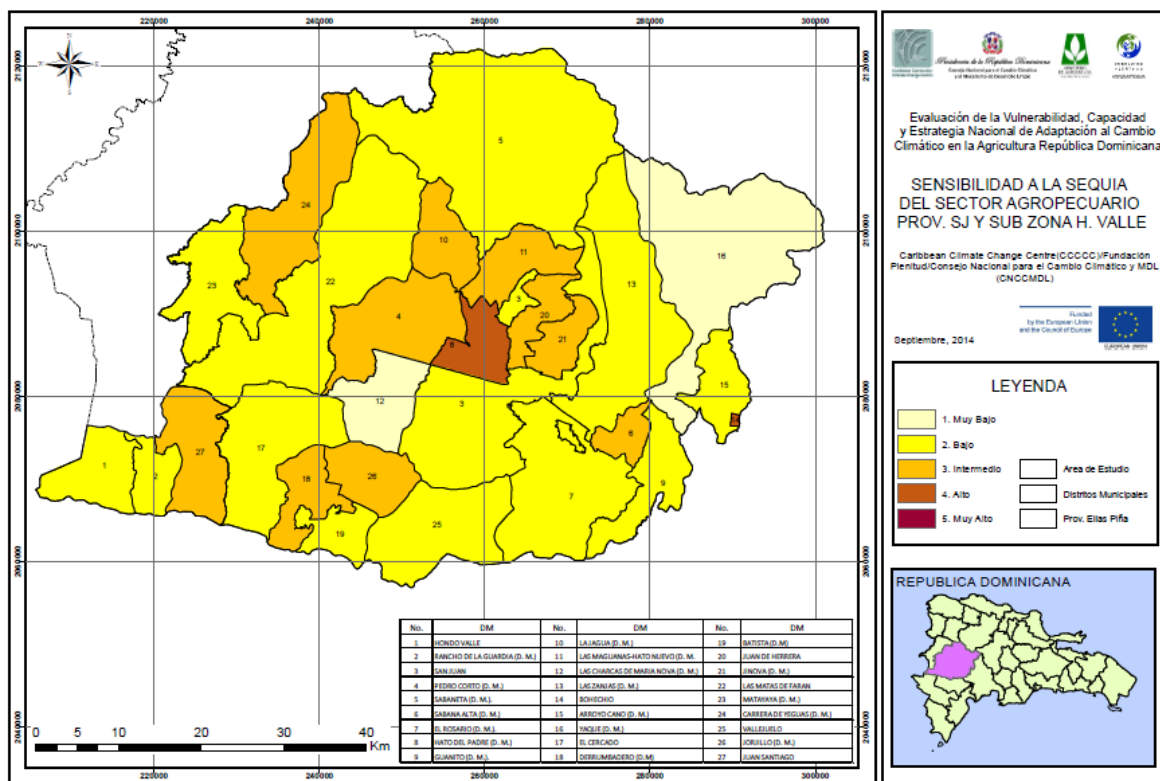
**Figure 49** Surface covered by intensive crops of each Municipal District in relation to the agricultural area of the district



### **- Integrated results of sensitivity**

The map is sensitivity to drought, presents the values obtained by integrating the previously mentioned indicators. In this, it can be seen that the District more sensitive to prolonged drought events that cause significant levels of water stress to crops is Hato del Padre with a high value. Continue you with intermediate value districts: Juan Santiago, Derrumbadero, Jorjillo , Sabana Alta, Jónova, Juan de Herrera, Las Maguanas-Hato Nuevo, La Jagua, Pedro Corto and Carrera de Yeguas. The only ones with very low sensitivity were Las Charcas de Maria Nova and Yaque; still the rest of low sensitivity.

Map 8 Sensitivity to drought events.



## Adaptive Capacity

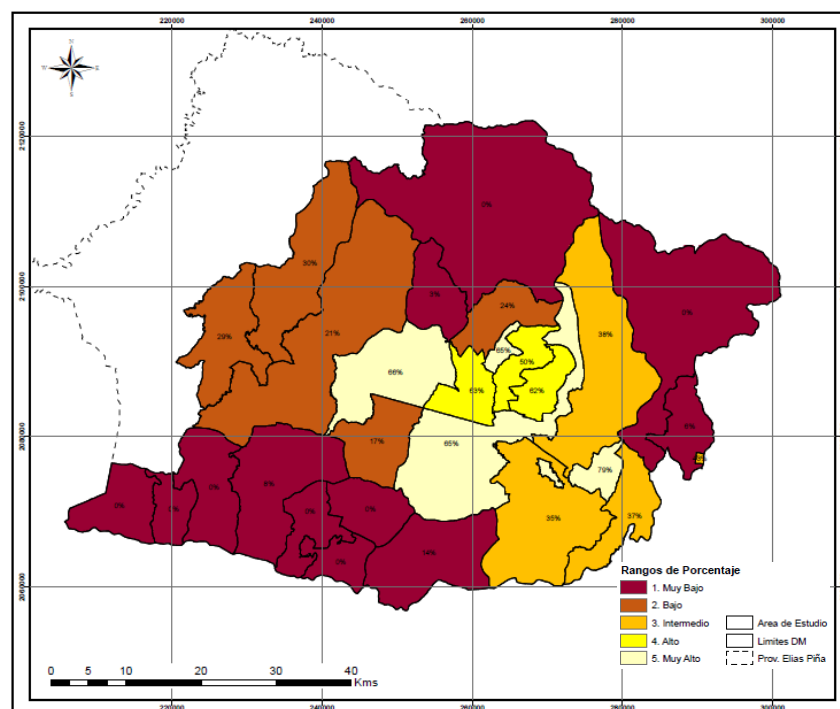
In this evaluation, the adaptive capacity has been considered as the ability of a system to adjust to climate change to moderate potential damages, take advantage of the positive consequences, or bear the negative consequences of the occurrence of events of prolonged drought. This component of the vulnerability is one that allows you to offset the exposure and sensitivity of a system to climate change and variability. For this reason, unlike the other two components (exposure and sensitivity), the DM with very low values in the selected indicators should be considered with greater care than those with high values, marking is therefore on the map with colors inverted in relation to the other two component code.

### - Area under irrigation

This indicator was analyzed considering that the DM where they operate irrigation systems may replace in a controlled manner the crop water demands when this is not satisfied by the rains, thereby adapting to climate change and minimize the impact that drought causing crops more advantageously than those where the area under irrigation is less.

This indicator the DM with greater relative surface under irrigation are Sabana Alta (79%), San Juan (65%) and Pedro Corto (66%). Followed those of the central zone of the study area: Hato del Padre (63%), Jínova (62%) and Juan de Herrera (50%). The DM who obtained a low rating are those ranging from 17-30% of the surface area under irrigation DM and the value very low total is where the irrigation area is really not very significant (less than 14%).

Figure 50 Percentage of irrigated area

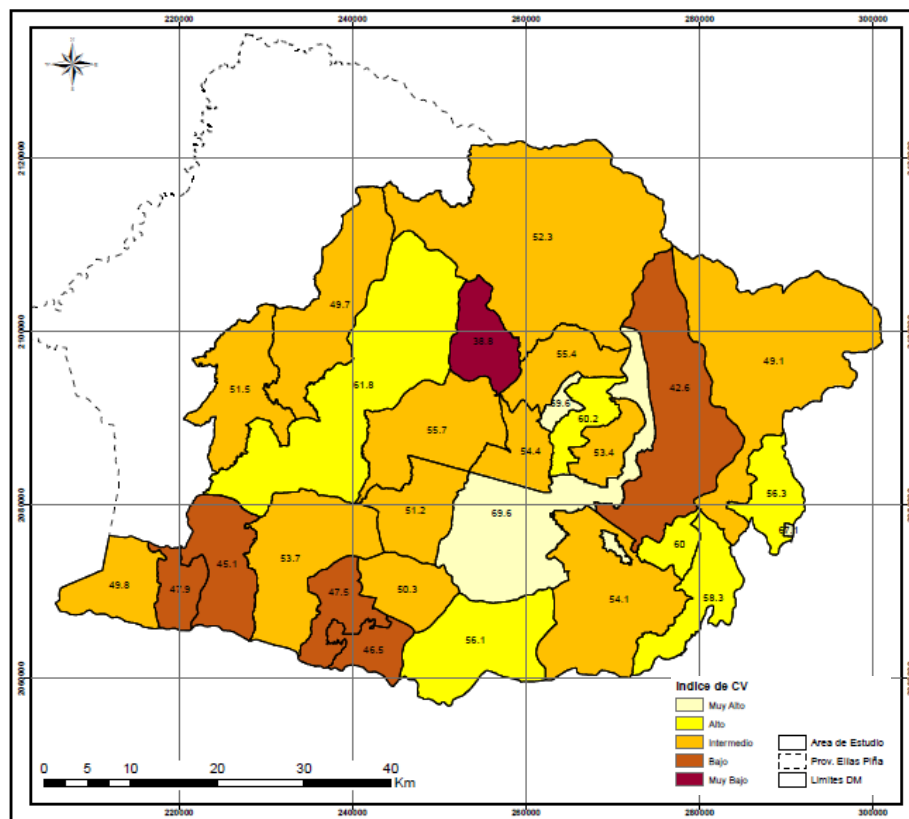


## - **Index of Quality of Life (ICV)**

This index was selected to evaluate the adaptive capacity of the various DM as it may relate indirectly to the ability of a population to counter independently impacts of climate change through prevention, mitigation or risk transfer (private irrigation systems, greenhouse crops, production of agricultural credit, agricultural insurance, etc.)

In assessing this indicator independently and relating the values obtained solely between DM that make the study area, the following results were obtained: The DM with Highest Quality of Life in relation to the contents in the study area are San Juan (69.6) where the senior populated area is located downtown, concentrated commercial activities and policies and Bohechío (67.1). Follow with High valuation, Las Matas de Farfán (61.8), Juan de Herrera (60.2), Sabana Alta (60), Guanito (58.3) and Arroyo Cano (56.3). The Index of Quality of Life Very Low proved La Jagua (38.8) and Baja Rancho de la Guardia (47.9), Juan Santiago (45.1), Derrumbadero (47.5), Batista (46.5) and Las Zanjás (42.6). The rest of the DM are located with intermediate values.

**Figure 51** Index of quality of life



## • **Protected areas**

Protected areas are considered to be acting as the high watershed protection systems, help maintain the recharge of aquifers and surface water bodies, lessen the production of sediments in reservoirs that generate electricity and supply water irrigation systems. These factors, coupled

with many other associated biodiversity, stability of the ground, etc., are factors that provide a higher adaptive capacity to climate change associated with drought events.

The DM with the highest relative proportion of protected Area will be more prepared to deal with the impacts, prevent or minimize them.

The next table presents existing in the study area and the matching surface protected areas:

**Table 54 Protected areas and matching surface.**

Municipality	Protected area		Area (km <sup>2</sup> )
San Juan	National parks 788.71 km <sup>2</sup>	Anacaona	117.49
		Armando Bermúdez	9.77
		José de el Carmen Ramírez	619.85
		Sierra de Neiba	41.60
	Natural reserves 186.41 km <sup>2</sup>	Arroyo Cano	5.29
		Guanito	68.94
		Cabeza de Toro	112.17
Elías Piña (Sub zone Hondo Valle)	National Park	Sierra de Neiba	34.85

Source: own elaboration based on info from MARENA. S/F. Distribution of Areas protected by province.

In this sense the DM with very high value turned out to be Yaque (89%) and Guanito (86%) associated with national park José de el Carmen Ramírez and las R.N. Arroyo Cano and Guanito. National Park José del Carmen Ramírez, created using the 5066 law of 1959, has the largest number of hydrological resources in its interior. It is located in the South of the Central Mountain range from which are born Yaque del Sur and all its tributaries that produce the San Juan Valley irrigation and provide electric power to neighboring communities. Possesses the highest point in the Antilles, Pico Duarte at an elevation higher than the 3,000 msnm.

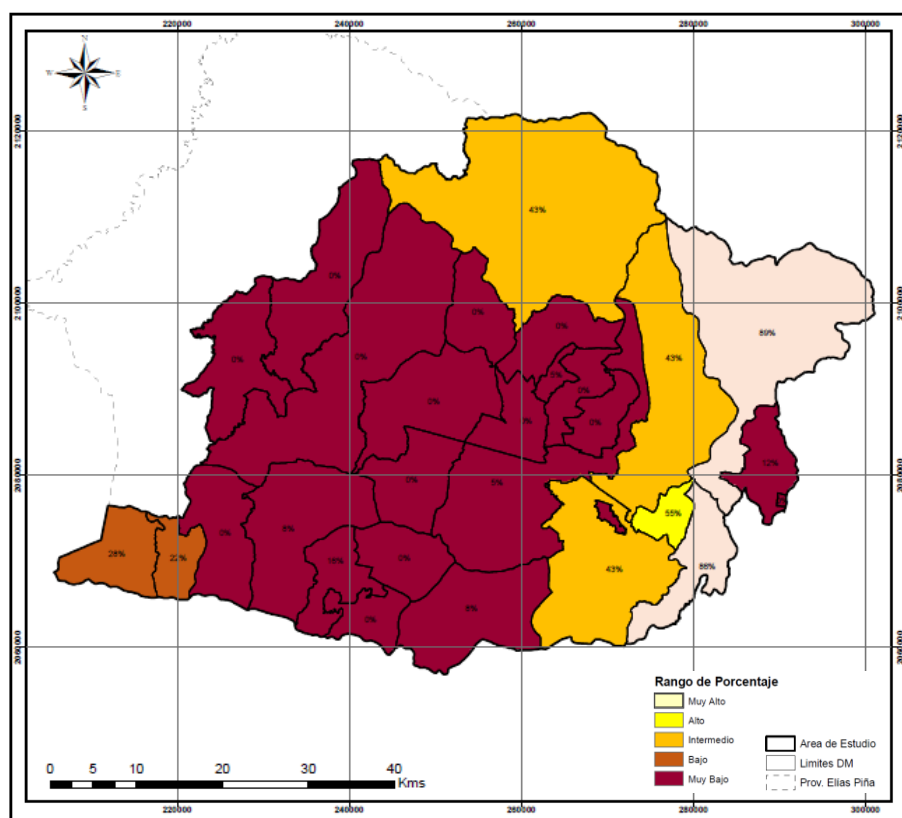
Natural Reserve Arroyo Cano has a total length of 18.61 km<sup>2</sup>, only placing 5.29 km<sup>2</sup> within the study area and Reserva Natural Guanito, has a total length of 68.91 km<sup>2</sup>.

DM Sabana Alta with a high value to be 55% of its territory under the figure of Guanito Forest Reserve. The DM who obtained an intermediate value were El Rosario, 43% of its area within the national park being Anacaona; Las Zanjas to include 43% of National Park José de el Carmen Ramírez; and Sabaneta with 43% of its territory in national park (José de el Carmen Ramírez and Armando Bermúdez).

The Hondo Valle and Rancho de la Guardia, DM with value low, have a 28% and 22% of their territory within the National Park Sierra de Neiba respectively. The rest of the DM are seen with very low value since the percentage of its territory occupied by any figure of protected Area does not exceed 16%, mostly to have 0%.

The National Park Sierra de Neiba with 183 km<sup>2</sup> includes only 85.5 km<sup>2</sup> within the study area being its very small fraction relative to the total surface of the DM located to the South of the province of San Juan.

Figure 52 Percentage of protected areas



### ***-Integrated results of adaptive capacity***

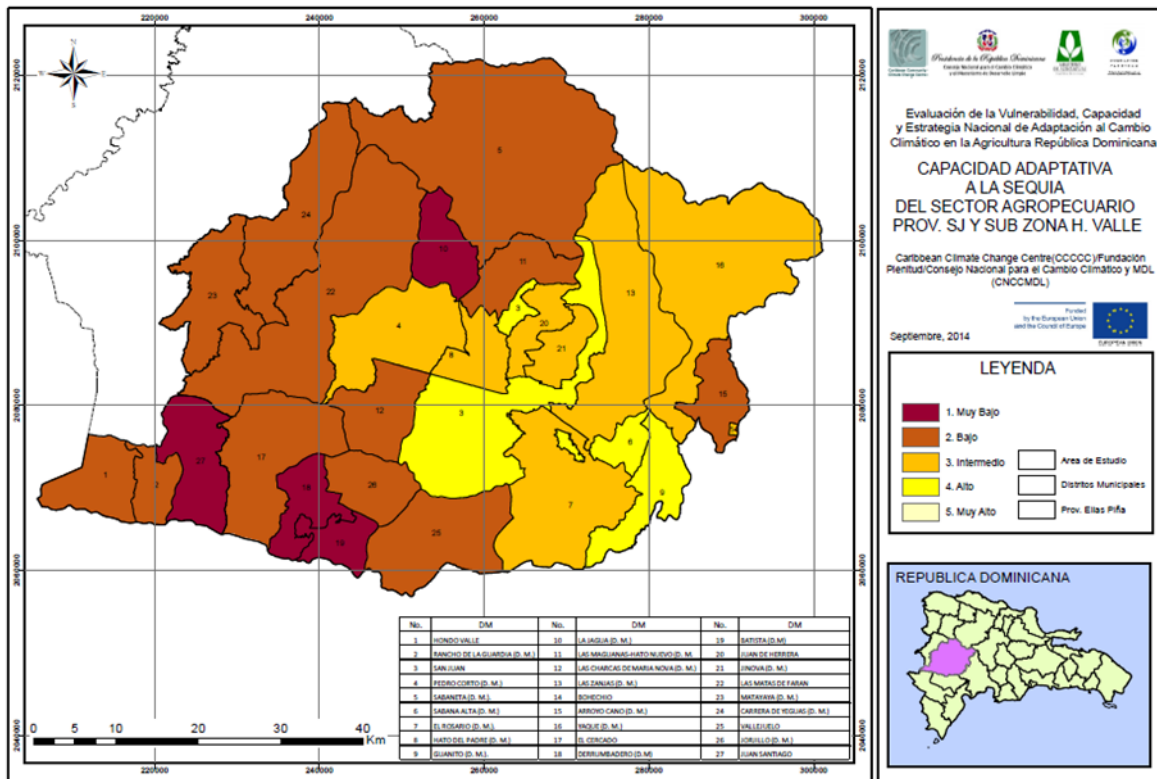
To integrate the values of the three analyzed indicators to assess adaptive capacity component to drought events, was obtained the map presented below.

The map shows that none of the DM got a very high rating, being Guanito, Sabana Alta and San Juan the highest value (high). The case of San Juan, it is located within this category presented the highest values in relation to the indicators of area under irrigation and life quality index that combined them with small protected areas still manifesting a high value.

Sabana Alta and Guanito, are located in this classification for the three indicators with high and very high values. In the case of Sabana Alta the highest score is the surface under irrigation, introducing protected area and high quality of life. Guanito, on the other hand, was rating high mainly for the large area of protected area, conjugated with extensive area under irrigation and high quality of life in relation to the rest of the DM.

The DM with the lowest value corresponded to Juan Santiago, Derrumbadero, Batista and La Jagua to combine in these very low or no area under irrigation, poor quality of life and very little surface of protected area.

Map 9 Integrated results of adaptive capacity



- **Vulnerability to Drought events**

Vulnerability to climate change associated with drought scenario was calculated considering the Exposure, Sensitivity and Adaptive Capacity. The DM who obtained values higher vulnerability in relation to the remaining were: Jinova, Hato del Padre, Bohechío and La Jagua, when combined High Sensitivity, High and Medium Exposure to Low Adaptive Capacity.

**Jínova y Hato del Padre** are located in the valley of San Juan where the annual average rainfall has the lowest values of the area with a high rate of evapotranspiration, placing them in a dry sub-humid climate class. Additionally, the adaptive capacity of both is high. In these areas of reduced availability of moisture and rainfall, coinciding with the landscapes of the valley, pass the main rivers Macasía and San Juan.

El DM **Bohechío** belongs to the basin of Grande (sub Yaque del Sur) River, located in the eastern region, with low rainfall, high population density relative to the rest of the province and poor irrigation infrastructure and PAs.

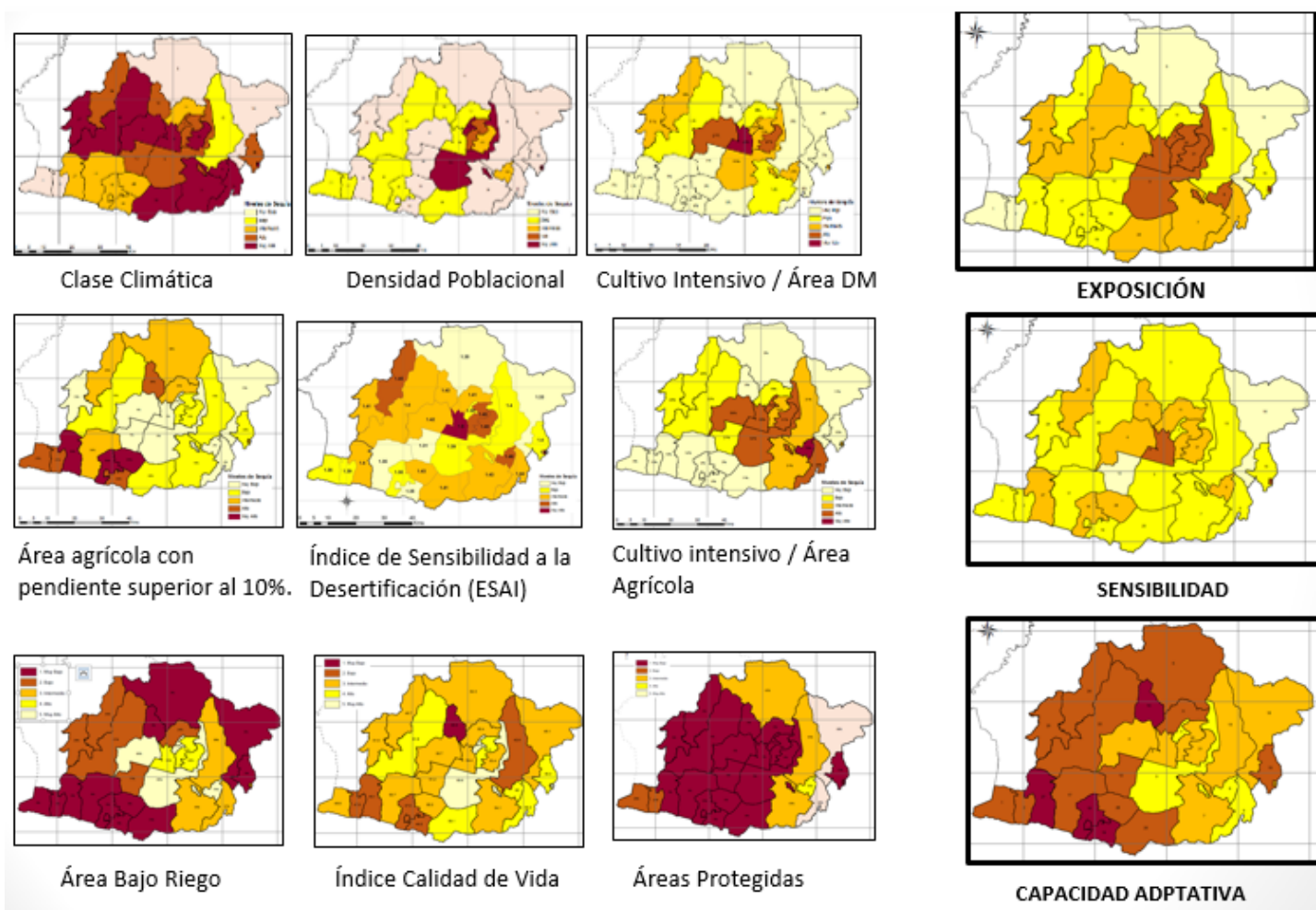
La **Jagua** s in the Rio San Juan, with an intermediate sensitivity to drought influenced by the high proportion of intensive crops and medium ESAI. The low ICV, absence of irrigated areas and Protected Areas gives a very low adaptive capacity.

Continue with high vulnerability is Juan Santiago, Derrumbadero, Carrera de Yeguas and Juan Herrera. Los dos primeros, a pesar de ser su exposición y sensibilidad de valor Medio, su Capacidad Adaptativa presenta los valores más bajos confiriéndole con ello la más alta vulnerabilidad. Para el caso de Carrera de Yegua y Juan Herrera, los valores de sensibilidad y exposición son medio pero la capacidad adaptativa es baja o Intermedia resultado igualmente de vulnerabilidad Muy Alta.

By contrast, the lowest values of vulnerability, extracted DM Las Charcas de Maria Nova, Guanito, Las Zanjás, Yaque and Sabaneta when combined sensitivities and very low exposures and therefore the Adaptive Capacity is immaterial.

The summary of the various indicators and results of each component are presented in the following figure:

Figure 53 Results of the various indicators and each component that conform the Vulnerability to drought events



Map 10 Drought Vulnerability events

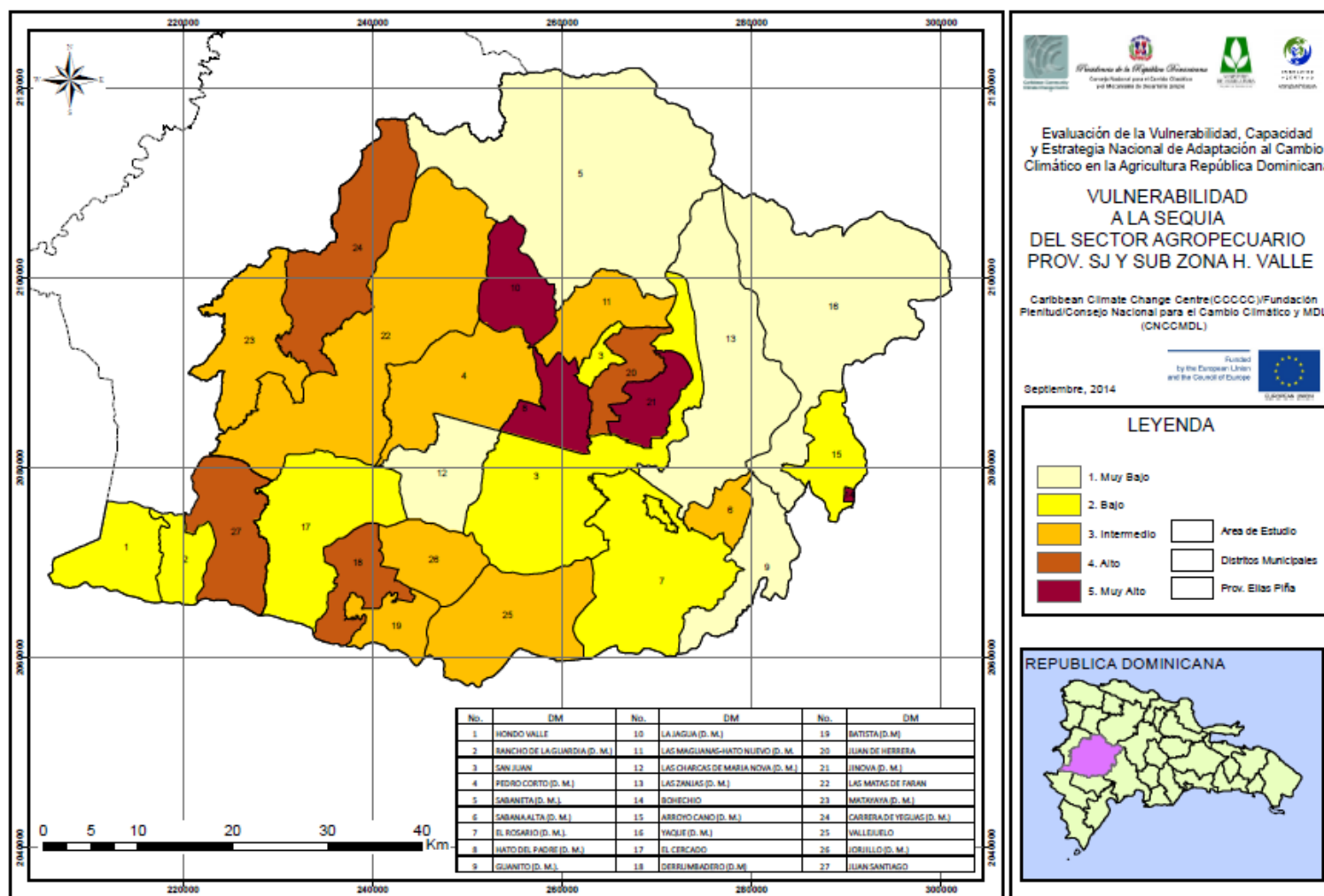


Table 55. Drought Vulnerability events in each Municipal District

No.	DM	SENSIBILIDAD				EXPOSICION				CAP. ADAPTATIVA				VULNERABILIDAD A LA SEQUIA
		% Area cult	ESA	% Cultivo Pend >10%	Promedio Aprox	Dens Pob	Clase Clima	Agricola con Cultivo	Promedio Aprox	Area Bajo Riego	ICV	% Aps	Promedio Aprox	
1	HONDO VALLE	1	2	4	2.0	2	1	1	1.0	1	3	2	2.0	2.0
2	RANCHO DE LA GUARDIA (D. M.)	1	2	4	2.0	2	1	1	1.0	1	2	2	2.0	2.0
3	SAN JUAN	3	2	1	2.0	5	4	4	4.0	5	5	1	4.0	2.0
4	PEDRO CORTO (D. M.)	4	3	1	3.0	1	5	4	3.0	5	3	1	3.0	3.0
5	SABANETA (D. M.)	1	1	3	2.0	1	1	1	1.0	1	3	3	2.0	1.0
6	SABANA ALTA (D. M.)	3	4	1	3.0	3	5	5	4.0	5	4	4	4.0	3.0
7	EL ROSARIO (D. M.)	2	3	2	2.0	1	5	3	3.0	3	3	3	3.0	2.0
8	HATO DEL PADRE (D. M.)	5	5	1	4.0	2	5	4	4.0	4	3	1	3.0	3.0
9	GUANITO (D. M.)	1	3	1	2.0	1	5	4	3.0	3	4	5	4.0	1.0
10	LA JAGUA (D. M.)	1	3	4	3.0	2	4	1	2.0	1	1	1	1.0	3.0
11	LAS MAGUANAS-HATO NUEVO (D. M.)	2	3	3	3.0	2	3	2	2.0	2	3	1	2.0	3.0
12	LAS CHARCAS DE MARIA NOVA (D. M.)	1	1	1	1.0	1	4	2	2.0	2	3	1	2.0	1.0
13	LAS ZANJAS (D. M.)	1	2	2	2.0	1	2	3	2.0	3	2	3	3.0	1.0
14	BOHECHIO	3	5	3	4.0	5	5	3	4.0	3	5	1	3.0	3.0
15	ARROYO CANO (D. M.)	1	2	2	2.0	1	4	1	2.0	1	4	1	2.0	2.0
16	YAQUE (D. M.)	1	1	1	1.0	1	1	1	1.0	1	3	5	3.0	0.0
17	EL CERCADO	1	1	3	2.0	2	3	1	2.0	1	3	1	2.0	2.0
18	DERRUMBADERO (D.M)	1	2	5	3.0	2	3	1	2.0	1	2	1	1.0	4.0
19	BATISTA (D.M)	1	1	4	2.0	1	3	1	2.0	1	2	1	1.0	3.0
20	JUAN DE HERRERA	3	4	2	3.0	4	4	3	4.0	4	4	1	3.0	4.0
21	JINOVA (D. M.)	4	4	2	3.0	3	5	4	4.0	4	3	1	3.0	3.0
22	LAS MATAS DE FARAN	2	3	2	2.0	2	5	2	3.0	2	4	1	2.0	3.0
23	MATAYAYA (D. M.)	3	3	1	2.0	1	5	2	3.0	2	3	1	2.0	3.0
24	CARRERA DE YEGUAS (D. M.)	3	4	3	3.0	1	4	2	2.0	2	3	1	2.0	4.0
25	VALLEJUELO	1	3	2	2.0	2	5	1	3.0	1	4	1	2.3	3.0
26	JORJILLO (D. M.)	1	3	5	3.0	1	3	1	2.0	1	3	1	2.0	3.0
27	JUAN SANTIAGO	1	3	5	3.0	1	3	1	2.0	1	2	1	1.0	4.0

### **6.3.2 Scenario of heavy rains and flooding**

In this scenario considers storms, heavy rains and flooding. According to FAO<sup>61</sup>, natural disasters have increased significantly in the LAC region over the past decade, aggravated by the impact of climate change, which has increased food insecurity for the most vulnerable populations, with capacity levels very low recovery due to the high incidence poverty and poor preparedness for climate risks. Even with moderate intensities, the recurrence of increasingly frequent events, does not allow people to have enough time to recover. The DM and municipalities where no flooding occurs, but have a high slope, coupled with deforestation, increases vulnerability to landslides.

- **Exposure to intense rainfall and flooding**

- **Population density**

This indicator, as well as what is expressed for the scenario of drought, presents the degree of exposure on the basis of the distribution of the population according to the number of inhabitants per square kilometer average in each DM. As the same map, the results and their analysis can be reviewed in section 6.3.1.

- **Area of cultivation in flooded area**

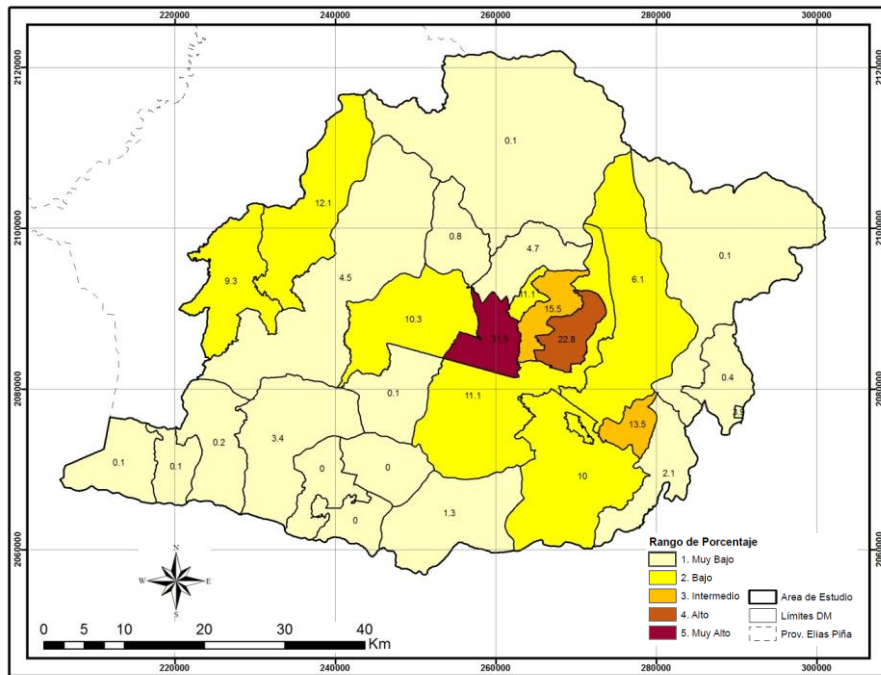
This indicator, drawn up using information developed for the map of Area of floodable crop, developed by the Ministry of the environment and natural resources and the Institute Hydraulic Resources (INDRHI, 2010) as a source. In this map, we presented the relative percentage of each DM area that is classified as being an agricultural area with potential to be flooded.

The DM which was more exposed according to this indicator is Hato del Padre with 10.2% of its surface. Next in importance, High value , Jinova with 5.9%. Intermediate and value Sabana Alta and Juan De Herrera. Like the DM value of Very High, High and Intermediate, the Low value is located in the valley of San Juan given that it is in this landscape that have the lower slopes may be susceptible to flooding. The DM, however, where are located the Sierra de Neiba and the Central Cordillera, the slopes are much steeper no flooding process still possible.

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<sup>61</sup> FAO (2011) Estrategia Regional de la FAO para la gestión del riesgo de desastres en América Latina y el Caribe, FAO (2011 - 2013)

**Figure 54**      **Area of cultivation in flood zone**



- ***Integrated results of Exposure***

By analyzing the values obtained from the integration of these two indicators, it is clear that the DM with higher exposures are those located in areas of lower slopes in San Juan Valley and with the greatest population densities. The highest exposure (Alta) were as follows: San Juan, Sabana Alta, Hato del Padre Juan de Herrera and Jinova. With intermediate value only resulted Bohechío for its very high population density.

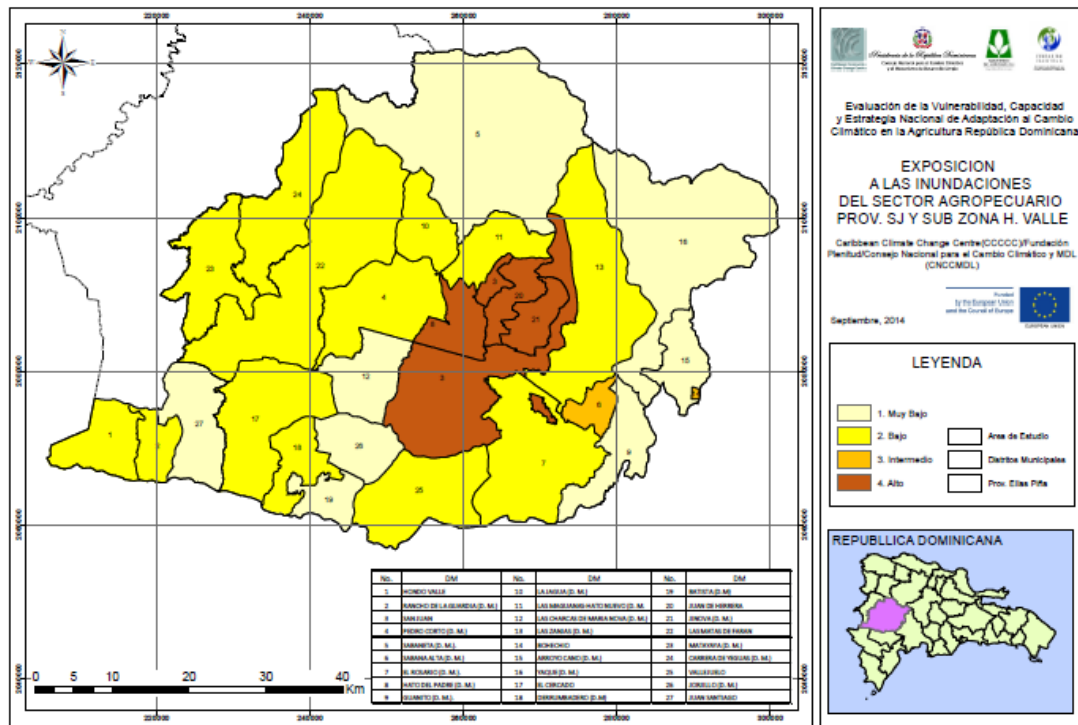
The DM with Very Low exposure values are those where population densities are lower and have a proportion of very low or no flood crops to be located in high areas (Sabaneta, Guanito, Las Charcas de Maria Nova, Arroyo Cano, Yaque Batista, Jorjillo and Juan Santiago. the rest of the DM are considered exposure all having values Baja Low and Very Low Density and% growing areas in flood zones.

- ***The resulting map is the Exposure component.***

By analyzing the values obtained from the integration of these two indicators, it is clear that the DM with higher exposures are those located in areas of lower slopes of the valley of San Juan and the highest population densities. The highest exposure (Alta) were as follows: San Juan, Sabana Alta, Hato del Padre Juan de Herrera and Jinova. With intermediate value only resulted Bohechío for its very high population density.

The DM with Very Low exposure values are those where population densities are lower and have a proportion of very low or no flood crops to be located in high areas (Sabaneta, Guanito, Las Charcas de Maria Nova, Arroyo Cano, Yaque Batista, Jorjillo and Juan Santiago. the rest of the DM are considered exposure all having values Baja Low and Very Low Density and% growing areas in flood zones. Then the resulting map presents the Exposure component.

Map 11 Integrated Exposure results



- **Sensitivity to heavy rains and flooding**

In assessing the sensitivity to this scenario, the level at which the various DM may be affected by the effect of a heavy and prolonged rainfall and particularly related to agricultural activities located in the area was analyzed. For this component we use the following indicators:

- ***Agricultural area with slope of more than 10%***

This indicator was selected for the sensitivity presenting these crops for damage caused by runoff and potential events of landslides during heavy rainfall events.

The map and the results are the same as those presented for the scenario of drought, where the DM with higher sensitivity are located south of the study area on the Sierra de Neiba: Derrumbadero (59%), Juan Santiago (54%) and Jorjillo (57). Followers with high value close to these DM: Rancho de la Guardia (41%), Batista (44%) and Hondo Valle (37%).

The Intermediate value are those who, despite having large tracts of land on slopes greater than 10%, the total area of DM is proportionately greater: The Sabaneta (36%), Cercado (34%), Las Zanjás (30%) and Carrera de yeguas (29%).

Under those DM value is obtained which, despite having part of its agricultural areas in areas of steep slopes, share large tracts of land in the valley of San Juan: Juan de Herrera (25%), Vallejuelo (24%), Arroyo Cano (20%), Las Matas de Farfán (19%), Las Zanjás (15%), El Rosario (15%) and Jinova (14%).

The DM where almost all its extension is characterized by soils with low slopes located in the valley, are those who obtained a value Very Low: Matayaya (13%), Yaque (13%), Hato del Padre (8%), San Juan (8%) Charcas de Maria Nova (7%), Pedro Corto (4%) and Guanito (4%).

- Results and map are the same as discussed in Drought Scenario (see Section 6.3.1)

- ***Area covered by intensive cultivation of each Municipal District in relation to the agricultural area of the Municipal District..***

This indicator is the same used for the analysis of sensitivity to drought events reflects the proportion of this agricultural area in the DM is mainly associated with intensive crops, which are associated with greater economic investments, infrastructure and management systems. Results and map are the same scenario analyzed in Drought.

- ***Integrated Sensitivity Results***

The DM with Intermediate values were found to be those where the% of agricultural area with slope > 10% is high and farmland are not primarily intensive crops: Hondo Valle, Rancho de la Guardia, La Jagua, Derrumbadero, Batista and Jorjillo. Or conversely, where agricultural areas are mainly intensive crops but not mainly located on slopes > 10%: Pedro Corto, Hato del Padre and Jinova. And others where these variables are independently mean values: The Maguanas-Hato Nuevo, Bohechío, Juan de Herrera and Carrera de Yeguas. The DM's lower sensitivity to this scenario evaluated are the DM: San Juan, Sabaneta, Sabana Alta, El Rosario, Las Zanjás, Arroyo Cano, El Cercado, Las Matas de Farfán, Matayaya, Vallejuelo and Juan Santiago,

characterized by a very low percentage of areas with crops on a slope greater than 10%, and in addition a percentage very low intensive cultivation, this as well because you can influence other indirect conditions, such as low population, high percentage of protected area, among others. This explains the case of Juan Santiago with 91.32% of its territory with slopes greater than 10%.

The lower sensitivity of the area were Yaque, Las Charcas de Maria Nova and Guanito present very low proportion of its territory assigned to intensive and very little agriculture on slopes greater than 10%.

- **Adaptive capacity before heavy rains and flood events**

In this scenario were used indicators index of quality of life and Protected Areas of each DM, whereas these a reflection of the ability of each DM counter sensitivity and exposure, which can submit to intense rainfall and flooding events.

- ***Index of quality of life***

This index was selected for this event as an indirect indicator of the social capacity of each DM counter independent or collectively the impacts of climate change through measures of prevention, mitigation or transfer of risk (construction of drainage systems and protection of crops, hiring of agricultural insurance, etc.).

The map and the results are analyzed in the Drought scenario.

- ***Protected areas***

The areas protected, as in the eyes of the drought scenario previously evaluated, consider themselves acting as the high watershed protection systems, help to increase the infiltration of rainwater and act as effect of stabilization of soils in the upper watersheds, reducing inputs of sediments in water bodies, increasing flood times, etc.

The map and the results are analyzed in the Drought scenario.

- ***Integrated Results Adaptive Capacity***

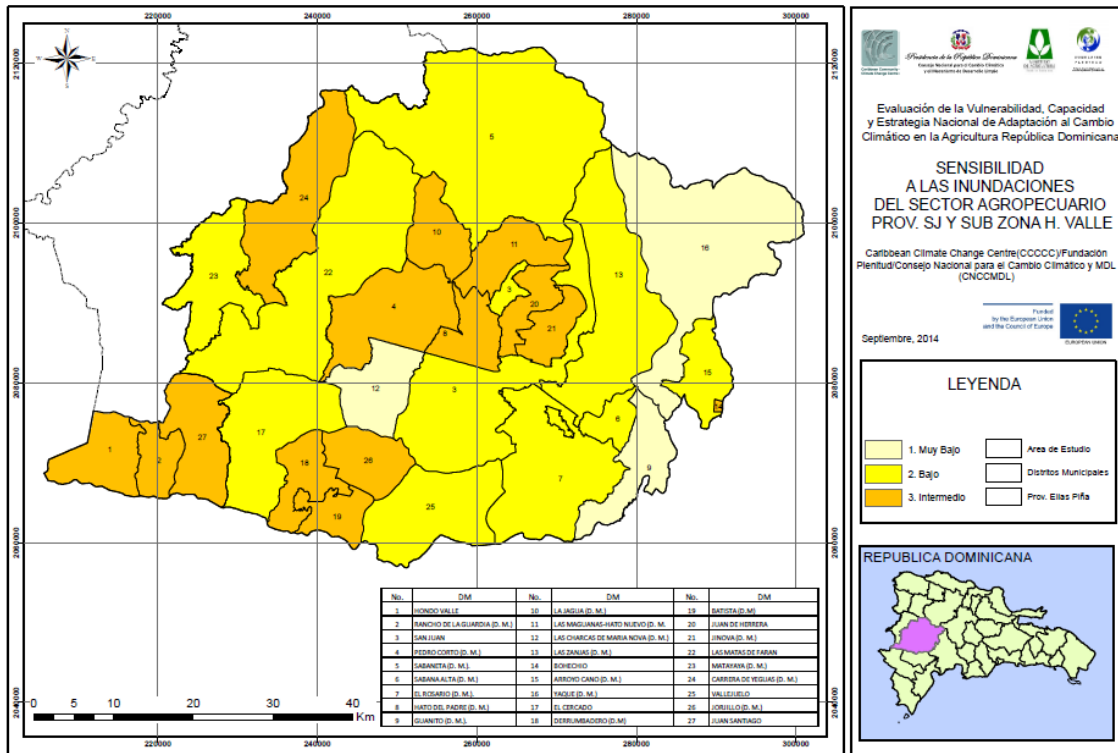
By integrating the values of the two indicators analyzed to assess the component of Adaptive Capacity to events of heavy rains and flooding, the map presented below was obtained (**Error! eference source not found.**). The DM with the value of higher adaptive capacity in relation to those evaluated in the study area was Guanito to have a relative value ICV High and Very High proportion of land under the category of protected area. Next in importance, value, Sabana Alta and Yaque to present medium to high the two variables. The low ranking were those located in the central zone of the study area, where there are no protected areas and ICV are located in Intermedia rated Baja.

Which showed a lower value of Adaptive Capacity (Very Low) was La Jagua, for having the ICV with the lowest value of the evaluated in the study area (38.8) and 0% protected area in the country.

Map 12

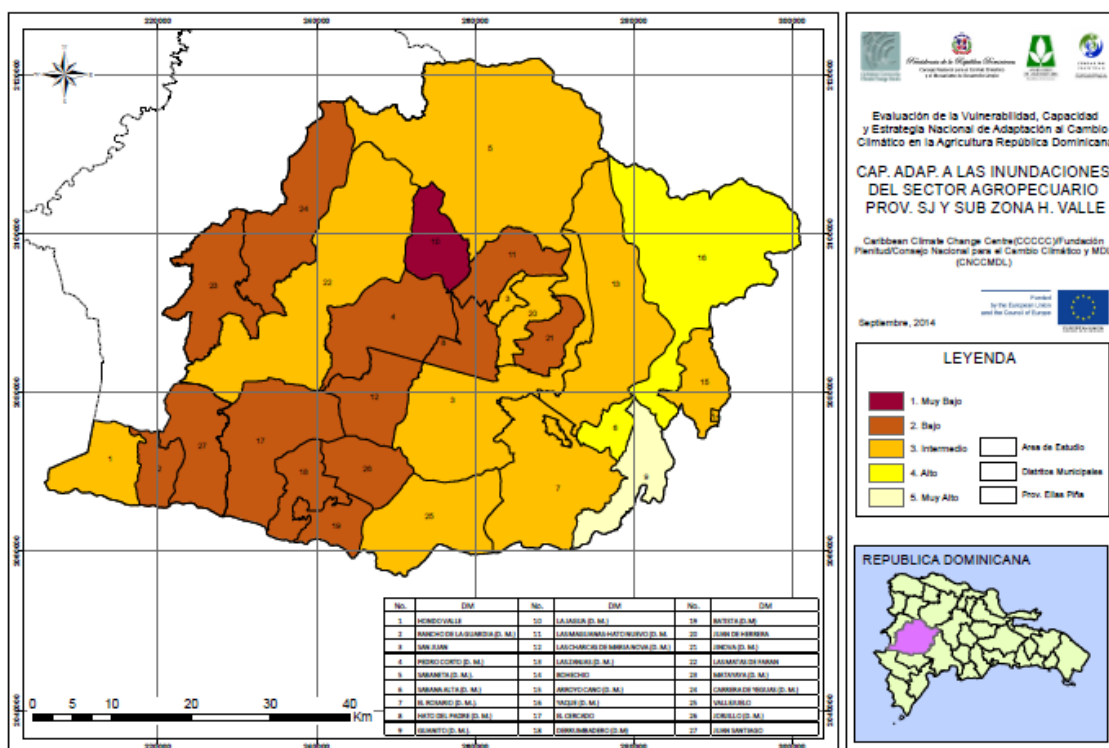
-

Integrated Sensitivity to heavy rains and flooding



Map 13

## Adaptive Capacity to intense rainfall and flooding events



- **Vulnerability to intense rainfall and flooding events**

Vulnerability to climate change associated with the scene of intense rains and flooding, was calculated by considering the exposure, sensitivity and adaptive capacity evaluated for this trend-based scenario.

The following map shows the results obtained for each Municipal District

The DM who were with the best value Vulnerability (Very High) in relation to other DM that conform the study area are Jinova and Hato del Padre, the conjugated Media Sensitivity, High and Exposure and Very Low Adaptive Capacity.

In the case of Jinova Exposure of agricultural activities to "Heavy Rain and Flooding" resulted High to observe an average population density and percent crop up flood zone. Furthermore, the sensitivity was primarily Media being in the presence of a high percentage of intensive cultivation. In this district, Adaptive Capacity Lower was mainly influenced by a very low percentage of Protected Area.

Hato del Padre, was a Very High vulnerability. This value is a result of high exposure, having a significant percentage of acreage in flood zone and an average sensitivity mainly influenced by a very high percentage value of intensive cultivation. Adaptive capacity for this District was low when in the presence of a Quality life Index Average and very low percentage of protected area.

Followed by High vulnerability: Bohechío, Derrumbadero and Juan de Herrera. The lowest vulnerability to these events have Guanito and Yaque to have sensitivity and exposure Lower conjugated High and Very High Adaptive Capacity.

The summary of the various indicators and results of each component are shown in Figure 55

Table 56 vulnerability summarizes the values obtained for each district and the values of each of the indicators and components used.

Map 14 Vulnerability to flood events and heavy rain

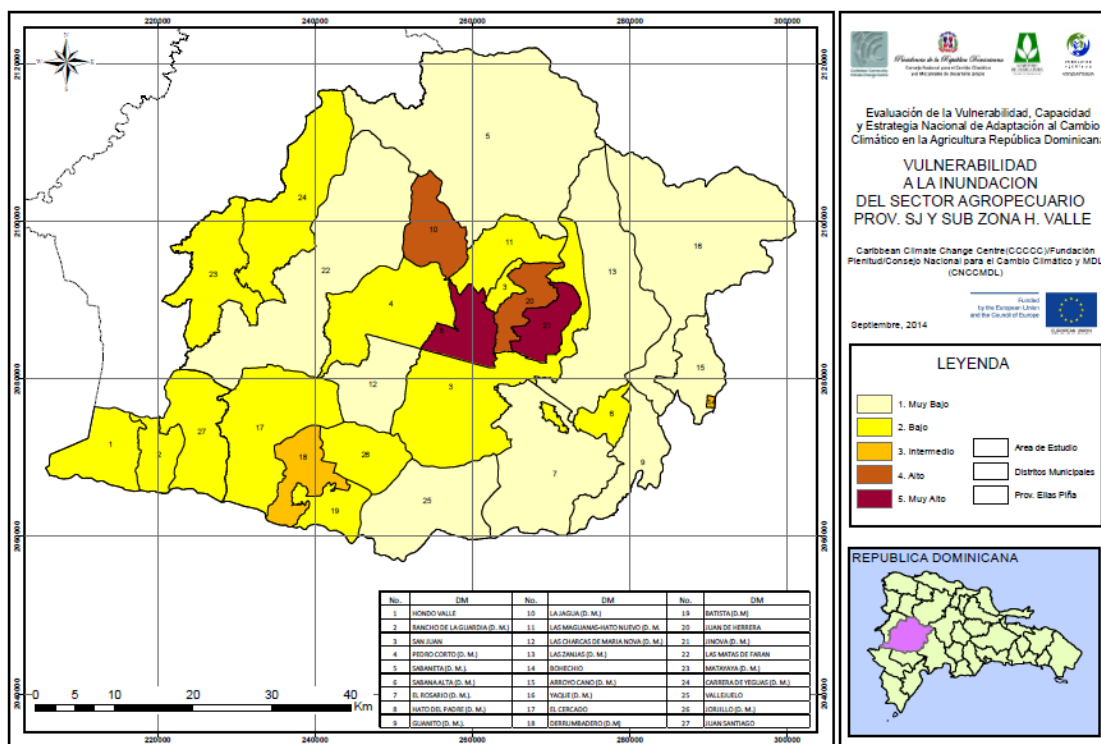


Figure 55 Results of the various indicators and each component that form the vulnerability to events of heavy rains and flooding.

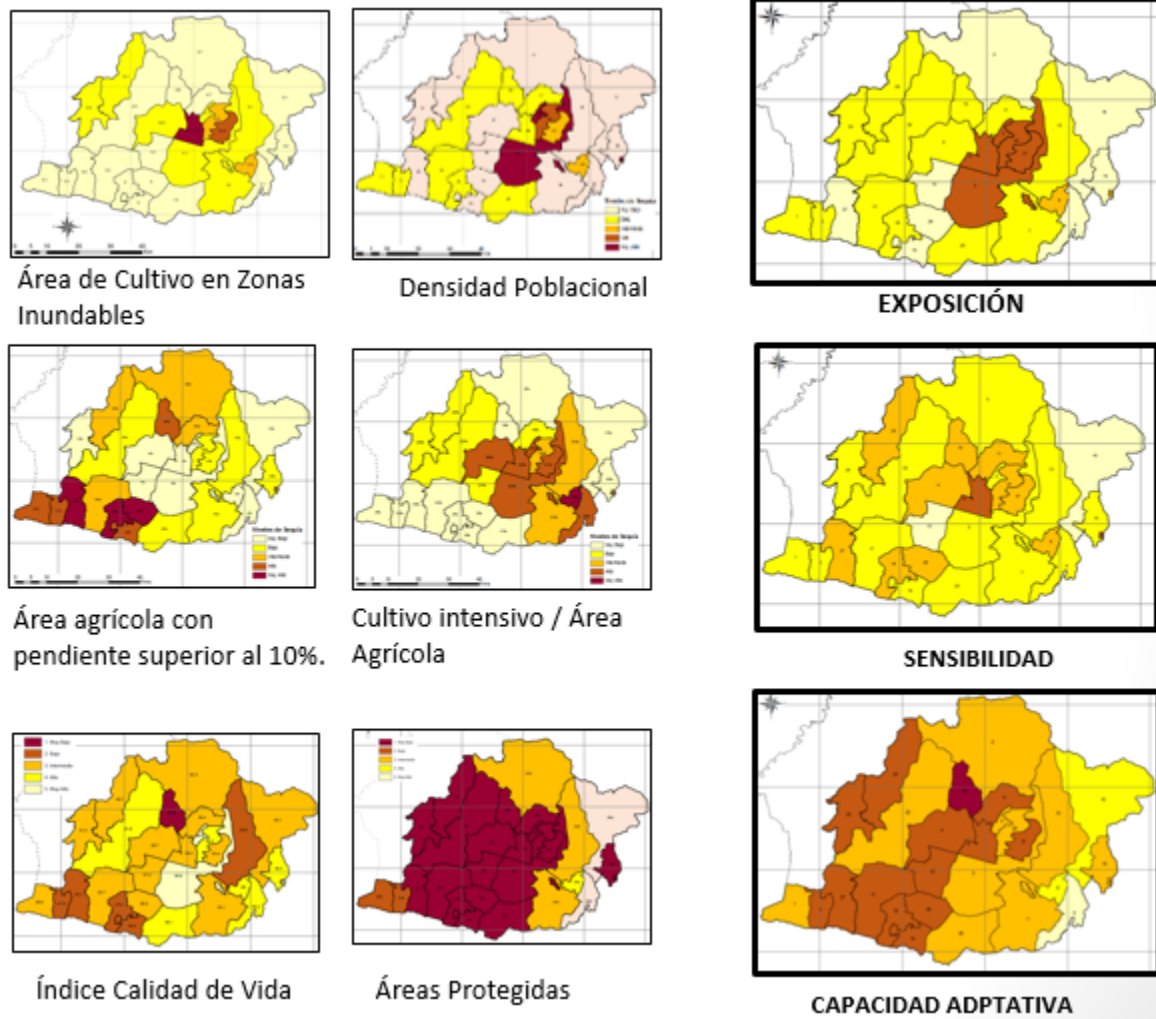


Table 56. Vulnerabilidad ante eventos de lluvias intensas e inundaciones por Distrito Municipal

No.	DM	SENSIBILIDAD			EXPOSICION			CAP. ADAPTATIVA			VULNERABILIDAD
		% Cultivo Intensivo	% Cultivo Pend >10%	Prom Aprox	Dens Pob	% Cultivo Inudable	Prom Aprox	ICV	% Aps	Prom Aprox	
1	HONDO VALLE	1	4	3.0	2	1	2.0	3	2	3	2.0
2	RANCHO DE LA GUARDIA (D. M.)	1	4	3.0	2	1	2.0	2	2	2	2.0
3	SAN JUAN	3	1	2.0	5	2	4.0	5	1	3	2.0
4	PEDRO CORTO (D. M.)	4	1	3.0	1	2	2.0	3	1	2	2.0
5	SABANETA (D. M.)	1	3	2.0	1	1	1.0	3	3	3	1.0
6	SABANA ALTA (D. M.)	3	1	2.0	3	3	3.0	4	4	4	2.0
7	EL ROSARIO (D. M.)	2	2	2.0	1	2	2.0	3	3	3	1.0
8	HATO DEL PADRE (D. M.)	5	1	3.0	2	5	4.0	3	1	2	5.0
9	GUANITO (D. M.)	1	1	1.0	1	1	1.0	4	5	5	0.0
10	LA JAGUA (D. M.)	1	4	3.0	2	1	2.0	1	1	1	4.0
11	LAS MAGUANAS-HATO NUEVO (D. M.)	2	3	3.0	2	1	2.0	3	1	2	2.0
12	LAS CHARCAS DE MARIA NOVA (D. M.)	1	1	1.0	1	1	1.0	3	1	2	1.0
13	LAS ZANJAS (D. M.)	1	2	2.0	1	2	2.0	2	3	3	1.0
14	BOHECHIO	3	3	3.0	5	1	3.0	5	1	3	3.0
15	ARROYO CANO (D. M.)	1	2	2.0	1	1	1.0	4	1	3	1.0
16	YAUQUE (D. M.)	1	1	1.0	1	1	1.0	3	5	4	0.0
17	EL CERCADO	1	3	2.0	2	1	2.0	3	1	2	2.0
18	DERRUMBADERO (D.M)	1	5	3.0	2	1	2.0	2	1	2	3.0
19	BATISTA (D.M)	1	4	3.0	1	1	1.0	2	1	2	2.0
20	JUAN DE HERRERA	3	2	3.0	4	3	4.0	4	1	3	4.0
21	JINOVA (D. M.)	4	2	3.0	3	4	4.0	3	1	2	5.0
22	LAS MATAS DE FARAN	2	2	2.0	2	1	2.0	4	1	3	1.0
23	MATAYAYA (D. M.)	3	1	2.0	1	2	2.0	3	1	2	2.0
24	CARRERA DE YEGUAS (D. M.)	3	3	3.0	1	2	2.0	3	1	2	2.0
25	VALLEJUELO	1	2	2.0	2	1	2.0	4	1	3	1.0
26	JORJILLO (D. M.)	1	5	3.0	1	1	1.0	3	1	2	2.0
27	JUAN SANTIAGO	1	5	2.0	1	1	1.0	2	1	2	1.0

## 7 PERCEPTION OF RISK AND ADAPTIVE CAPACITY TO CLIMATE CHANGE BY THE COMMUNITY.

In order to obtain information on the perception of risks related to climate change on the part of officials, technicians and producers of the study area were held three consultative workshops with key stakeholders, two in the San Juan province and one in the sub-zone Hondo Valley.

The workshops were planned and executed by the technical team of PLENITUD in coordination with the Ministry of agriculture, specifically with the Regional Unit of planning and evaluation of the direction agricultural of the Southwest Regional.

The key players were selected in coordination with the regional staff of the Ministry of agriculture and the local staff of the environment and natural resources, according to the following:

**Table 57.** Definition of actors key to be invited to the workshops

Public sector
<ol style="list-style-type: none"><li>1. Ministry of agriculture (MA)</li><li>2. Ministry of the environment</li><li>3. Municipalities</li><li>4. Dominican Agrarian Institute (IAD)</li><li>5. Academy</li><li>6. Ministry of Education</li></ol>
Civil society and producers
<ol style="list-style-type: none"><li>1. Community organizations related to the agricultural sector and producers.</li><li>2. NGOs and civil society organizations related to the environment and agricultural, commercial and industrial activities in the province of San Juan and Elías Piña (Sub area Hondo Valley)</li><li>3. Unions and associations related to the agricultural sector in the province of San Juan and Elías Piña (Sub area Hondo Valley)</li></ol>

They asked about the atmospheric phenomena that most remain in the memory of the population, what are considered higher risk for the development of agricultural activities, awareness existing key players about the risks for such activity and livelihood in a general sense, communities and vulnerable production activities and their valuations on the responses of local institutions to the damage caused by these phenomena and change climate, among other aspects.

The consultation involved 92 people (technicians, civil servants and farmers), representatives of public institutions and non-governmental organizations. The Annex 5 contains the list of participants (name and institution represented) in each consultative workshop.

The report on the results of the consultations presented here contains the perceptions of participants on climate changes observed in the province of San Juan and Sub-area Hondo Valle and their impact on agricultural activity, particularly in the planting season of certain crops, land use and the expansion or contraction of the agricultural frontier. Assessments of the participants on weather events that have impacted agriculture in the study area, cultures and communities most vulnerable and views on the responsiveness of local to risk prevention and mitigation of damage institutions is included by natural phenomena.

The analysis of information gathered particularly addressed the differences of opinion presented between producers and technicians; as well as those reported among various geographical areas.

## 7.1 San Juan Province.

### 7.1.1 *Changes in climate and incidence of pests and diseases.*

The opinions of technicians and producers in the province who were consulted reveal that the crop most affected by climate change has been the bean, specifically changes in both temperature (especially in the area of irrigation) and the rainfall regime (delays in high areas and cultivation in rainfed). Because of these changes, producers have changed the time of sowing the crop in different production areas and in other cases, such as uptown, have moved to cooler areas dedicated to forest.



Other crops, according to participants in the consultations have experienced changes in the planting season are rice, pigeon peas, cassava, maize, sweet potatoes and vegetables. In the case of maize and sweet potatoes, variation in the planting season was due to changes in climate and the decrease in water availability, the latter factor has also influenced the change of the rice planting season . On the other hand, it has also changed the time of planting vegetables, host Whitefly, in order to change the cycle of this pest of beans. In the case of pigeon pea in the lower or irrigation area, the most influential factor planting pattern is the introduction of improved varieties that can be grown throughout the year and avoid production concentrated in the months November-December each year .



producers surveyed is last two decades. In

Furthermore, in Vallejuelo onion grown in rotation with beans. A change in the productive culture, incorporating irrigation and increased awareness of protecting the forest area. In so far as has been pointed modify the planting season of snap beans for change in the rainfall regime, has also changed the time of sowing onion.



Regarding pests and diseases, the opinion of technicians and that they have intensified in the particular Whitefly, and Trip-

Palmer and bean mosaics and Roya and Atracnosis; Tribazca rice, Pericularia and snail. Bedbug, blight, green hope and worm; the corn earworm and potato bug *Cyla Fornicarum* or piogán. n uptown coffee has been attacked with greater intensity by Broca and Roya at levels that could that crop at risk of disappearing if resistant varieties are introduced. While crop of peppers and eggplant Vallejuelo and El Cercado being most affected by mites, botrytis and worm Constancero; and onion and pigeon pea by Witches' Broom. In general, in the opinion of technicians and producers have created climatic and environmental conditions favoring the level of incidence of pests and diseases of crops traditionally grown in the area of San Juan.

### **7.1.2 Land use changes**

Technicians respondents stated that there have been changes in land use, which has been associated with various cultural practices, including: pressurized irrigation, leveling, crop rotation, the culture of slash and burn and land use for forestry in agriculture. In the upper part, by the terms of the loss of fertility and productive capacity of soils, many growing areas are abandoned favoring the process of desertification in the most vulnerable areas. The hydrological pattern, deforestation and erosion have been factors that have led to changes in land use. On another note, for the construction of the Palomino dam, rice lands are now cultivated peanut and many producers have moved to the higher areas which has expanded the process of deforestation in the limited existing wooded areas.

Consultative workshop participants: Farmers also referred to the construction of the Palomino dam as a factor that caused change in land use. They indicated that because this work was stopped cultivating lands in the bottom and increased deforestation in the part of the forest. They also expressed that some of the floors of the sub-areas of Las Matas de Farfán and Peter Short have been affected by erosion, desertification and salinization. In Vallejuelo, for the construction of roads and irrigation systems, land that was dedicated to livestock have gone to agriculture, while in the upper lands have been abandoned by low productivity of soils and frequent and prolonged periods of drought. For this slash-and-drop and dry conditions through tour of the study area can be checked accused progressive desertification process in the mountainous strip of Vallejuelos, El Cercado to Hondo Valle.

In general, the information provided by technicians and producers tend to introducing technical agriculture, orchards produced under greenhouses. Increasing agricultural to the construction of canals border, the incorporation of vacant land clearing forest areas for growing avocado, increased cultivation areas on the banks of River Yaque River and Al Medio is attributed. They believe that in the Matas de Farfán has seen an increase in cultivated areas by the introduction of oriental vegetables and horticultural crops. Farmers also pointed out that the balance between abandoned areas and incorporated into agricultural production areas in recent years is not clear whether it has actually expanded the agricultural frontier in the province.

### **7.1.3 Major weather events that have affected agriculture in the province**

There is consensus among the groups consulted that droughts, storms, cyclones and floods are the phenomena that affect agricultural activities in the area.

Among the meteorological events of the past 20 years that have most affected agriculture in the province respondents referred to the following phenomena: droughts of 1997, 2007, 2011 (in

Carrera de Yegua and this year 2014), cyclone George in 1998 and storms Noel and Olga. Despite the effects caused by the storms Olga and Noel, in the opinion of respondents, the drought of 2007 and Cyclone George are the phenomena that have caused more damage to agriculture in the area .

#### **7.1.4 Most vulnerable producers and communities**

According to what they perceive local groups consulted in the province there are a variety of areas subject to high levels of vulnerability, both from the point of view of direct risk to people and the development of agricultural activity. Unable to get through these consultations remember estimates or data on damage reported, in terms of acreage affected, number homeless or other quantitative information.

However they were repetitive in pointing out that small producers located in the highest part of the area are the most vulnerable, especially the constants losses in crop either by drought or by increasingly lower yields in crops and poor ability to engage in another activity.

Among the most vulnerable to flooding geographic areas cited Mesopotamia and along the San Juan River, downstream of the dam of Sabaneta; Guachupita, Quija Quieta, Managuayabo, Hoyo Oscuro, Villa Flores and La Maguana. Furthermore, in Las Matas de Farfán, his Mesopotamia, between the Macasías and Cachon rivers.

Other communities vulnerable to flooding are Banks in Sabana Alta, and Bohechío, the Palmar, La Vereda, La Guama, La Loma del Yaque, which are located on the banks of the Yaque del Sur and Al Medio River. They also cited communities Las Zanjas and Las Charcas among which were affected by floods.

One of the main vulnerabilities of the producers of the top is the low productive capacity of soils, lack of irrigation and drought. Among vulnerable communities to drought pointed to Arroyo Cano, Los Ginger, Los Montancitos, El Corozo and Guayabal and communities Jorjillo and Rio Arriba, in Vallejuelo and the Fencing: Sabana Bomb, The Guanál and La Vereda.

Rainfed farmers in the poorest communities, as Jorjillo and El Vallecito, are seen as the poorest of the poor part of the respondents.

#### **7.1.5 Responsiveness of institutions**

Public and private institutions related to the issue of climate change and risk management serving in the province that the technicians and consulted farmers identified were the following: Ministry of agriculture, National Institute of hydraulic resources (INDRHI), Ministry of environment, Special Fund for agricultural development (FEDA), company of hydroelectric generation (EGHI), Instituto Dominicano de Investigación Agropecuaria y Forestal (IDIAF) City Hall, Civil Defence, fire brigade, Red Cross, Board of irrigation, future South Foundation, FECADESJ and Church.

The institution identified with higher level of involvement in the issue is the Ministry of environment and, to a lesser extent, the city councils. Add in some areas NGOs have been developing activities related to the environment.

According to an important part of the respondents, the institutions of the province does not have information on current and future hydroclimatic risks. Others stated that the EGHI, IDIAF and INDRHI have information on this type of risk. It was noted that the INDRHI and the Regional Directorate of the Ministry of Agriculture collect information on rainfall and other phenomena, data they provide to the Department of Meteorology and Environment manages information on fire control.

The population receives information about risks of extreme weather conditions through the media that operate at the national level.

The perception about the response of the local institutions before the disasters by hydro-climatic events in the province varies significantly between groups who participated in the consultative workshop. The assessment of persons of the environment of the municipality of San Juan, having as reference the intervention of institutions on the strong flood that affected the area of the city called Mesopotamia, is higher than the valuation that is perceived in people from more distant communities. Indeed, in other communities, including the top, they manifest a low assessment of the response of local institutions to damage caused by weather events and focus their attention on institutions such as ministries of environment and agriculture.

## 7.2 Sub-zona Hondo Valle- Juan Santiago

### 7.2.1 *Changes in the climate and incidence of pests and diseases.*



The beans regularly are sowing in two times of the year, April-May and July-August, although there are areas where are three harvests. The regime of rain and temperature have been altered in recent decades. The area producers perceive that the average temperature has increased and have observed that the rain period begins earlier. This has led to the planting of beans and other crops start about a month before regarding the sowing date from decades ago.

In relation to the vulnerability of crops to pests and diseases, the bit and the rust in coffee and whitefly in the bean, are a strong threat for these crops. An important part of the polled farmers stated that related illnesses and plague were unknown in the area 20 years ago. Others pointed out that for more than two decades they knew them and that they have observed that their damage have intensified in recent years, as well as the incidence of Antragnosis in bean, black Sigatoka in plantation and banana and the viruses (witch broom) in the pigeon peas.

The general opinion of the respondents favored that have increased their degree of impact on crops. The case of Roya and Broca in coffee are the most significant.



### 7.2.2 *Land use changes*

The vast majority of respondents stated that there has been a significant replacement of areas dedicated to the cultivation of coffee, along with the expansion of the

deforested areas. Some perceive that 80% of the forest has been lost.

Avocado growing area is expanding, particularly after the installation of a company dedicated to the production of this fruit. Consulted producers pointed out that certain areas dedicated to coffee are growing beans and fruit trees, and that areas in which was grown beans are reforesting.

On the other hand, are pronounced diverging opinions concerning the increase or decrease in the acreage of gandul as in relation to changes in the agricultural frontier. Some understand the agricultural frontier has been expanding, and among the examples put the business project of production of avocados, which has acquired an appreciable extension of land, part of which was unused. Others believe that high has decreased the agricultural frontier due to migratory agriculture, as well as land for sale that remain unused.

It should be noted that the statistics of cultivated areas of the Ministry of Agriculture, do not support the view of the expansion of the agricultural frontier of the sub-area Hondo Valle since it stays around 80,000.00 tareas including coffee cultivation.

### ***7.2.3 Principales eventos climatológicos que han afectado la agricultura en la sub-zona***

According to consultations made, cyclones and tornadoes are among the main meteorological phenomena at different times in the last 20 years have affected agriculture in the sub-area. They cited the cyclone George in 1998 and storms Noel and Olga, and another storm in 2013 and a hailstorm in 2014. They referred to the decreased level of rainfall, with estimates that more than 1,000 mm of rain per year.

There was no consistency in the information provided, in identifying which of these events occurred more damage. Among the affected crops identified coffee and avocado. There is a documented record that quantifies the damage caused by the phenomena in the area and that makes it difficult for locals to establish the extent of damage caused.

### ***7.2.4 Most vulnerable producers and communities in Hondo Valle***

he groups of sub-area view that there smallholders beans and pigeon peas from the top and those at the lower part prone to floods are the most vulnerable to climate variability and change. The information provided identifies specific areas which should pay more attention mitigation policies or reduction of possible future damage caused by weather phenomena.

Part of the respondents said that the whole area was rural municipalities Hondo Valle and Juan Santiago was quite vulnerable. Others identified the producers of Juan Santiago as the poorest of the sub-area. They also indicated that drought affects the entire upper and floods mainly low areas of Los Botados, Cañada Miguel and Los Guineos.

### **7.2.5 Responsiveness of institutions**

The opinions of the participants in the consultative workshop on the performance of official local institutions with activities related to climate change and risk management were divided, but dominated the view that this performance was unsatisfactory.

Between official institutions present in the sub-area related to the subject of the consultation, participants identified the following: Ministry of Agriculture, Dominican Agrarian Institute, Directorate of Border Development, Dominican Institute of Hydraulic Resources (INDRHI), Dominican Council Café (CODOCAFE), Ministry of Environment, Agricultural Bank, Ministry of Education and the municipalities of Hondo Valle and Juan Santiago.

Part of the respondents considered that none of these institutions was devoted to the issue of climate change and risk management. The representative of the Ministry of the reforestation highlighted the work being done with permanent crews hired for this job. Others felt that on occasions when damage occurred by hydroclimatic event, have formed brigades to support agricultural recovery activities.

On access to information on hydroclimatic risks, prevailing views were that this information was not provided or was very limited. It was noted that in some workshops on the topic offered in Hondo Valle and there is a station of the Ministry of Agriculture that manages information on rainfall and temperature with the Directorate of Meteorology Santo Domingo.

## 8 CONCLUSIONS

### 8.1 Close link between poverty and vulnerability to hydrometeorological events and adverse effects of climate change.

The vulnerability of the population of the study area to the effects of climate change is increased in the case of significant segment of the local population living in poverty, both in terms of monetary poverty as based on Unsatisfied Basic Needs Poverty (NBI) .

**Vulnerability Drought events:** Vulnerability to climate change associated with drought scenario was calculated considering the Exposure, Sensitivity and Adaptive Capacity. The Municipal Districts (DM) who obtained values higher vulnerability in relation to the remaining were: Jinova, Hato del Padre, Bohechío and La Jagua, when combined High Sensitivity, High and Medium Exposure to Lower Adaptive Capacity.

**Vulnerability to climate change scenario associated with heavy rains and floods and landslides** was calculated considering the Exposure, the sensitivity and adaptive capacity evaluated for this trend scenario. The DM who were with the high value of Vulnerability (Very High) in relation to other DM that conform the study area are Jinova and Hato del Padre, that conjugated Media Sensitivity, High and Very Lower Exposure Adaptive Capacity. In the case of Jinova Exposure of agricultural activities to "Heavy Rain and Flooding" resulted High to observe an average population density and percent crop up flood zone. Furthermore, the sensitivity was primarily Media being in the presence of a high percentage of intensive cultivation. In this district, Adaptive Capacity Lower was mainly influenced by a very low percentage of Protected Area.

Hato del Padre, the vulnerability is Very High. This value is a result of high exposure, having a significant percentage of acreage in flood zone and an average sensitivity mainly influenced by a very high percentage value of intensive cultivation. Adaptive capacity for this District was low when in the presence of a Quality Index Average life and very low percentage of protected area. Followed by High vulnerability: Bohechío, Derrumbadero and Juan de Herrera.

Among the socioeconomic and environmental characteristics of the study area related to vulnerability and adaptability are the following:

- The socioeconomic data analyzed show high levels of vulnerability and adaptive limitations to the impacts of climate variability and change in all municipalities of the province San Juan capabilities and Hondo Valle, Elías Piña Province, in the agricultural activity which is the livelihood for more than a third of the employed population.
- Around 14,000 households in the province of San Juan (22% of total) and 1,700 households in the Sub-region (45%) perform some type of agricultural activity.
- The main livelihood of the study area is agriculture. San Juan province 34% of employed persons were engaged in this industry, a proportion which is more than triple the national average. Next in importance, commercial activity, which generates 19% of employment in the province, one component of which is the marketing of agricultural products.

- A very high proportion of the population lives in poverty and extreme poverty. Significantly, in the municipalities of the SJ-HV area, virtually all indicators of unmet basic needs, including more closely related to the environment, recorded extremely high, well above the national average values. Associated with high levels of poverty a set of indicators that clearly show the vulnerabilities and lack of capacity of the population to confront the threats of natural phenomena is identified.
- The territory of San Juan province has a population of around 232,000 thousand inhabitants and Sub-area Hondo Valle-Juan Santiago 15,000; population density is 69 inhabitants / km<sup>2</sup> and 66 inhabitants / km<sup>2</sup>, respectively. 41% of the total population of the study area lies in the rural area; proportion is 40% in the province San Juan and 53% in Sub-area Hondo Valle-Juan Santiago.
- Both the province of San Juan and the Sub-area Hondo Valle are ejectors population territories; has a negative migration balance. If the trend of recent years, the population of the study area would be reduced by about 21,000 people in 2010-2030.
- Capacity building and opportunities through education are very limited in San Juan province and further into Sub-area Hondo Valle-Juan Santiago.
- Need to human capital: the high levels of poverty and unmet basic needs is added a very important element in the process of implementation of related policies and appropriate use of natural resources and climate change interventions, the need to equip people for more knowledge on these issues. A major barrier for these purposes is the high proportion of semi-illiterate people in the province, which reaches 42% in the province of San Juan and 61% in Sub-area Hondo Valle, representing 17 and 36 percentage points above the national average (25%).
- The number of people in extreme poverty in the province of San Juan in 2010 was about 53,000 people, a figure surpassed only by the province of Santo Domingo (158,000). In Sub-area Hondo Valle that figure was about 8,000. The proportion of poor households varies significantly among municipalities in the study area. The proportion of poor households varies significantly among municipalities in the study area. The lowest percentage of households in poverty generally recorded in the municipality of San Juan (59%) and highest in the municipality Juan Santiago (92%). In terms of extreme poverty, the lowest level corresponds to the municipalities Juan Herrera (21%) and San Juan (22%) and the highest also Juan Santiago (61%).
- Between the fifth and fourth of the households in the province are contamination of streams, garbage or stagnant which increases their vulnerability to hydrometeorological series waters.
- In the area of SJ-HV there are marked gaps in access to goods and services directly related to environmental issues. 26% of households in the province of San Juan and 42% of the Sub-area Hondo Valle-Juan Santiago do not have drinking water facility; mientras que el 37% en la provincia y el 57% en la Sub-area suitable no dispone de servicios sanitario.
- Approximately 24,000 households in the study area (36% of total) use wood or charcoal to cook their food consumption is a factor of direct impact on environmental degradation.
- About a third of households area SJ-HV no means of communication (or landline or cell, or computer), which represents a limitation interventions alert communities about the danger of natural disasters and dissemination of information for public awareness on climate change.

- A much higher proportion than the national average of homes are built with inadequate materials. The poor quality of housing has a direct impact on the quality of life of a high proportion of households in the area of SJ-HV by an insufficiently protected implications of household dust, temperature, humidity and other factors affecting health, such as overcrowding due to space limitations.
- Exposure of homes in the province at risk of collapse or landslide is 12.3%, while the national average is 10.7%, and the risk of wildfire 5.7%, also higher than the national average (4.9%) . Instead hurricanes have affected a smaller proportion of households in the province of San Juan (32%) than in the whole country (50%), as well as storms and floods.
- The incidence of drought has been much higher in the province of San Juan, affecting 43% of households, almost double the national average (23.5%).
- Agriculture is the most important activity in the area of San Juan and Subzone Hondo Valle. The area of San Juan has grown over 700,000.00 tasks in 2013, of which about 45% are made in upland soils with steep slopes, low productivity, and susceptible to erosion. The statistics of cultivated areas of major crops, provided by the Southwest Regional URPE not define a trend in expansion of the agricultural frontier in Hondo Valle and San Juan, despite the reduction in the areas of water producing forests.
- Although replacement of one crop with another and neglect fragile areas of steep slopes and low productivity is observed, rainfed agriculture remains a major proportion of the area cultivated in the study area mainly influenced by the cultures of beans and pigeon peas.
- The area of Hondo Valle presents anthropogenic pressures that increase their vulnerability to climate change and variability, characterized by erosion and overuse of soils, deterioration of vegetation cover, deforestation and forest fires.
- The province San Juan and the sub Hondo Valle show a level of exposure to drought and degree of sensitivity considerably higher than the average national territory desertification. Furthermore, most of the agricultural area is located in areas of high gradient. A relatively favorable factor is that the proportion of crop area at risk of flooding is less than in most of the remaining provinces.
- The province San Juan recorded 67% average agricultural drought area of medium intensity, occupying position 23 among the 32 provinces, indicator whose value fluctuates between 21% (Samana) and 91% (Bahoruco). The Sensitivity Index Desertification (ESAI) of the province is 1,392, which represents the 21 position between all provinces, in a range that varies between 1.147 (National District) and 1,521 (Bahoruco). This index depends on four basic components: climate, vegetation, soil and land management. On the other hand, 53.4% of the agricultural areas of the province is steeper than 10%, occupying position 23 among the 32 provinces. The climate classification is 4.86 and the percentage of cultivated areas in flood zones is 15.2%.
- Irrigation systems use water from rivers and reservoirs that feed the different channels and irrigation systems on which agricultural activity is based. The San Juan river and the river Macasía with their tributaries, with Sabaneta dams and river Millet, are the most important sources of supplies to systems that operate in the area of San Juan. The system consists of 44 channels carrying a flow rate of 31.5 m<sup>3</sup> / sec, 471.84 km long with primary and secondary channels with about 10,000 benefit farmers. These channels have lack of maintenance, sedimentation ye inefficient operation by users watering irrigation boards. The subzone of Hondo Valle virtually no have irrigation system.

- The province of San Juan has 725 km<sup>2</sup> of land between Class 1 and III, equivalent to 21% of its total area. The municipality Juan de Herrera is the one with better endowment of good soils (Class I and II), which represent 29% of its surface; ratio that is only between 3% and 9% in other municipalities of the province. The Sub-area Hondo Valle-Juan Santiago does not have these two types of soil.
- From the point of view of its production capacity soils in this area with a vocation for culture (class II to IV) represent 28.81% of the total area, being the most important class III with 11.39%. In the second group, floors classes V to VIII represent 71.19% of the land area, being the most representative class VII to occupy 56.55% of the surface. Soils with higher agricultural potential are located entirely in the Province of San Juan, specifically in the valley.
- The production is based on small farmers with little technological and business level and low land titling. These conditions do not allow them access to agricultural loans easily, are mainly financed with loans from informal market or short-term trade credit for working capital and high interest rates.
- The province of San Juan has good accessibility by road to major cities, ports, airports and border, but the poor state of the network of roads and productive ways that serves the areas of production, increases costs and times farmers to access markets. The subzone of Hondo Valle has greater access difficulties.
- A high proportion of the area of the province of San Juan (30%) is covered by protected areas, but these areas have human impacts by slash and burn practices and deforestation.

## 8.2 Quality and gaps in the information available.

- Part of the work of this study was to search and collection of geo spatial information on environmental issues for the study area, and as a result of this search was observed that the availability of information both spatial and non-spatial in that territory is insufficient. For this reason I had to use national data, representing imprecise information regarding spatial and temporal aspects. This failure and uncertainties are reflected in some of the thematic maps.
- Another important limitation was related to gaps in climate information available, reaching the very few stations and the data area thereof are incomplete and /or outdated, which do not make reliable statistical analyzes and projections.
- The decision to build combined or integrated indices (eg drought, floods and landslides, among others), allowed us to expand the range of exposure and sensitivity to probability of occurrence of these phenomena in the territories, but also became more complex and restrictive the vulnerability of the spaces considered in the study area. This expresses that naturally exposed, sensitive and vulnerable to floods to droughts or floods, the combined effect of the index zones were not listed as such in the study. The variables related to living conditions and the existence of protected areas and territories, had very strong impact on the determination of adaptive capacity thereof.
- Comparative data of the Ministry of Environments for 1996, 2003 and 2012 respectively, for the use of land in the area, indicates a growth in the forested area; however, for both producers and technicians consulted in San Juan and in Hondo Valley felt that locally whenever is shrinking more forest area capable of producing water, and by which they are drying up rivers and streams, to cause widespread slash and burn agriculture disseminated at the top of the mountain despite reforestation programs conducted in the area.

### 8.3 Extreme events: climate variability and change

- Standard Precipitation Index (SPI) calculated for 1 month and 3 months indicates that there is great variability in rainfall can significantly affect agriculture in the area. There are likely more than 95% of having months marked by a severe drought during the growth of the main crops in the area (May, June and July) with a return period of 15-30 years.
- On the 1st and 2nd quarter, there is also a high probability of having very dry or very wet events with a return period of 30 years or more. In both cases these events greatly affect agriculture in rainfed area and farmers who implement because they are generally the poorest and weakest against economic difficulties.
- The Standard Precipitation Index (SPI) calculated over one year indicates that major drought events (about 2.5 standard deviation) may occur with a return period of 30 years or more, and may have a duration of three years, this represents a high risk to the population of the area can thereby severely affect agriculture and the living conditions of the population that depends on it. There is also a high probability of having high rainfall events (classified as extremely wet) with a return period of 15 years; these events are a good indicator of threats of flooding and landslides.
- According to projections at regional and local level, in every trend models made by this evaluation as well as other national documents reviewed indicate that the temperature in the area is increasing.
- The effects of phenomena associated with climate change (high temperatures and drought) are increasingly evident in the area of SJ-HV; however, the available data do not allow technical accuracy measure the levels at which these phenomena are expressed and the effects of its occurrence and even more when the level of precision required is at the locality level.

### 8.4 Perception of communities regarding vulnerability to climate change and variability

- High temperatures and frequent and prolonged periods of drought are affecting patterns of planting crops like beans, pigeon peas and corn upland area of study.
- In the opinion of the respondents (producers and technicians SJ-HV), plantings of these crops associated with rainy periods (March-April and August-September) of each year have moved a month later and fresh period of the top (including the month of January) has been reduced to December. However, the frequency of drought and the effects on production of major crops in the area, producers and technicians consulted have no records of this phenomenon and damage to the producer
- Both producers and technicians feel vulnerable to the effects of climate change and variability. Perceive pests and diseases have increased their negative impact on the production of the main items of the region.
- Producers and technicians do not have similar findings in relation to the strategies adopted in relation to planting schedules.
- Producers and technicians of the Sub Area Hondo Valle are more affected by the loss of forested areas than those of the Province of San Juan basins even if everyone believes that agricultural land use has expanded, increasing deforestation, burning and soil loss.

- Hydroclimatic events most remembered by the population have been associated with human losses (Mesopotamia, Hurricane George, Olga and Noel) although some recurring events (drought, hail, etc) can have high impact on economic activities and livelihood of the population.

## 9 RECOMMENDATIONS

Trends observed in recent decades related to socioeconomic aspects, with a view to adjust adaptive capacities in rural areas with intensive farming, the Dominican Republic is conditioned to link greater involvement of public policies to generate greater resilience to the events of variability and climate change on ecosystems and people linked.

### 9.1 Strengthening Governance Systems

Under the provisions of the Law No. 498-06 on Planning and Public Investment, strengthening mechanisms for participation of citizens across the multiple organizations in the study area, with particular attention to associations producers water users associations, neighborhood associations and other organizations recognized for his work in the rural area.

In this regard, strengthen Provincial Development Councils San Juan de la Maguana and Elías Piña, and each of the Municipal Development Councils of the study area. At the same time, promote the Municipal Districts articulation mechanisms of representative organizations of Districts with the respective municipal councils.

With a focus on building and strengthening capacities, reducing vulnerability to climate change and environmental sustainability, promote locally, with the active participation of community organizations:

- The discussion and solution of specific problems of the communities (including at sections).
- Identify programs and projects with direct impact on their territory. Establish an order of priority projects to be executed
- Influence the appropriate authorities for proposals generated locally are considered priority interventions within the multiannual National Public Sector Plan and consequently included in the national budget as hedged items.
- Monitor the implementation of projects at the local level: sections, districts, municipalities and province.
- Accountable to the communities of the efforts and responses of the agencies concerned.
- Migration policy interventions should consider the significant dependence on foreign labor in areas of high economic and social importance, eg (coffee, rice, cocoa, vegetables, etc).
- Interventions social protection policies should incorporate the trend of vulnerability aging population.
- Interventions in social protection policy with a gender perspective.

## **9.2 Strengthening the productive capacity taking into account environmental sustainability**

Given the inherent limitations of the soils in class V to class VIII predominant in the area (98% in Hondo Valle and 72% in San Juan), its widespread use for farming leads to a degrading activity of the environment and natural resources and poverty conditions of the livelihoods and persons involved. Therefore, measures to reverse this process positively must contain the answers to the conditions of poverty of the persons, and accompanied by appropriate technological responses. Improving the infrastructure of irrigation canals is required as to repair both primary and secondary channels, sediment management and user training through irrigation boards to improve irrigation efficiency .

To reverse the trend of declining populations in the provinces of San Juan and Elías Piña, shall: Created economic and institutional capacity such as improving access to credit for producers and programs land titling capabilities.

- Apply hydroclimatological preventive risk management rather than reactive, taking into account the multidimensional vulnerability of the area and its people.
- Promote resistant to drought, pests and can be handled in soils with large production constraints species.
- Improving road infrastructure of highways and roads to facilitate access quickly for extreme hydrometeorological series and marketing of agricultural products.
- Maintenance, expansion and intensification of reforestation and protection of resources must be accompanied by a local development approach that supports and enhances the efficient use of available resources and integrate community actively.

The action of the state and its institutions permanently in finding solutions to diversify income generation of local people is essential, beyond the traditional agricultural activity to decrease the pressure on land use with decreasing capacity productive and reduce the expansion of the agricultural frontier at the expense of low vocation of these soils.

## **9.3 Education, training and research to generate capacities and opportunities.**

- Apply adult literacy programs with greater emphasis on the area and improve school infrastructure.
- Programs for training in the use of ICT producers and irrigation boards. Education campaigns on issues of vulnerability, risk management and climate change. Training program for irrigation boards to make irrigation systems more efficient.
- Implementation of pilot projects in drought-resistant developed by research institutes such as IDIAF, CEDAF, CONIAF and others, as well as demonstration pilots for implementation of best practices for adaptation to climate change crops. Research studies that generate data locally on vulnerability to climate change and variability.
- Improve systems for climate information available and easy to understand for small and medium producers, for decision-making.
- Improve existing network of weather stations in the area, applying repair and maintenance programs, install new stations to supplement the recorded data and implement training programs for personnel in charge of its operation.

- Create an early warning system for drought and flood events in collaboration with the Ministry of Agriculture, Irrigation Management Division, National Emergency Commission, Environment Ministry, INDRHI, COE, among others.
- Develop a Climate-Smart Agriculture program modules education, training and information to producers.

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## 11 ANNEX

## 1- Selection of key stakeholders

A categorization of stakeholders was conducted to involve them in the project

Categories of stakeholders
Public Sector
1-Ministries, national and local government agencies that formulate and implement related to agriculture, climate change and risk management
2- Public University and Research Institutions
Private Sector
1 Academic Institutions with training programs on issues related to agriculture or to include any of the issues such as food security within their educational curricula and research.Private research Institutions
2.- NGOs and Community Organizations related to agriculture, environmental, commercial, industrial, the agricultural sector in pilot points Hondo Valle San Juan and Elías Piña.
3 -. Unions and associations.
Civil Society
1 - Private citizens interested in the topic or affected directly or indirectly
2 -. Researchers, scientists, related to the agricultural sector and at the locations selected for the VCA.
International Organisms
1.- Cooperating bilateral or multilateral donors 2 -. International NGOs

### • Stakeholder Engagement approaches

Different strategies to initiate, maintain and strengthen links with the various organizations and individuals who were interested in participating in the evaluation process, engaging them in the issues that were of most interest to them. The communication strategy is based on first identifying the key contact and then through a letter or electronically. The objective is to engage and build consensus among all stakeholders - Identify and mobilize stakeholders - Create partnerships.

Techniques are described below:

### Communication Strategies.

These communication strategies were used in the initial stage and others will be used during the process as required.

**a. Identification of the key actor**

Definition: Selection within institutions, companies or organizations identified as stakeholders, the key person linked to the issue under review, so that act as connector body between the organization and the project. Via: phone, email, messaging. Resources: questionnaires, surveys, correspondence, reports, working papers, meetings and workshops. Objective: require and provide data that serve to the project and to participate in the process. For the identification of contact did the following:.

a - telephone contact with the institutions identified as potential participants to develop stakeholder directory. b -. Send by e-mail a summary of objectives, goals and important information about the project to institutions identified as potential participants.c-.Send by e-mail a matrix with the contacts identified. d -. Forwarding communication requesting for institutional representative designated to form the advisory committee. e -. Referral media requesting interviews to gather information and data requisition.f -.Request of interview appointments by telephone.

**b. Print material, electronic communications**

Definition: Reproduction of information about VCA-NASAP RD publicizing their activities, process development, scope and levels of intervention. Via: Direct delivery in workshops and meetings, Shipping by courier, press releases, coverage of activities. Resources: copy submission of documents, web page and press. Objective: to provide knowledge about the goals set by the VCA-NASAP project and expected to achieve the same results.

At this point the following activities: - Sending e-mail invitations to convening workshops and thematic meetings.. b -. Event coverage by the national press. c -. Project data and activity on PLENITUD website . d -. Referral media reporting on the implementation process and activities. e -. Referral questionnaires to gather information. f -. Delivering presentations and speeches made in the workshops. g -. Submission of draft report for review and incorporation of suggestions. h -. Submission of final reports for each stage in physics and electronics to the parties involved in the process

• **Engagement Strategies**

**a. Informative.**

**a. Informative.**

Definition: Establishment of bidirectional links that expand the base of knowledge about the actions performed by different entities, companies and organizations, related systems and sectors to be analyzed. Via: mail, email, print materials, web site, presentation media. Resources: meetings, visits, interviews, questionnaires, documents, reports. Objective: require and provide relevant data to the VCA-RD-NASAP comply with each of the steps provided in the evaluation process.

**b. Participative.**

Definition: Stakeholders engaged in delivering tasks or with responsibility for a particular area/activity, related to the topics covered in both the VCA and the NASAP in engaging activities.

Via: physical and electronic, telephone invitations. Resources: Workshops, focus groups, technical advisory committee, direct observation. Objective: Create a work environment oriented to the contribution of the the key actors, with guidelines and recommendations to adopt or make the best decisions, jointly and synergistically design an action plan that engages stakeholders interested in its execution and delivering results and recommendations to the draft reports.

**c. Consultive.**

Definition: Promoting dialogue between different organizations mainly Council on Climate Change and CDM and the Ministry of Agriculture to create a common commitment basis, ensuring the openness and transparency of the different processes.

Via: Communications, emails, telephone, face to face dialogue. Methods: Mini workshops, panel discussions, consensus meetings and discussion, welcome-send reports and documents. Objective: The consultation and approval of the documents from the document analysis NASAP-VCA.

- **Establishment of focal points**

Through a consultative communications strategy, a letter was sent to the Ministries of Agriculture, Economy, Planning and Development and the National Council on Climate Change consulting them to nominate focal points for project, for monitoring and technical assistance during the development.

**Annex 2. Matrix of links of institutional actors and the issue of climate change, risk management and agriculture in the Dominican Republic**

<b>Matrix of links of institutional actors and the issue of climate change, risk management and agriculture in the Dominican Republic</b>		
<b>PUBLIC SECTOR</b>		
<b>Institucion</b>	<b>Description</b>	<b>People in charge and contact</b>
<p>National Council for climate change and CDM  <a href="http://cambioclimatico.gob.do/">http://cambioclimatico.gob.do/</a></p> <p>AV. Winston Churchill, No.77, building GRUCOMSA, 5th level, Ensanche Piantini. Santo Domingo, Dominican Republic            Tel.: (809) 472-0537 ext. 236   Fax: (809) 227-4406            Email: info@cambioclimatico.gob.do</p>	<p>The National Council for climate change and the mechanism of clean development (CNCCMDL), was created by the Presidential Decree 601-08, September 20, 2008, in order to articulate and work together from the various institutions that make up the developing sectors of the country, to fight the global problem of climate change. Formulation, design and execute the necessary public policies for the prevention and mitigation of emissions of the of Greenhouse Gases (GHG), the adaptation to the adverse effects of climate change, and promote the development of programmes, projects and climate action strategies relating to the fulfilment of the commitments made by the Dominican Republic in the UNFCCC and the instruments derived from it, particularly the Kyoto Protocol</p>	<p>Executive Vice President Omar Ramirez</p> <p>Director Moises Alvarez</p> <p>Coordinator of the third national communication Yomaira Martino</p> <p>Focal point CC and agriculture Federico Grullon  <a href="mailto:f.grullon@cambioclimatico.gob.do">f.grullon@cambioclimatico.gob.do</a>            Ext 231  <a href="mailto:k.hederman@cambioclimatico.gob.do">k.hederman@cambioclimatico.gob.do</a>            Ext 230</p>
<p>Ministry of agriculture  <a href="http://www.agricultura.gob.do/">http://www.agricultura.gob.do/</a>            Physical address: Duarte Highway km. 6½ Jardines del Norte, Santo Domingo, Rep. Sun.            P.o. box: n/a            Phone: (809) 547-3888 / (809) 547-1692            Fax:            Email: info@agricultura.gob.do</p>	<p>Function is: Formulate and lead the agricultural policies in accordance with the General plans of development of the country, so that producers take advantage of the comparative and competitive advantages in the markets, and contribute in this way to ensure food security, the generation of productive employment and foreign exchange, and the improvement of the living conditions of the population.</p> <p>You must define policies for adapting to the effects of climate change on agriculture, land degradation, has incidence also in the adaptation of the watersheds of the country and is a source of data essential for the preparation of GHG inventories.</p> <p><b>DEGRYCC-</b> climate change / risk management, Juan Mancebo            juan.mancebo@agricultura.gob.do            ext 3046</p> <p>Directorate-General of livestock  <a href="http://www.ganaderia.gob.do/">http://www.ganaderia.gob.do/</a>            This dependency of the Ministry of agriculture is linked to climate change through information provided that they are necessary for GHG inventories</p>	<p>Minister: Agronomist engineer Angel Francisco Estévez  <a href="mailto:despacho@agricultura.gob.do">despacho@agricultura.gob.do</a>            Ext 1002            Vice Ministry of agricultural sectoral planning            Deputy Minister: Carlos Sanquintin            Ext. 3001            Director planning Altagracia Paulino  <a href="mailto:altagracia.paulino@agricultura.gob.do">altagracia.paulino@agricultura.gob.do</a>            ext 3041</p> <p>Bolivar Toribio</p>
<b>Agencies decentralised Ministry of Agriculture</b>		
<p>BAGRICOLA            AV. George Washington No.601, Santo Domingo, D.N.</p>	<p>The agricultural Bank of the Dominican Republic ensures the financing of productive activities in the agricultural sector, to guarantee the increase of the production, meet the food demand of the population, and modernize the production of exportable items and others that support the development of the national industry.</p>	<p>Administrator of the agricultural Bank, Carlos Segura Foster E-mail: bagricola@bagricola.gob.do            Phone: (809) 535-8088            Fax: (809) 535-8022</p>

<p>The agricultural insurance Dominican (Agrodosa) AV. Independencia No. 455, Santo Domingo, RD</p>	<p>The Dominican agricultural insurance company, AGRODOSA, is a company of mixed capital, mostly State private subscription. It is the only insurance company that supports farmers in the country.</p>	<p>Emilio olive Toribio, CEO of Agrodosa Tel. 809-687-4790 * Fax 809 682-9355 Email: <a href="mailto:agrodosa@claro.net.do">agrodosa@claro.net.do</a></p>
<p>Dominican Institute of farming and forestry (IDIAF) research</p> <p>Rafael Augusto Sanchez #89, Ensanche Evaristo Morales, Santo Domingo, Dominican Republic Phone: 809 567-8999 Fax: 809 567-9199</p>	<p>The IDIAF is the State institution responsible for the implementation of policy research and farming and forestry validation of the Dr. It is linked to the issue of climate change for his research on natural resources and biodiversity through its research on issues such as the sustainable forestry development, PSA, geographic information and use of the land, among others.</p>	<p>Director Executive Rafael Pérez Duverge <a href="http://www.idiaf.org.do/">http://www.idiaf.org.do/</a></p>
<p>National Council of I enquiries Agropecuarias and forestry CONIAF Calle Felix Maria of Mount No.8, Gazcue, Santo Domingo, D.N. Dominican Republic Phone: (809) 686-0750 • Fax: (809) 689-9943IAF</p>	<p>THE CONIAF is a decentralized institution of the Dominican Government, which strengthens, stimulates and guides to the national system of agricultural and forestry - research SINIAF. It offers financing through the Research Fund, promoting the development of scientific and technological capacity in public and private institutions.</p>	<p>Executive Director: Juan Chavez  Litt. Natural resources Division: José Nova <a href="http://www.coniaf.org.do">http://www.coniaf.org.do</a></p>
<p>Dominican Agrarian Institute IAD <a href="http://www.iad.gob.do">http://www.iad.gob.do</a> Avenida 27 de Febrero, Square flag, Distrito Nacional, Santo Sunday, Tel: (809) 620-6585. Fax: (809) 620-1537. Email: <a href="mailto:info@iad.gob.do">info@iad.gob.do</a></p>	<p>The Dominican Agrarian Institute is the Agency of the State responsible to implement and follow-up on policies of land reform. In addition to acquisition of land for the settlements of farmers and grant property titles, contributes to the strengthening and training of peasant organizations, through the conduct of activities in order to transfer knowledge of technical-organizational order.</p> <p>Current policies are aimed at dynamizing the agrarian reform through the following lines of action: to) increase in the uptake of new land; (b) the revival of agricultural settlements; (c) consolidation of the plots for the benefit of which demonstrated efficiency and management capacity.</p>	<p>Director Alfonso Radhames Valenzuela</p>
<p>Project of support to the Transition and the farming (Patca II) (809) 535-3333 / F. (809) 535-3530 Av. George Washington No. 601 Edif.Bank Agricola 3rd. floor, West side. <a href="http://www.patca.gov.do/">http://www.patca.gov.do/</a></p>	<p>PATCA, of the Ministry of agriculture, invest 932.5 million pesos to provide 22,090 producers technologies in different areas. This project, financed by the Inter-American Development Bank (IDB), has 21,568 registered producers and 13,632 approved applications 13,385 technologies executed, representing 130% of the goal line. Areas where producers receive technologies are leveling ground, technification of irrigation, zero or minimum tillage; use of In Vitro plants, rehabilitation and conservation of grasslands, introduction of tree species, Fertigation and protected cropping system.</p>	<p>General Coordinator Argentina Betances  <a href="mailto:argentina_betances@hotmail.com">argentina_betances@hotmail.com</a> (809) 535-3333 / (809) 535-4445 (809) 535-3530</p>

<b>Other Key public institutions</b>		
<p>Ministry of environment and natural resources (MARENA)</p> <p>Avenida Cayetano Germosen esq. Avenida Gregorio Luperón, Sector El Pedregal, Santo Domingo, D. r.</p> <p>Phone: (809) 567-4300, (809) 567-0555</p> <p><a href="http://www.ambiente.gob.do/">http://www.ambiente.gob.do/</a></p>	<p>Responsible for the implementation of the multilateral environmental agreements (MEAs - UNFCCC, CBD and UNCCD) in the RD in coordination with the Ministry of Foreign Affairs. The Vice-Ministry of environmental management under which is the direction of climate change, the Deputy Minister of education and environmental information was appointed focal point for article 6 of the UNFCCC. The viceministerios of biodiversity and Protected Areas, forest resources and soils and waters and international cooperation collect and manage information relevant to the project.</p> <p>-Vice-Minister of environmental management: Zoila Gonzales Gutierrez <a href="mailto:zoila.gonzalez@ambiente.gob.do">zoila.gonzalez@ambiente.gob.do</a></p> <p>climate change Direction: Pedro Garcia Brito <a href="mailto:Pedro.Garcia@ambiente.gob.do">Pedro.Garcia@ambiente.gob.do</a></p>	<p>-Minister: Bautista Rojas Gómez 809-567-4300 <a href="mailto:ministro@ambiente.gob.do">ministro@ambiente.gob.do</a></p> <p>-Deputy Minister of soils and waters: José Alarcón <a href="mailto:jose.alarcon@ambiente.gob.do">jose.alarcon@ambiente.gob.do</a></p> <p>-</p>
<p>Special for agricultural development (FEDA) Fund</p> <p>AV. Independencia #601, building agricultural Bank, 2nd floor, Santo Domingo (809) 532-1428</p>	<p>The FEDA, is an institution attached to the Presidency of the Republic, which aims to promote and foster sustainable development in the rural environment through innovation and technology transfer. Supported by means of financing to small and micro agricultural company operating under the partnership system.</p>	<p>(Daddy) Antonio López</p>
<p>Ministry of economic planning and development - MEPYD- AV Mexico, Santo Domingo 10201 (809) 688-7000</p> <p><a href="http://www.economia.gob.do/eweb/">http://www.economia.gob.do/eweb/</a></p>	<p>El MEPYD has as part of its functions lead and coordinate the process of formulation, management, monitoring and evaluation of macroeconomic policies and sustainable development. Be the governing body of the national system of planning and public investment and land use and the management of the territory. Formulate the development strategy and the Plan national multi-year Public Sector, among other functions develop and maintain the national statistical system and complementary to the same economic indicators. Use statistical information and indicators mainly from this institution.</p>	<p>-Juan Tomás Monegro, Vice Minister of planning <a href="mailto:juantmonegro@gmail.com">juantmonegro@gmail.com</a></p> <p>-Magdalena Lizardo, Director, Advisor for economic and Social Analysis Unit. <a href="mailto:mlizardo@pro-reforma.gov.do">mlizardo@pro-reforma.gov.do</a> <a href="mailto:lizardomagdalena@gmail.com">lizardomagdalena@gmail.com</a></p> <p>-Alexis Cruz <a href="mailto:acruz@pro-reforma.gov.do">acruz@pro-reforma.gov.do</a></p>

Directorate-General of planning and development Territorial-DGODT-	Responsible for the management and the formulation of public policies for sustainable development in the territory, such as spatial expression of the policy of economic, social, environmental and cultural society and inter-sectoral and inter-institutional coordination, between the different levels of public and private entities. Currently developing the program of prevention of disaster and risk management 1708/OC DR. are being developed various manuals, methodological instruments and maps, useful for planning disaster.	-Franklin Labour Director General of ordering and Territorial Development  <a href="mailto:flabour@economia.gov.do">flabour@economia.gov.do</a> Tel: (809) 682-5170 Fax: (809) 682-5852  <a href="http://dgodt.gob.do">http://dgodt.gob.do</a> Arq. Erick Dorrejo <a href="mailto:erickdorrejo@gmail.com">erickdorrejo@gmail.com</a> Omar Rancier <a href="mailto:orancier@gmail.com">orancier@gmail.com</a>
Directorate-General of border development Street Moises Garcia Avenue Dr. Delgado, Esq. Moisés García, Bldg. Felipe III, Santo Domingo 10205	Dominican State institution, attached to the Executive power, created by the Decree No.443-2000, dated August 16, 2000. Promote the agricultural and industrial utilization of border provinces; Dajabon, Montecristi, Elías Piña, independence and Flint, as well as Santiago Rodríguez and Bahoruco. Mission: Coordinate the policies of public investment in the development of the border through well-planned efforts, acting with fairness and transparency along with other institutions of the Dominican State to improve the quality of life of the inhabitants of the border provinces.	Director-general of the DGDF, Eng. Miguel Alejandro Bejaran Alvarez  (809) 689-9666  <a href="mailto:administracion@dgdf.gob.do">administracion@dgdf.gob.do</a>  <a href="http://dgdf.gob.do">http://dgdf.gob.do</a>
National geological service - SGN Avenida Mexico, Esq Leopoldo Navarro, building Juan Pablo Duarte, piso 10, Santo Domingo, Dominican Rep. Phone: 809-689-2769 <a href="http://www.sgn.gov.do/index.php">http://www.sgn.gov.do/index.php</a>	Cartography Geo thematic of the Dr, with information geo-referenced geological sheets at scale 1: 50,000 complemented with structural data supported in images from satellites, geophysics, dating. It is attached to the MEPYD.	Santiago J. Muñoz Tapia Director national geological service <a href="mailto:sgn.mineria@dgm.gov.do">sgn.mineria@dgm.gov.do</a>  Assistant smiles Garcia Geographer
National Bureau of statistics-ONE AV. Mexico esq. Leopoldo Navarro, Bldg. offices governmental Juan Pablo Duarte, Santo Domingo, D.N., RD floor 9.	Producing and disseminating official statistics with quality and transparency to decision-making in the field of public policy and national development as specialized technical agency and coordinator of the national statistical system institution belonging to the MEPYD.	Phone: 809-682-7777  <a href="http://www.one.gob.do/">http://www.one.gob.do/</a>
National office of meteorology-ONAMET Mirador del Este, Santo Domingo	Provides forecasts, warnings, information on weather and climate aeronautical, marine and agricultural purposes; conducts studies and research meteorological and climatological; manages and preserves all the meteorological and climatological information national in order to mitigate damage by atmospheric phenomena, it is a dependence of the National Directorate of Civil Aviation.	Eng. Gloria Ceballos 809-788-1122 ext.222 <a href="mailto:sgonzalez@onamet.gov.do">sgonzalez@onamet.gov.do</a> , <a href="mailto:gceballos@onamet.gov.do">gceballos@onamet.gov.do</a> (809) 788-1122 <a href="http://www.onamet.gov.do/">http://www.onamet.gov.do/</a>
Central Bank of the Dr c/Pedro Henríquez	The Central Bank of the Dominican Republic has as main objective, to maintain the stability of prices, by constitutional mandate, the	<a href="mailto:R.blondet@bancentral.gov.do">R.blondet@bancentral.gov.do</a> Roberto Blondet-829-221-

Ureña esq. Leopoldo Navarro, Santo Domingo, Rep. Sun.	monetary law and finance no. 183-02. Socio-economic information relevant to the project.	9111 ext. 3124  Tels.: 809-221-9111 <a href="http://www.bancentral.gov.do/">http://www.bancentral.gov.do/</a>
National Council of energy, CNE Ave. Romulo Betancourt No. 361, Bella Vista Santo Domingo, Dominican Republic	It is responsible for follow-up on the fulfilment of the law of incentive to the development of renewable energies and their special regimes (Law No.57-07) the scope of its powers includes: conventional energy, fuels derived from petroleum, natural gas and coal. Renewable, from source solar, wind and hydro energy. Biofuels, such as bioethanol, biodiesel, biogas and its potential in our country. It develops and coordinates projects of legal and regulatory standards. Draw the policy of the State in the sector energy. Indicative of the sector plans energy; among others	Julián Despradel <a href="mailto:idespradel@cne.gov.do">idespradel@cne.gov.do</a>  Phone: 809-540-9002 Fax: 809-547-2073 Postal code: 10112 <a href="http://www.cne.gov.do/app/do/frontpage.aspx">http://www.cne.gov.do/app/do/frontpage.aspx</a>
National Commission of emergencies (CNE) Bldg. emergencies, 1st floor Plaza de la Salud Comision, Santo Domingo, Dominican Republic	According to article 10 of the law 147-02, is ratified by this law the National Commission of emergencies, as a dependency of the National Council for prevention, mitigation and response to disasters, chaired by the President of the Republic. This Commission shall be coordinated and chaired by the Executive Director of the Civil Defense. It will be composed of officials appointed by the institutions members of the CNPMRD, which are appointed by presidential decree to help develop and promote the policies and decisions of the CNPMRD. It must promote and implement national integrated information system to systematize the knowledge of threats, vulnerabilities and risks in the country.	Lic. Luis to. Luna Paulino, (DEM) Major General parka. FAD, Executive Director of the Civil Defense and Lic. Luis to. Luna Paulino, (DEM) Tel: (809) 472-0909 Fax: (809) 472-8623/24 <a href="http://www.coe-repdom.4t.com/">http://www.coe-repdom.4t.com/</a>
Operations Center of Emergencias-COE- Bldg. National Commission of emergency, Plaza de la Salud, Ens. Faith Santo Domingo Distrito Nacional Dominican Republic	Body created by Decree No. 360 of 14 March 2001 and then ratified by law 147-02 of September 22 2002 dependent of the National Commission of emergency, responsibility promote and maintain coordination and operation Joint between different levels, jurisdictions and functions of the institutions involved in the management and care of emergencies and disasters in the country, direct and coordinate the actions of preparedness, response and rehabilitation, guaranteeing the participation of all institutions.	Directorate-General  Director: Cnel. Juan Manuel Mendez Tel: (809) 472-0909 Fax: (809)472-8623/24 <a href="http://www.coe.gov.do">http://www.coe.gov.do</a>  <a href="http://www.coe-repdom.4t.com/">http://www.coe-repdom.4t.com/</a>
Civil Defense Calle Pepillo Salcedo, Santo Domingo, Distrito Nacional, Dominican Republic	Civil Defense directs the actions of coordination, preparation and operation of all functions of emergency before the occurrence of a natural or anthropic event in an efficient and effective way, ensuring an adequate control of operations to protect the life and property of the inhabitants.	TEL. 809-472-4614/16/17 <a href="http://www.defensacivil.gov.do/">http://www.defensacivil.gov.do/</a>
EGEHID-hydroelectric power generation company Ave. Rómulo Betancourt, no. 303. Santo Domingo, RD	Hydroelectric power generation company carries out reforestation activities of the main basins, especially in those where there is incidence of different reservoirs that feed the hydroelectric Central of the country (Yaque del Sur, Rio Grande and Rio Blanco), in the area of the dam and Sabana Yegua, central payment for environmental services, water in the upper basin of the Yaque del Norte, among other activities related to mitigation. Generates information relevant to the project.	Phone: 809-533-5555ominicana.  <a href="http://www.hidroelectrica.go.b.do/">http://www.hidroelectrica.go.b.do/</a>
Road transport (OTTT) Technical Office- C / Pepillo Salcedo front Est. Quisqueya, Ens. Faith	This office is related to emissions of GHG and the potential actions of mitigation in that sense.	Tel.: (809) - 338-6134 fax: (809) - 547-2291 <a href="http://www.ottt.gov.do/">http://www.ottt.gov.do/</a>

<p>Unique system of beneficiaries - SIUBEN  AV John F Kennedy 38,  Santo Domingo  (809) 689-5230  <a href="http://www.gabsocial.gov.do/siuben/">http://www.gabsocial.gov.do/siuben/</a></p>	<p>Is responsible for identifying families and beneficiaries on the basis of technical and scientific processes that ensure rationality, equity and transparency in the process of identification and prioritisation of public transfers and mechanisms. Belongs to the Cabinet of coordination of social policies and generates the index of quality of life and collects information about poverty at the territorial level.</p>	<p><b>Email:</b> <a href="mailto:info@siuben.gob.do">info@siuben.gob.do</a>  <b>Página:</b> <a href="http://www.siuben.gob.do">www.siuben.gob.do</a>  <a href="http://www.gabsocial.gov.do/siuben/">http://www.gabsocial.gov.do/siuben/</a></p>
<p>Dominican Institute of hydraulic resources (INDRHI)  AV. Jiménez Moya,  Center of the Heroes,  Santo Domingo,  Dominican Republic.</p> <p>(809) 532-3271  <a href="http://www.indrhi.gob.do/">http://www.indrhi.gob.do/</a></p>	<p>El INDRHI has links to several topics of climate change and desertification and drought by his role as administrator and research on water resources, its relationship with vulnerable areas, among others. The INDRHI is the seat of the water Observatory and the Committee of operation of dams and reservoirs (copper). They carry the statistics of irrigation and provide relevant information on water systems. Culture of water, rural electrification and emergency recovery programs. They provide digital mapping services. Among its functions is organize and manage the operation and maintenance of the systems national irrigation, with the intervention of users, in the terms that indicate the laws and the Ministry of agriculture, for the purpose of coordination of the production agricultural</p>	<p>Olgo Fernández  <a href="mailto:direccion@indrhi.gob.do">direccion@indrhi.gob.do</a></p>
<p>Instituto Nacional de Agua Potable y Alcantarillado (INAPA)  Guarocuya Street,  building Inapa, Centro Comercial million,  Apartado Postal 1503,  Santo Domingo, D.N.  RNC: 401-00745-2</p>	<p>INAPA ensures the water supply to the Dominican population living outside the two largest cities so it has great sensitivity by the effects of climate change in the population with regard to their access and quality. INAPA is: ensure the supply of the service water in quantity and quality, collection, treatment and final disposal of rainwater and water waste throughout the jurisdiction, compliance with the standards, with the aim of contributing to the improvement of the quality of life of citizens and protection of the environment, promoting a culture of saving and compromise between the beneficiaries and the institution</p>	<p>Eng. Alberto Holguín  Executive Director</p> <p>(809) 567-1241  <a href="http://inapa.gob.do/Inicio/tabid/38/Default.aspx">http://inapa.gob.do/Inicio/tabid/38/Default.aspx</a></p>
<p>Corporación de Acueducto y Alcantarillado de Santo Domingo (CAASD)  Morillo Euclid Street 65,  Santo Domingo,  Dominican Republic</p>	<p>The CAASD institutional aims provide the service of drinking water and sewerage, in the province of Santo Domingo, with its municipalities and semi-rural areas, as well as in the National District. It is linked to climate change by sensitivity and vulnerability of water resources by its goal of supplying water to Santo Domingo. It has statistics on the production and quality of the water.</p>	<p>Director: Alejandro Montás</p> <p><a href="http://www.caasd.gov.do/">http://www.caasd.gov.do/</a>  Phone: 809-562-3500 Fax.: 1809-541-4121</p>
<p>Attorney for the defense of the environment and natural resources.  Street Hipolito Herrera Billini Esq. Juan de Dios Ventura Simo, Center of Constanza, Maimon, and Estero Hondo Heroes.</p>	<p>It works as a specialized part of the Public Ministry of the Dominican Republic, and has as main function the prosecution of environmental crimes that are established in the law 64-00, as well as sectoral or special laws, decrees and other provisions relating to the environment and natural resources, legal.</p>	<p>Tel. 809-508-1955 Ext. 21 / 809-533-3522 Ext. 451 / 1-200-0594  <a href="http://www.procuraduria.gov.do/PGR.NET/Dependencias/Ambiente/IndexAmbiente.aspx">http://www.procuraduria.gov.do/PGR.NET/Dependencias/Ambiente/IndexAmbiente.aspx</a></p>
<p>Environmental protection service  Avenida Cayetano Germosen esq. Avenida Gregorio Luperón,  Sector El Pedregal, Santo Domingo, D. r.</p>	<p>Investigate, pursue, stop and submit to the Attorney for the defense of the environment and natural resources to individuals or institutions who commit violations of environmental laws</p>	<p>Phone: (809) 567-4300, (809) 567-0555  <a href="http://www.ambiente.gob.do/">http://www.ambiente.gob.do/</a></p>

PRIVATE SECTOR NGOs, academic institutions, associations, business		
Institucion	Description	Contact
Agricultural and Forestal (CEDAF Development Center José Amado Soler # 50, Ensanche Paraíso, Santo Domingo, Dominican Republic	The CEDAF is a foundation that promotes the sustainable development of the agricultural and forestry sector, through training, information, institutional innovation and analysis of policies and sectoral strategies, endorsed by a picture of institutional excellence and high credibility in order to stimulate a competitive agriculture that contributes to reduce the levels of poverty and protect the environment. The principal consultant is the director of this organization and information relevant to the project for the agriculture sector.	Director Juan José Espinal Code Postal-567-2, phone: (809) 565-5603, Fax: (809) 544-4727 <a href="http://www.cedaf.org.do/">http://www.cedaf.org.do/</a>
PLENITUD Foundation Street Arabia #1, first floor, Arroyo Hondo Santo Domingo, Dominican Rep.	The FP is a centre of reflection (think-tank) independent and nonprofit, with headquarters in Dr. The work of PLENITUD is oriented to generate, collect and disseminate evidence, methods of high technical quality, that support decision-making aimed at environmentally sustainable development; and monitoring, civil society, public policy. One of the Areas of specialty focuses on environmental and development issues, particularly related to climate change, mainly in adaptation policies. It is the Research Center responsible for conducting investigations of vulnerability to the DR.	Laura Rathe Research Coordinator Coordinator of climate change <a href="mailto:laurathe@fundacionplenitud.org">laurathe@fundacionplenitud.org</a> Tel: 809-563-1805 <a href="http://www.fundacionplenitud.org">www.fundacionplenitud.org</a>
IDEAC- Institute of development of the Associative economics <a href="#">Calle Enriquillo No. 23, widen Quisqueya, paragraph Postal No. 2228, Santo Domingo, Distrito Nacional, Dominican Republic.</a>	The Institute for development of economic associations (IDEAC) is a non-profit dedicated to contributing to the development, in Dominican Republic, in organizational structures, economicas-sociales relationships, values and a legal framework based on Social and solidarity economy . The target population are the Associative rural enterprises (ERAs) with good level of leadership in your area or region, composed by small / you and medium / os producers / you of goods and services and workers, self-employed women, with potential economic and organizational reproduction and corporate sustainability. These are target populations that should be the measures of adaptation to climate change and variability.	Executive Director, Nicolas Cruz Tineo <a href="mailto:ncruz@ideac.org.do">ncruz@ideac.org.do</a>  Phone (809) 227-0012 Fax (809) 227-0031 <a href="mailto:contacto@ideac.org.do">contacto@ideac.org.do</a>
Fundación Sur Futuro Ave. February 27 Esq. Abraham Lincoln Bldg. Unicentro Plaza, 3rd. level, Santo Domingo, RD	Private nonprofit organization that started operations from 16 November 2001, promoting the development and welfare of the communities in the southern region of the DR. Seeks to reduce the high levels of poverty and marginalization of the inhabitants of that region, through promoting the development of social, natural and productive capital in communities, helping to improve the quality of life of vulnerable populations and support sustainable management the environment and natural resources.	Executive Director, Melba Grullon Segura <a href="mailto:mgrullon@surfututo.org">mgrullon@surfututo.org</a> 809-472-0611 Phone: (809) 472-0611 Fax: (809) 472-0612
Board of Agro business JAE	The Agro Board empresarial Dominicana, Inc. (JAD) feels very pleased when placing on the Internet is Web page, which contains up-to-date information about the main services, programs, projects and activities of the Agricultural Sector.	Osmar C. Benítez Tel: 809-563-6178 Fax: 809-563-6181
Committee agricultural unit (CAU)	Private entity non-profit dedicated to the production of agropecuaria-forestal and business, . Incorporated by Decree No. 708-04 of the Presidency of DR, in on July 30 of 2004. This institution is constituted on the basis of physical, human resources and capital of 13 associations of agricultural and livestock producers who compose it. These organizations are which must implement measures for adaptation to climate change.	President and CEO Manuel Matos Perez <a href="http://causim.blogspot.com">http://causim.blogspot.com</a>
Association of producers of San Juan de Maguana	An association that brings together the major producers of the province of San Juan de Maguana.	President Manuel Matos (809) 557-4262

AV independence 15, San Juan de la Maguana		
Association of small and medium producers San Juan de la Maguana	Association of Small and Medium pacerlos producers was founded in 1992 and aims to achieve a further increase in agricultural production	President Antonio Luciano (Tony)
Foundation REDDOM AV Rómulo Betancourt #1516 Plaza Thalys, 3rd. floor Bella Vista, Santo Domingo, Dominican Republic	Is aimed at promoting sustainable rural development through the identification of competitive solutions and the management of resources and innovative processes. Initiative called climate resilience and insurance-based indexes for small producers in the Dominican Republic, funded by USAID, to help vulnerable communities of agricultural value, to access and use an insurance product as a tool of risk transfer, at the time that apply preventive measures to protect their assets and investments.	Isabel Abreu. Board of Directors Pilar Ramirez, Executive Director. <a href="mailto:pilar@fundacionreddom.org">pilar@fundacionreddom.org</a> Luis Tolentino resources management specialist natural <a href="mailto:luis@fundacionreddom.org">luis@fundacionreddom.org</a> Tel. 809-338-0887 <a href="http://www.fundacionreddom.org">http://www.fundacionreddom.org</a>
CONAMUCA Confederation Nacional de la Mujer	CONAMUCA is an organization of national coverage, founded the 1st. In November 1986, which promotes women's rights and interests and vindicates the struggle for a life worthy. Is the Vision of Build a model of agricultural production that peasant agriculture, based on the equality of right to the land to recover and ensure food sovereignty, organized, trained and empowered women and effective impact on public policies, strategic alliances, expanded and strengthened institutional quality management. These organizations are which must implement measures for adaptation to climate change.	Coordinator of the CONAMUCA: Juana Ferrer  809-480-6730 <a href="http://www.conamuca.org">http://www.conamuca.org</a>
Pro nature Fund AV. J.F. Kennedy, km. 6 1/2, Bldg. No. 3, UNPHU Santo Domingo, D.N.	Orvoiceless private non-profit, incorporated by the Decree of the power Executive No.77-90 on February 28, 1990. It is an agglutinating instance of other organizations with an interest in promoting sustainable development through renewable natural resources and the human enhancement in priority areas. Runs a climate change program called programme less CO2 and various programmes of education, training, conservation and reforestation of watersheds, among others.	phone: 809-687-5609 Fax: 809-687-5609 <a href="http://www.pronatura.org.do/">http://www.pronatura.org.do/</a>
UASD Universidad Autónoma de Santo Domingo UASD - Primate of America - all rightschos Alma Mater, Santo Domingo, Dominican Republic	The Autonomous University of Santo Domingo is a social public patrimony of high strategic interest that is part of the national system of State higher education, comprising headquarters, campuses, centres and Sub centres University, scattered in the geography of the country and abroad, with normative centralization and decentralization operational and interdependent, which is managed under the regime of autonomy with responsibility. It has the career of Agronomy and agricultural research laboratories.	Phone: (809) 535-8273 Fax (809) 508-7374
Instituto Tecnológico de Santo Domingo INTEC (basic and environmental sciences) Address: Avenida Los Próceres, the gardens of the North 10602, Santo Domingo, RD, Apartado postal 342-9, 249-2	It has a role on the research on environmental issues in the Dr in addition to his role as an academic institution participating in education on climate change. The CEGA-INTEC is a Centre for environmental management and the laboratory of remote sensing (geomatics) have relevant territorial information	Phone: 809-567-9271 Fax: 809-566-3200 <a href="http://www.intec.edu.do/">http://www.intec.edu.do/</a>

ISA Address: Avenida President Guzmán km. 5.5 - La Herradura Santiago, Dominican Republic	The ISA University is an institution of education superior, private, non-profit, covered in the Act 139-01 of August 13, 2001.  ISA was born in 1962 as a vocational Institute, on the initiative of the Association for the development, Inc. (APEDI), responding to the needs of an essentially agricultural economy and a society of rural origin...	Phone: (809) 247-2000 Fax: (809) 247-2626
ECORED-national network of business support for environmental protection- AV. Sarasota # 20, Torre Empresarial AIRD, floor 2, suite 207, Santo Domingo, D.N., RD.	Promote the integration of the enterprise sector in the development of a culture of conservation and sustainable management of natural resources and the environment of the Dr. They have a program of clean production and MDL.	Phone: 809-547-3529
<b>International cooperation agencies</b>		
FAO Ave. Anacaona No.9 Mirador Sur Santo Domingo, Dominican Republic	Food and nutrition 1- Safety and poverty reduction Family Farming 2- 3- Integrated Watershed Management, efficient use of natural resources and risk management and climate change	Representative: Gero Vaagt <a href="http://www.fao.org/republica-dominicana/es/">http://www.fao.org/republica-dominicana/es/</a>
The United States for international development - USAID Agency USAID/Santo Domingo 3470 unit, Box 528	USAID supports in the Dominican Republic the democracy and governance improving electoral processes and strengthening the participation of a responsible civil society in the political system. The program supports a more informed and more active citizens who can sue over elected officials. At the same time, it urges officials to comply with their obligations and to the Dominican people to evaluate the performance of elected officials.	34041-0175 Phone 809-221-1100 Fax 809-221-0444 <a href="http://www.usaid.gov/dr/index_es.htm">http://www.usaid.gov/dr/index_es.htm</a>
German International cooperation - GIZ -	The German society of international cooperation (GIZ, for its acronym in German), gathers competences of other traditional institutions in that country, such as the German service cooperation development (DED), the German cooperation agency (GTZ) and the InWet, dedicated to the training and development of international.  Operates in numerous areas of activity, ranging from the promotion of the economy and employment to the protection of the environment, natural resources and climate, governance and democracy, the construction of peace, security, reconstruction and civil conflict management, food security, health and basic education. The GIZ climate change portfolio grows steadily, contributing to greenhouse gas emissions mitigation or adaptation to climate change.	<a href="http://www.giz.de/de/html/index.html">http://www.giz.de/de/html/index.html</a>
Spanish Agency of international cooperation for development - AECID	Fight against poverty and exclusion, defending peace, the environment and sustainable development, acts in conflicts and natural disasters and promotes rights such as education, health, culture and food. The project Araucaria XXI Enriquillo and tourism and the prevention of risks and water and sanitation projects can provide data relevant to the project.	C/ Dr. Delgado no. 166, Gazcue. República Dominicana  <a href="http://www.aecid.org.do">http://www.aecid.org.do</a> (809)689-5090
UNDP-United Nations programme- UNDP ODH	This Office is committed to the welfare of the people, which works to give response to the major challenges presented by national development, promoting economic growth with equity and	<a href="http://odh.pnud.org.do/">http://odh.pnud.org.do/</a>

<p>The UNDP Human Development Office Ave. Anacaona Sur Mirador No.9 Santo Domingo, Dominican Republic Tel.: (809) 537-0909 ext. 255 Fax: (809) 531-3507</p>	<p>institutionality. It has high importance in the project since the data of the index of human development as an indicator of adaptive capacity will be used.</p>	
<p>The United Nations Development Programme (small grants program) PPS Calle Juan Sánchez Ramírez No. 32, enclosure of Post degree UASD, Bldg. classrooms, 2nd nivelGazcue, Santo Domingo, Dominican Republic</p>	<p>The PPS, as instance of the GEF, develops actions to contribute to the implementation of various international conventions related to the environment, such as the Convention on biological diversity, the Convention on climate change and the Convention to combat desertification and drought, among others. It focuses its work on five thematic areas main, always in accordance with the national priorities of environmental protection. The data of climate change projects will be used.</p>	<p><a href="http://www.ppsdom.org/">http://www.ppsdom.org/</a></p> <p>Phone: (809) 682-2305</p> <p>Fax: (809) 531-3507</p>
<p>Program ART GOLD RD Office of the national authorising officer for the European funds for development-ONFED- UNDP collaboration <a href="http://www.pnud.org.do/content/apoyo-redes-tematicas-y-territoriales-para-el-desarrollo-humano-en-republica-dominicana-art-">http://www.pnud.org.do/content/apoyo-redes-tematicas-y-territoriales-para-el-desarrollo-humano-en-republica-dominicana-art-</a></p>	<p>La ART initiative supports and provides technical assistance in economic development agencies for Local economic development (ADEL) active in many countries and the different ART programs, in order to strengthen and internationalize the processes of regional economic development, in line with the national policies implemented by countries. RD starts in 2008.Coordina with the DGODT in territorial development programmes and topics on planning and risk management.</p>	<p>Office UNDP RD Mauricio Ramirez Deputy Resident Representative of UNDP RD mramirez@pnud.org.do Anyarlene Berges Officer of Gobernability UNDP DR aberges@onu.org.do</p>
<p>Worl Bank Dominican Republic</p> <p>809) 872 7300 Ave. Lope de Vega No. 29, Torre Novo-Centro, Piso 10, Ensanche Naco, Santo Domingo</p>	<p>The World Bank is a vital source of financial and technical assistance to the countries in development around the world. Its mission is to fight poverty for lasting results, and help people to help themselves and the environment that surrounds it, providing resources, providing knowledge, building capacity and forging partnerships in the public and private sectors. Data and indicators will be used.</p>	<p><a href="mailto:adelapaz@worldbank.org">adelapaz@worldbank.org</a></p> <p>Andrea De La Paz</p> <p><a href="http://www.bancomundial.org/es/country/dominicanrepublic">http://www.bancomundial.org/es/country/dominicanrepublic</a></p>
<p>Inter-American Development Bank IDB Tel.: (809) 562-6400 fax: (809) 562-2607 Calle Luis F. Thomen Esquina Winston Churchill Torre BHD, piso 10</p>	<p>The IDB seeks to eliminate poverty and inequality, as well as to promote sustainable economic growth. Support in the design of projects, and provides financial and technical assistance and services of knowledge in support of the development interventions. The IDB focuses on empirical evidence to make decisions and measure the impact of these projects, with the purpose of increasing the <a href="#">development effectiveness</a>.</p>	<p>Representant : Flora Montealegre <a href="mailto:BIDDominicana@iadb.org">BIDDominicana@iadb.org</a> <a href="http://www.iadb.org/dominicana/index.htm">http://www.iadb.org/dominicana/index.htm</a></p>



### Annex 3. Inception Workshop (list of participants, program invitation and photos)

#### INCEPTION WORKSHOP (JUN 24 2014)

##### Time and place of execution.

Location: Halls CEDAF street Amado Soler # 50, Ensanche Paraíso, Santo Domingo, Dominican Republic.

Time: From 10:00 a.m. to 12:00 p.m..

Date: Tuesday, June 24, 2014

##### Objectives.

General Objective: The objective of the Project Launch was to motivate, inform, publicize the project and begin to involve institutions and individuals. Present the draft Assessment Vulnerability and Capacity and National Strategy for Adaptation to Climate Change in Agriculture- Dominican Republic

**Specific objective:** To strengthen institutional relations by key actors involved in the project and provide the technical and political support.

##### Program and invitation



The banner features logos at the top: a stylized green leaf, the Dominican Republic coat of arms, and the Fundación Plenitud logo. Below these are the names of the organizing institutions: Ministerio de Agricultura, Presidencia de la República Dominicana (Consejo Nacional para el Cambio Climático y el Mecanismo de Desarrollo Limpio), and Fundación Plenitud. The main text, in bold, states: 'El Caribbean Community Climate Change Center, el Consejo Nacional para el Cambio Climático y MDL, el Ministerio de Agricultura y la Fundación Plenitud le invitan al:'. This is followed by a white box containing the project title: 'Lanzamiento del Proyecto: EVALUACIÓN DE LA VULNERABILIDAD Y LA CAPACIDAD Y ESTRATEGIA NACIONAL DE ADAPTACIÓN AL CAMBIO CLIMÁTICO EN LA AGRICULTURA- REPÚBLICA DOMINICANA'. Below the box, the date and time are given as 'FECHA: martes 24 de Junio HORA: 9:00 AM-11:00 AM' and the location as 'LUGAR: Salón CEDAF José Amado Soler #50, Ensanche Paraíso Santo Domingo, República Dominicana.'. At the bottom right, it says 'Funded by the European Union and the Council of Europe' next to the European Union flag logo.

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*Presidencia de la República Dominicana*  
Consejo Nacional para el Cambio Climático  
y el Mecanismo de Desarrollo Limpio

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**El Caribbean Community Climate Change Center, el Consejo Nacional para el Cambio Climático y MDL, el Ministerio de Agricultura y la Fundación Plenitud le invitan al:**

**Lanzamiento del Proyecto:**  
EVALUACIÓN DE LA VULNERABILIDAD Y LA CAPACIDAD Y ESTRATEGIA NACIONAL DE  
ADAPTACIÓN AL CAMBIO CLIMÁTICO EN LA AGRICULTURA- REPÚBLICA  
DOMINICANA

**FECHA: martes 24 de Junio HORA: 9:00 AM-11:00 AM**  
**LUGAR: Salón CEDAF José Amado Soler #50, Ensanche Paraíso  
Santo Domingo, República Dominicana.**

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and the Council of Europe

  
EUROPEAN UNION



**PROYECTO DE EVALUACIÓN DE LA VULNERABILIDAD Y LA CAPACIDAD Y ESTRATEGIA NACIONAL DE ADAPTACIÓN AL CAMBIO CLIMÁTICO EN LA AGRICULTURA  
REPÚBLICA DOMINICANA  
REUNIÓN DE LANZAMIENTO DEL PROYECTO**

**Objetivo general:** El Objetivo del Lanzamiento del Proyecto es motivar, informar, dar a conocer el proyecto *Evaluación de la Vulnerabilidad y la Capacidad y Estrategia Nacional de Adaptación al Cambio Climático en la Agricultura; República Dominicana* y comenzar a involucrar a instituciones y personas interesadas en el desarrollo del mismo. \*

**Objetivo específico:** Consolidar las relaciones institucionales por parte de actores claves relacionados con el proyecto y brindarle el apoyo técnico y político necesario.

**Lugar :** Salón Centro para el Desarrollo Agropecuario y Forestal -CEDAF, calle José Amado Soler # 50, Ensanche Paraíso, Santo Domingo.

**Fecha:** Martes 24 de Junio de 2014 a las 9:00 AM

<b>Actividad / Hora</b>	
<b>9:00 AM - 9:15 AM</b>	Recepción de participantes (inscripción, entrega material)
<b>9:15 AM - 9:20 AM</b>	Bienvenida a cargo de Omar Ramírez Tejada, Vicepresidente del Consejo para el Cambio Climático y Mecanismo de Desarrollo Limpio
<b>9:20 AM - 9:40 AM</b>	Palabras de presentación del proyecto a cargo de Laura Rathe, representante de Fundación PLENITUD y Coordinadora Nacional del proyecto
<b>9:40AM - 10:00AM</b>	Palabras a cargo de Juan José Espinal, experto en Agricultura y parte del equipo técnico de CEDAF/PLENITUD
<b>10:00AM - 10:10AM</b>	Palabras a cargo Claudio Jiménez, Vice Ministro de Planificación Sectorial Agropecuaria, del Ministerio de Agricultura
<b>10:10AM -10:30 AM</b>	Preguntas, comentarios y refrigerio

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and the Council of Europe



## List of participants Inseption Workshop



### LISTADO DE ASISTENCIA

LANZAMIENTO DEL PROYECTO DE EVALUACIÓN DE LA VULNERABILIDAD Y LA CAPACIDAD Y ESTRATEGIA  
NACIONAL DE ADAPTACIÓN AL CAMBIO CLIMÁTICO EN LA AGRICULTURA REPÚBLICA DOMINICANA

Centro para el Desarrollo Agropecuario y Forestal –CEDAF

C/ José Amado Soler # 50, Ensanche Paraiso, Santo Domingo.

	Nombre	Cargo	Institución	Tel. / Móvil	(F) ó (M)
1	José Antonio Nova	ENC. DIPMARENA	CONIAF	(809) 686-0750 (809) 886-1329	
2	Maldani Guebo	Analista Proy.	CONIAF	(809) 686-0750 (809) 886-1600	
3	FEODORA GRULLON	ENC. DEPTO TÉCNICO	CNCCMOL	809-472-0537	M
4	ANTONIO PERPINIAN	COMISION G. Ambiente	IAD	809 722 4031	M
5	Sarah Soriano	Oficial de Programas	Delegación Unión Europea	809 2270525	F
6	Yomaira Martínez	COORDENADORA	FALD	(809) 467-7718	F
7	Solange de la Cruz	CNCCMOL	Comunicadora	809 844-4544	F
8	Juan F. García	AECID Base Proyectos		809 689 5090	M
9	Lois Tolentino	ENC. MEDIO Amb.	Fondo REDDOM	829-669-4181	M
10	Domitio Noriega	Enc. Producción	'	809 338-0887	M
11	FAUSTO MONTEGRO	SUBDIRECTOR	I.A.D	829-715-2264	M
12	Pablo Ovalles	Consultor PLENITUD	PLENITUD	809-502-5660	M
13	Ricardo Barceló	PTE	ADHA	809-5017903	M

	Nombre	Cargo	Institución	Tel. / Móvil	(F) ó (M)
14	JUAN MANUEL	DIRECTOR DEPTO GRUPO	MA	809 9125204	M
15	Pedro García	Medio ambiente	Ministerio Ambiente	809 41622443	M
16	José Luis Espinal	Sub-Enc. Coop. Internacional	F.A.D	829-770-5361	
17	Ignacio Rojas Saura	Resp. Proyecto	AECID	8096694245	M
18	José Espinal	Coordinador Iniciativa	Fundación EDDOM.	829-669-4172	F
19	OMAR RAMÍREZ	Vicepresidente Ejecutivo	ENCCYMDL	809-8500535 829-471-6210	M
20	Carmen Álvarez	Responsable Campaña CRECE	Oxfam	809-330-3655	F
21	Andrés Lora	Asistente Viemingo	M.A	829-281-4732	M
22	Maria E. Gómez	Directora Operativa	ADHA	809-712-2595	F
23	Laura Segura	Enc. Capacit.	CEDAF	829 979 2964	F
24	José Peña	Director, seguimiento control y evaluación (del)	Ministerio Agricultura	849-343-0853	M
25	GEO VAGT	Rep	FAO	809. 577 0707	M
26	José Luis S.	Subdirector	M.A	809 547 3888	M
27	Dora E. Rodríguez	Directora Técnico	Fondo MARINA	(809) 448-6069	M
28	Montserrat Acosta	Especialista adaptación	TNC	809 541 7666	F
29	Camelio Lugo	Subdirector PMF	M.A	829-860-9991	M
30	Donna Laine	Secretaria	J.A.D	809 563 6178	
31	Karina Sator	Exenio THOM	ONAMET	(809) 788-1122	F
32	Juana Sille	En. Dpto.	11	809-788-1122	F

En

	Nombre	Cargo	Institución	Tel. / Móvil	(F) ó (M)
33	Patricia Basarigo	Enc. Div. Recursos	ONAMET	809-788-1122	F
34	Alfredo	Investigador	PLAN RUC	829-990-8888	M
35	Elena Del Conte		PLAN RUC	809 299 0871	F
36					
37					
38					
39					
40					



! Joseline(Martínez,(facilitadora(de(la(reunión.Laura(Rathe,(coordinadora(del(proyecto(y(coordinadora(de(la(Investigación(PLENITUD( rPedro(García,(Director(de(Cambio(Climático(del(Ministerio(de(Ambiente.(Omar(Ramírez(Tejada,(Vicepresidente(Ejecutivo(del(Consejo( de(Cambio(Climático(y(MDL.(Gero(Vaagt,(Representante(de(al(FAO.(Sarah(Soriano,(Oficial(de(Programa(de(la(UE.(Juan(José(Espinal( Director(Ejecutivo(de(CEDAF(y(miembro(del(equipo(técnico(de(PLENITUD."

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**EVALUACIÓN DE LA VULNERABILIDAD Y LA CAPACIDAD (VCA) AL CAMBIO CLIMÁTICO EN  
EL SECTOR AGROPECUARIO. PROVINCIA SAN JUAN Y ELÍAS PIÑA (HONDO VALLE).  
REPÚBLICA DOMINICANA.**

**Taller Personal y Productores**

**Equipo No. \_\_\_\_\_ Participantes del Equipo:**

Nombre	Apellido	Cargo

<b>1 INFORMACIÓN RELATIVA A LOS CULTIVOS (Tiempo disponible: 15 min)</b>
--

- 1.1 Consideran que han habido cambios en la fecha de siembra y cosecha de algunos rubros agrícolas? En cuales rubros? Explique las causas en cada uno de ellos?  
Llene la información en el **Cuadro 1** anexo.
- 1.2 En los últimos 20 años ¿han aparecido plagas o enfermedades importantes que no existían antes? Identifique el rubro afectado y el tipo de plaga o enfermedades.
- 1.3 Identificar las plagas o enfermedades existentes hace más de 20 años que hayan intensificado su impacto negativo en la producción agropecuaria. Explique



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CUADRO 1: RUBROS QUE HAN MANIFESTADO CAMBIOS EN LA FECHA DE SIEMBRA Y COSECHA

Rubro Agrícola	Época tradicional		Época Actual		Causas
	Siembra	Cosecha	Siembra	Cosecha	



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el Mecanismo de Desarrollo Limpio



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**EVALUACIÓN DE LA VULNERABILIDAD Y LA CAPACIDAD (VCA) AL CAMBIO CLIMÁTICO EN  
EL SECTOR AGROPECUARIO. PROVINCIA SAN JUAN Y ELÍAS PIÑA (HONDO VALLE).  
REPÚBLICA DOMINICANA.**

**Taller Personal y Productores**

Equipo No. \_\_\_\_\_

<b>2 INFORMACIÓN RELATIVA A USOS DEL SUELOS</b> (Tiempo disponible: 15 min)
---

- 2.1 Se han registrado cambios en el uso de suelo del municipio en los últimos 20 años que benefician o perjudiquen la producción agropecuaria? Piense en diferencias ocurridas en las cuencas altas y bajas.
- 2.2 Dentro del uso agropecuario: Han habido cambios en el municipio relacionados al tipo de cultivos o actividades pecuarias desarrolladas?
- 2.3 Se ha ampliado o disminuido la frontera agrícola en el municipio en los últimos 20 años? Identifique las causas de la ampliación o disminución de la frontera agrícola del municipio.

Ejemplo: Nuevas presas, Nuevos canales de riego, Nuevos pozos, Pérdida de caudal de las fuentes de agua (especifique cual), Cambios en fenómenos atmosféricos (pluviometría, áreas inundadas, etc); cambios en el nivel freático; otras causas.



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el Mecanismo de Desarrollo Limpio



FUNDACIÓN  
PLENITUS

**EVALUACIÓN DE LA VULNERABILIDAD Y LA CAPACIDAD (VCA) AL CAMBIO CLIMÁTICO EN  
EL SECTOR AGROPECUARIO. PROVINCIA SAN JUAN Y ELÍAS PIÑA (HONDO VALLE).  
REPÚBLICA DOMINICANA.**

**Taller Personal y Productores**

Equipo No. \_\_\_\_\_

**3 EVENTOS HIDROCLIMATOLÓGICOS y SUS IMPACTOS (Tiempo disponible: 30 min)**

- 3.1 ¿Qué tipo de eventos hidroclimáticos han afectado al municipio (Sequía, Lluvia excesiva, Inundaciones, Viento, Cambio temperatura, Otro) en los últimos 20 años? Explique los impactos ocurridos.
- 3.2 Indique la frecuencia (anual, cada 5, 10, 15, 20 años) del fenómeno o los fenómenos que ocasionan daños importantes a la producción agropecuaria y a la población.
- 3.3 ¿Cuál ha sido el evento hidroclimático (sequía, lluvia excesiva, inundaciones, viento, cambio temperatura, otro) que ha provocado mayores daños a las actividades agropecuarias y a la población del municipio en los últimos 20 años? Indique el año en que ocurrió, áreas geográficas afectadas (barrios, secciones, poblaciones), rubros agropecuarios más afectados y otros aspectos de interés.
- 3.4 ¿Cuál ha sido el fenómeno más reciente que ha afectado la producción agropecuaria (aunque no sea catastrófico)? Indicar fecha (año) del evento.
- 3.5 Complete el Cuadro relativo a nivel de exposición a riegos (alto, medio y bajo) para cada uno de los principales rubros de producción del municipio por tipo de evento.  
Llene la información en el Cuadro 2 anexo.



MINISTERIO DE AGRICULTURA



Presidencia de la República Dominicana  
Consejo Nacional para el Cambio Climático y  
el Mecanismo de Desarrollo Limpio



FUNDACION  
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CUADRO 2: VALORACIÓN DE LAS AMENAZAS AGROCLIMÁTICAS POR RUBRO DE PRODUCCIÓN

Rubro Agrícola	Amenazas						
	Sequía	Inundaciones	Exceso de lluvias	Vientos fuertes (Tornado y ciclones)	Cambios de temperatura	Plagas y enfermedades	Otros
Arroz							
Habichuelas en riego							
Habichuelas en secano							
Guandul en riego							
Guandul en secano							
Café							
Maíz							
Batata							
Yuca							
Auyama							
Cebolla							
Maní							
Lechosa							
Plátano							
Tomate Ing.							
Otro							
Ganado de Leche							
Ganado de Carne							
Ovicaprinos							
Invernaderos							

NOTA: Para cada rubro más importante en el municipio, establezca la valoración de cada tipo de amenaza (Alta, Media, Baja)



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FUNDACIÓN  
PUNTURAS

**EVALUACIÓN DE LA VULNERABILIDAD Y LA CAPACIDAD (VCA) AL CAMBIO CLIMÁTICO EN  
EL SECTOR AGROPECUARIO. PROVINCIA SAN JUAN Y ELÍAS PIÑA (HONDO VALLE).  
REPÚBLICA DOMINICANA.**

**Taller Personal y Productores**

Equipo No. \_\_\_\_\_

<b>4 ESTRATEGIAS Y RESPUESTAS INSTITUCIONAL (Tiempo disponible: 30 min)</b>
---

- 4.1 ¿Cuáles son las instituciones locales, públicas y privadas (ONGs), más vinculadas al tema del cambio climático y gestión de riesgo?
- 4.2 Las instituciones locales ¿disponen de información sobre los riesgos hidroclimáticos actuales y futuros? Explique tipo de información disponible y como se difunde esta información?
- 4.3 ¿Existen planes o políticas locales de apoyo a los medios de vida resilientes al clima? (Préstamos o financiamientos agropecuarios, equipos, semillas, capacitación, etc)
- 4.4 Señale brevemente las principales actividades relacionadas con el cambio climático y gestión del riesgo que realiza cada una de las instituciones citadas anteriormente.
- 4.5 ¿Cómo ha respondido la gobernación, ayuntamientos e instituciones locales (del municipio y provincia) a los desastres ocurridos por eventos hidroclimatológicos que han tenido lugar en las últimas décadas? Describa brevemente las principales acciones emprendidas por las instituciones frente a cada fenómeno relevante y califique la intervención de cada institución (Muy buena / Buena / Regular / Mala)
- 4.6 ¿Entiende que la capacidad actual de respuesta de las instituciones locales ha mejorado en relación al momento en que enfrentaron los últimos desastres ocurridos? Explique en que aspecto ha mejorado y califique el nivel de mejoría para cada una de las instituciones (Mucho\_\_ Suficiente\_\_ Poco\_\_ Nada o empeorado\_\_)
- 4.7 ¿Cuáles son las principales necesidades o recursos locales para mejorar la capacidad de adaptación al cambio climático y gestión de riesgo?
- 4.8 Identifique los sistemas de alerta temprana ante eventos hidroclimatológicos a nivel nacional y local que son utilizados en la región? Explique el método de difusión de la información?



MINISTERIO DE AGRICULTURA



**EVALUACIÓN DE LA VULNERABILIDAD Y LA CAPACIDAD (VCA) AL CAMBIO CLIMÁTICO EN  
EL SECTOR AGROPECUARIO. PROVINCIA SAN JUAN Y ELÍAS PIÑA (HONDO VALLE).  
REPÚBLICA DOMINICANA.**

**Taller Personal y Productores**

Equipo No. \_\_\_\_\_

<b>5 ESTRATEGIA Y RESPUESTA DE LOS PRODUCTORES y COMUNIDADES</b> (Tiempo disponible: 30 min)
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- 5.1 ¿Qué grupos de productores agropecuarios son los más vulnerables al cambio climático y la variabilidad? Explique su respuesta
- 5.2 ¿Qué comunidades dentro del municipio son los más vulnerables al cambio climático y la variabilidad? Explique su respuesta
- 5.3 Existe en su municipio la planificación local participativa? Si \_\_\_\_\_ NO \_\_\_\_\_
- 5.4 Existe Consejo de Desarrollo Provincial? Si \_\_\_\_\_ NO \_\_\_\_\_
- 5.5 Existe Consejo de Desarrollo Municipal? Si \_\_\_\_\_ NO \_\_\_\_\_
- 5.6 En caso de existir, ¿cuáles son los mecanismos de ayuda para las personas vulnerables al cambio climáticos y variabilidad en su municipio?
- 5.7 ¿Qué tipo de mejora deberían aplicarse a estos mecanismos de ayuda? ¿Consideran necesarios crear nuevos mecanismos de ayuda para disminuir la vulnerabilidad y/o la capacidad adaptativa al cambio climático y la variabilidad?
- 5.8 Las mujeres y otros grupos marginados ¿tienen voz en los procesos de planificación local? Explique.

**Annex 5. Community consultation workshops at San Juan and Sub-Zone Hondo Valle ( guest lists, program and photographs of events)**

**Community Consultation Workshop at San Juan**

<b>DAY 1: TECHNICAL WORKSHOP</b>	<b>Date:</b> 16/07/2014	<b>Time:</b> 10:00 am-03:00 pm
<b>Meeting: EXTERNAL</b>		
<b>Place:</b> Salon Jacobo Moquete. Centro Universitario Regional Oeste. UASD. San Juan de la Maguana. San Juan		
<b>Subject: Technical workshop with staff of key institutions farming and agricultural sector. San Juan Area.</b>		

**Objectives of the event**

**General Objective:** The objective of this workshop is to motivate, inform, raise awareness of the project *Vulnerability and Capacity and National Strategy for Adaptation to Climate Change in Agriculture-Dominican Republic* and to engage and get information from the local institutions directly involved with the agricultural sector in relation to the relevant project implementation issues.

**Specific objective:** Apply data collection instruments to the technical staff of the participating institutions related to agriculture in the Province of San Juan

<b>Meeting:</b> <b>DAY 2: Community workshop</b> <b>EXTERNAL</b>	<b>Date:</b> 17/07/2014	Pages 1 of 3
<b>Place:</b> Salon Jacobo Moquete. Centro Universitario Regional Oeste. UASD. San Juan de la Maguana. San Juan		<b>Time:</b> 9:00 am-04:00 pm
<b>Subject: Community workshop with producers and farmers of the agricultural sector. San Juan Area.</b>		

**Objectives of the event**

**General Objective:** The objective of this workshop is to motivate, inform, raise awareness of the project *Vulnerability and Capacity and National Strategy for Adaptation to Climate Change in Agriculture-Dominican Republic* and to engage and get information from the community (farmers and producers) directly involved with the agricultural sector in relation to the relevant project implementation issues.

**Specific objective:** Apply data collection instruments to some key actors, farmers in the province of San Juan.

## Community Consultation Workshop Objectives at Hondo Valle, Elías Piña Province

<b>Meeting:</b> <b>EXTERNAL</b>	<b>Date:</b> 23/07/2014	<b>Time:</b> 10:00 am-03:00 pm
<b>Place:</b> Centro Tecnológico Hondo Valle.		
<b>Subject: Community workshop with technicians,producers and farmers of the agricultural sector,SubZone Hondo Valle, Province Elías Piña</b>		

### Objectives of the event

**General Objective:** The objective of this workshop is to motivate, inform, raise awareness of the project *Vulnerability and Capacity and National Strategy for Adaptation to Climate Change in Agriculture-Dominican Republic* and to engage and get information from the community (farmers and producers) directly involved with the agricultural sector in relation to the relevant project implementation issues.

**Specific objective:** Apply data collection instruments to key actors, technical staff of the Agriculture Ministry, producers and farmers in the SubZone Hondo Valle, Province Elías Piña.

**Participated in consultations in the communities of San Juan 68 people and Hondo Valle 24, a total of 92 people from 12 institutions and producers.**





**Workshop with producers and farmers in the agricultural sector URPE South West (San Juan)**





## Annex 6. The national workshop

<b>Meeting</b> <b>EXTERNAL</b>	<b>Date</b> 30/10/2014	<b>Time:</b> 9:00 am-04:00 pm
<b>Place:</b> Salón Aries, Hotel Barceló, Lina, Santo Domingo		
<b>The national workshop</b>		

### General Purpose :.

The objective of the national workshop is to publicize and make contributions to the results obtained by the Assessment of Vulnerability and Capacity tackle climate change in the Province of San Juan and Subzone Hondo Valle and present the National Strategy adaptation to Climate Change in Agriculture-Dominican Republic and contribute and discuss the strategic points contained therein.



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# Lista de participantes a la Consulta Nacional



Talleres De Consulta \* VCA – Agricultura  
Hotel Barceló Santo Domingo  
30 de octubre, 2014 \* 9 am a 4 pm

## LISTADO DE ASISTENCIA

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19	RODRIGO			
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#	Nombre Completo	Ocupación	Teléfono/Celular	E-Mail / Correo Electrónico
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31		Felicitación		DanielSotelo@gmail.com
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### Stakeholder participation of the project:

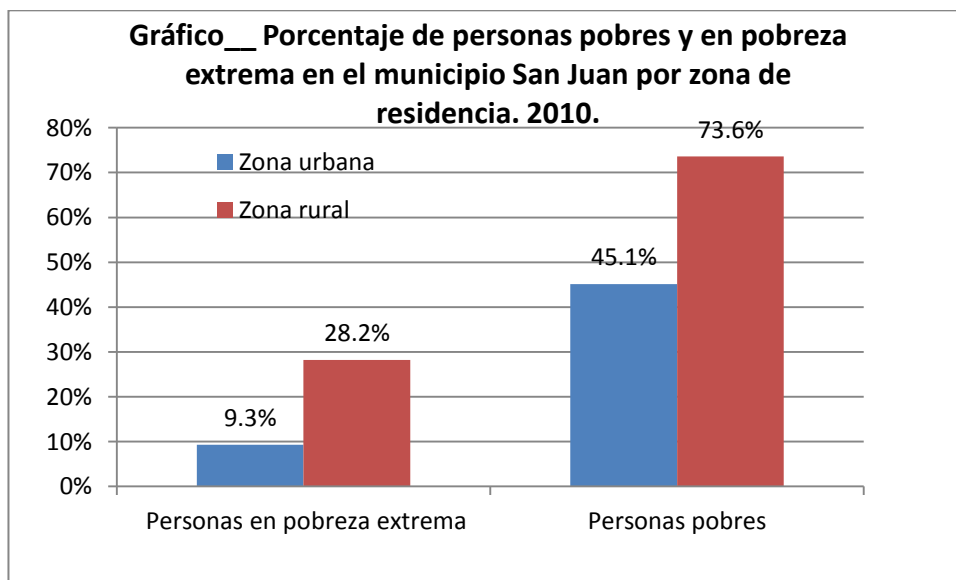
In the consultation process participated 29 institutions and independent consultants and 170 persons.

## Ranking de la provincia San Juan en pobreza y necesidades básicas insatisfechas

Indicadores	Posición provincia	Valor del indicador	
		Provincia	País
Población y pobreza			
Número de hogares	21	63,519	2,671,979
Población	22	232,121	9,421,747
Número de hogares pobres	27	40,029	1,080,089
Número de hogares en pobreza extrema	31	15,534	278,649
Número de personas pobres	28	144,445	3,837,800
Número de personas en pobreza extrema	31	52,687	908,936
% Hogares pobres	24	63.0	40.4
% Hogares en pobreza extrema	26	24.5	10.4
ICV	25	59.7	73.2
Necesidades básicas insatisfechas			
% Hogares pobres por NBI (Con 3 o más NBI de 15)	25	55.7	36.9
% de Hogares en viviendas con piso de tierra	30	20.1	3.7
% de Hogares en viviendas con techo de materiales inadecuados	28	4.6	1
% de Hogares en viviendas con paredes de materiales inadecuados	23	5.3	2.6
% de Hogares con 2 ó menos equipos básicos (nevera, estufa, lavadora, TV)	8	44.4	26.8
% de Hogares sin instalación de agua potable	11	26.4	32.8
% de Hogares sin energía eléctrica	21	10.5	4.2
% de Hogares que cocinan con carbón o leña	27	34.6	11.5
% de Hogares sin servicio sanitario	21	37.2	17.7
% de Hogares sin servicio de recogida basura	4	6.3	9.6
% Hogares que viven en barracón, casa en hilera, cuartería, parte atrás	14	4.9	7.8
% Hogares con más de 3.5 personas por cuarto	17	11.0	11.6
% Hogares con personas semi analfabetas	27	41.9	25.3
% Hogares con personas de 6-16 años que no asisten a la escuela	25	4.0	3.1
% Hogares sin medio de transporte privado	18	61.1	59.2
% Hogares sin acceso a medios de comunicación	25	30.9	17.8
Fuente: MEPYD. Mapa de la pobreza 2010 en la República Dominicana			

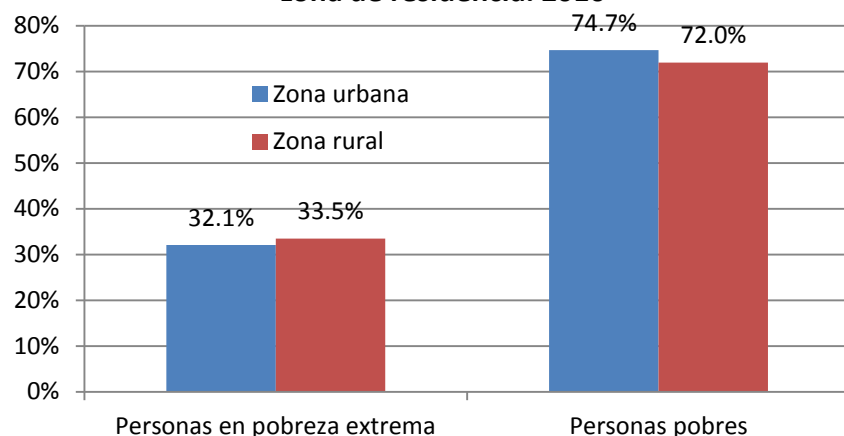
Necesidades básicas	Total Provincia San Juan	Municipios de la provincia San Juan						Sub-zona HV-JS	
		San Juan	Bohechío	El Cercado	Juan de Herrera	Las Matas de Farfán	Vallejuelo	Hondo Valle	Juan Santiago
<b>Total de Hogares</b>	<b>63,519</b>	<b>36,214</b>	<b>2,855</b>	<b>5,584</b>	<b>3,791</b>	<b>12,000</b>	<b>3,075</b>	<b>2,724</b>	<b>1,016</b>
% Necesidad de piso	<b>20.1</b>	16.8	22.5	32.8	20.6	20.7	29.5	32.6	45.3
% Necesidad de techo	<b>4.6</b>	5.7	2.3	3.7	2.0	3.0	4.3	4.1	3.7
% Necesidad de pared	<b>5.3</b>	5.7	2.9	1.3	5.7	4.7	12.2	2.5	0.6
% Necesidad de gas	<b>34.6</b>	30.8	33.3	49.5	30.3	39.1	40.9	48.1	66.4
% Necesidad de agua potable	<b>26.4</b>	23.6	29.9	35.9	27.1	29.2	27.7	42.7	41.0
% Necesidad de sanitario	<b>37.2</b>	33.1	57.9	40.3	41.6	37.8	53.8	60.5	47.9
% Necesidad de Energía Eléctrica	<b>10.5</b>	8.1	18.7	14.1	7.5	14.6	11.6	19.5	29.9
% Necesidad de recogida basura	<b>6.3</b>	4.9	13.5	15.3	4.1	4.4	9.5	22.3	16.3
% Necesidad de equipos	<b>44.4</b>	39.2	58.1	57.0	43.5	48.4	54.9	67.1	74.5
% Necesidad de capital humano	<b>41.9</b>	39.5	46.7	52.2	49.9	37.0	56.4	59.7	65.7
% Necesidad de escolaridad	<b>4.0</b>	3.9	4.1	3.3	3.5	4.1	5.5	8.8	7.7
% Necesidad de vivienda	<b>4.9</b>	6.9	1.5	0.4	2.5	2.9	3.0	2.7	0.5
% Necesidad ampliación de vivienda	<b>11.0</b>	11.7	12.5	10.1	10.1	8.4	14.8	19.3	18.4
% Necesidad de transporte	<b>61.1</b>	56.1	74.3	74.0	58.0	65.6	70.3	83.3	85.4
% Necesidad de TICs	<b>30.9</b>	27.6	46.1	39.5	31.5	32.0	36.5	43.2	47.5
% Pobres por NBI	<b>55.7</b>	50.4	69.6	69.6	56.7	57.5	70.6	78.0	87.3
Fuente: MEPLYD. Mapa de la Pobreza 2010 en la República Dominicana.									

Población del municipio San Juan y sus distritos municipales por sexo. Año 2010			
Municipio y Distritos	Hombres	Mujeres	Total
San Juan	39,631	38,682	78,313
Pedro Corto (D.M.)	3,787	6,891	6,891
Sabaneta (D.M.)	3,165	2,456	5,621
Sabana Alta (D.M.)	1,757	1,484	3,241
El Rosario (D.M.)	3,985	3,441	7,426
Hato del Padre (D.M.)	3,183	2,628	5,811
Guanito (D.M.)	1,825	1,845	3,670
La Jagua (D.M.)	2,289	1,566	3,855
Las Maguanas-Hato Nuevo (D.M.)	2,962	2,230	5,192
Las Charcas de María Nova (D.M.)	1,782	1,384	3,166
Las Zanjas (D.M.)	4,963	4,028	8,991
<b>Total</b>	<b>69,329</b>	<b>62,848</b>	<b>132,177</b>
Fuente: ONE. Tu Municipio en Cifras <a href="http://www.one.gob.do/themes/one/dmdocuments/TMC/San%20Juan/San%20Juan.pdf">http://www.one.gob.do/themes/one/dmdocuments/TMC/San%20Juan/San%20Juan.pdf</a>			



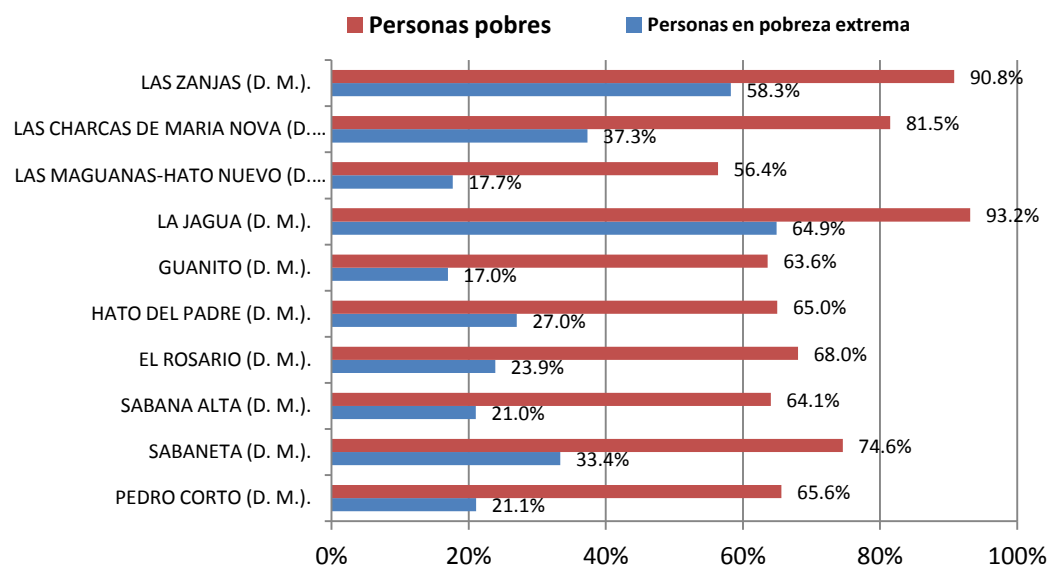
Fuente: MEPLYD. Mapa de la Pobreza 2010 en la República Dominicana

**Porcentaje promedio de población pobre y en pobreza extrema en los 10 distritos del municipio San Juan, por zona de residencia. 2010**



Fuente: MEPLYD. Mapa de la Pobreza 2010 en la República Dominicana

**Pobreza general y pobreza extrema en los distritos del municipio San Juan. 2010.**



Fuente: MEPLYD. Mapa de la Pobreza 2010 en la República Dominicana

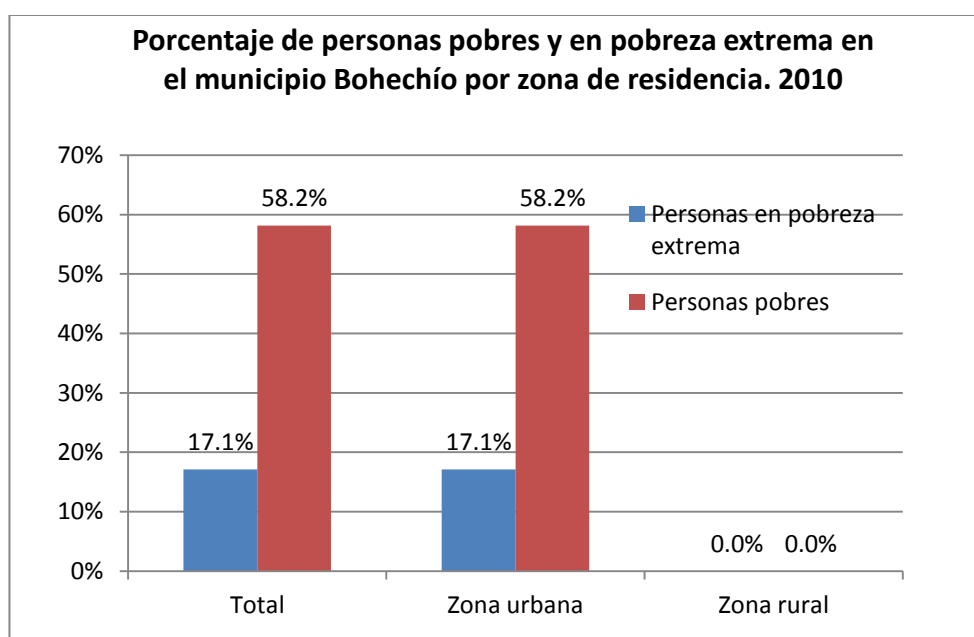
Número de hogares y personas en pobreza general y pobreza extrema en el municipio San Juan y sus distritos municipales, por zona de residencia. Año 2010.						
Nombre del área geográfica	Hogares en pobreza extrema	Hogares pobres	Total de Hogares	Personas en pobreza extrema	Personas pobres	Total de personas
<b>SAN JUAN (Municipio general)</b>	<b>7,899</b>	<b>21,285</b>	<b>36,214</b>	<b>26,362</b>	<b>76,456</b>	<b>132,100</b>
Zona urbana	3,464	12,062	23,688	11,806	44,288	87,564
Zona rural	4,435	9,223	12,526	14,556	32,168	44,536
<b>SAN JUAN</b>	<b>2,597</b>	<b>10,115</b>	<b>21,075</b>	<b>8,567</b>	<b>37,271</b>	<b>78,280</b>
Zona urbana	1,952	8,637	19,129	6,642	32,255	71,462
Zona rural	645	1,478	1,946	1,925	5,016	6,818
<b>PEDRO CORTO (D. M.).</b>	<b>437</b>	<b>1,218</b>	<b>1,827</b>	<b>1,452</b>	<b>4,520</b>	<b>6,889</b>
Zona urbana	100	398	639	355	1,525	2,454
Zona rural	337	820	1,188	1,097	2,995	4,435
<b>SABANETA (D. M.).</b>	<b>559</b>	<b>1,182</b>	<b>1,560</b>	<b>1,875</b>	<b>4,189</b>	<b>5,618</b>
Zona urbana	160	436	569	603	1,689	2,181
Zona rural	399	746	991	1,272	2,500	3,437
<b>SABANA ALTA (D. M.).</b>	<b>203</b>	<b>602</b>	<b>917</b>	<b>681</b>	<b>2,074</b>	<b>3,238</b>
Zona urbana	146	394	584	492	1,315	1,963
Zona rural	57	208	333	189	759	1,275
<b>EL ROSARIO (D. M.).</b>	<b>564</b>	<b>1,478</b>	<b>2,133</b>	<b>1,770</b>	<b>5,046</b>	<b>7,418</b>
Zona urbana	166	490	662	512	1,689	2,287
Zona rural	398	988	1,471	1,258	3,357	5,131
<b>HATO DEL PADRE (D. M.).</b>	<b>441</b>	<b>1,006</b>	<b>1,546</b>	<b>1,567</b>	<b>3,774</b>	<b>5,804</b>
Zona urbana	106	195	220	396	697	792
Zona rural	335	811	1,326	1,171	3,077	5,012
<b>GUANITO (D. M.).</b>	<b>202</b>	<b>679</b>	<b>1,068</b>	<b>622</b>	<b>2,334</b>	<b>3,669</b>
Zona urbana	104	320	502	326	1,055	1,649
Zona rural	98	359	566	296	1,279	2,020
<b>LA JAGUA (D. M.).</b>	<b>773</b>	<b>1,075</b>	<b>1,145</b>	<b>2,499</b>	<b>3,588</b>	<b>3,851</b>
Zona urbana	161	171	175	545	580	594
Zona rural	612	904	970	1,954	3,008	3,257
<b>LAS MAGUANAS-HATO NUEVO (D. M.).</b>	<b>303</b>	<b>886</b>	<b>1,488</b>	<b>917</b>	<b>2,926</b>	<b>5,189</b>
Zona urbana	134	269	359	434	895	1,247
Zona rural	169	617	1,129	483	2,031	3,942
<b>LAS CHARCAS DE MARIA NOVA (D. M.).</b>	<b>278</b>	<b>652</b>	<b>818</b>	<b>1,182</b>	<b>2,580</b>	<b>3,166</b>
Zona urbana	77	219	295	277	759	1,038
Zona rural	201	433	523	905	1,821	2,128
<b>LAS ZANJAS (D. M.).</b>	<b>1,542</b>	<b>2,392</b>	<b>2,637</b>	<b>5,230</b>	<b>8,154</b>	<b>8,978</b>
Zona urbana	358	533	554	1,224	1,829	1,897
Zona rural	1,184	1,859	2,083	4,006	6,325	7,081
Fuente: MEPLYD. Mapa de la Pobreza 2010 en la República Dominicana.						

Porcentaje de hogares y personas en pobreza general y pobreza extrema en el municipio San Juan y sus distritos municipales, por zona de residencia. Año 2010.				
Nombre del área geográfica	Hogares en pobreza extrema	Hogares pobres	Personas en pobreza extrema	Personas pobres
<b>SAN JUAN (Municipio general)</b>	<b>21.8%</b>	<b>58.8%</b>	<b>20.0%</b>	<b>57.9%</b>
Zona urbana	14.6%	50.9%	13.5%	50.6%
Zona rural	35.4%	73.6%	32.7%	72.2%
<b>SAN JUAN</b>	<b>12.3%</b>	<b>48.0%</b>	<b>10.9%</b>	<b>47.6%</b>
Zona urbana	10.2%	45.2%	9.3%	45.1%
Zona rural	33.1%	76.0%	28.2%	73.6%
<b>PEDRO CORTO (D. M.).</b>	<b>23.9%</b>	<b>66.7%</b>	<b>21.1%</b>	<b>65.6%</b>
Zona urbana	15.6%	62.3%	14.5%	62.1%
Zona rural	28.4%	69.0%	24.7%	67.5%
<b>SABANETA (D. M.).</b>	<b>35.8%</b>	<b>75.8%</b>	<b>33.4%</b>	<b>74.6%</b>
Zona urbana	28.1%	76.6%	27.6%	77.4%
Zona rural	40.3%	75.3%	37.0%	72.7%
<b>SABANA ALTA (D. M.).</b>	<b>22.1%</b>	<b>65.6%</b>	<b>21.0%</b>	<b>64.1%</b>
Zona urbana	25.0%	67.5%	25.1%	67.0%
Zona rural	17.1%	62.5%	14.8%	59.5%
<b>EL ROSARIO (D. M.).</b>	<b>26.4%</b>	<b>69.3%</b>	<b>23.9%</b>	<b>68.0%</b>
Zona urbana	25.1%	74.0%	22.4%	73.9%
Zona rural	27.1%	67.2%	24.5%	65.4%
<b>HATO DEL PADRE (D. M.).</b>	<b>28.5%</b>	<b>65.1%</b>	<b>27.0%</b>	<b>65.0%</b>
Zona urbana	48.2%	88.6%	50.0%	88.0%
Zona rural	25.3%	61.2%	23.4%	61.4%
<b>GUANITO (D. M.).</b>	<b>18.9%</b>	<b>63.6%</b>	<b>17.0%</b>	<b>63.6%</b>
Zona urbana	20.7%	63.7%	19.8%	64.0%
Zona rural	17.3%	63.4%	14.7%	63.3%
<b>LA JAGUA (D. M.).</b>	<b>67.5%</b>	<b>93.9%</b>	<b>64.9%</b>	<b>93.2%</b>
Zona urbana	92.0%	97.7%	91.8%	97.6%
Zona rural	63.1%	93.2%	60.0%	92.4%
<b>LAS MAGUANAS-HATO NUEVO (D. M.).</b>	<b>20.4%</b>	<b>59.5%</b>	<b>17.7%</b>	<b>56.4%</b>
Zona urbana	37.3%	74.9%	34.8%	71.8%
Zona rural	15.0%	54.7%	12.3%	51.5%
<b>LAS CHARCAS DE MARIA NOVA (D. M.).</b>	<b>34.0%</b>	<b>79.7%</b>	<b>37.3%</b>	<b>81.5%</b>
Zona urbana	26.1%	74.2%	26.7%	73.1%
Zona rural	38.4%	82.8%	42.5%	85.6%
<b>LAS ZANJAS (D. M.).</b>	<b>58.5%</b>	<b>90.7%</b>	<b>58.3%</b>	<b>90.8%</b>
Zona urbana	64.6%	96.2%	64.5%	96.4%
Zona rural	56.8%	89.2%	56.6%	89.3%
Fuente: MEPLYD. Mapa de la Pobreza 2010 en la República Dominicana.				

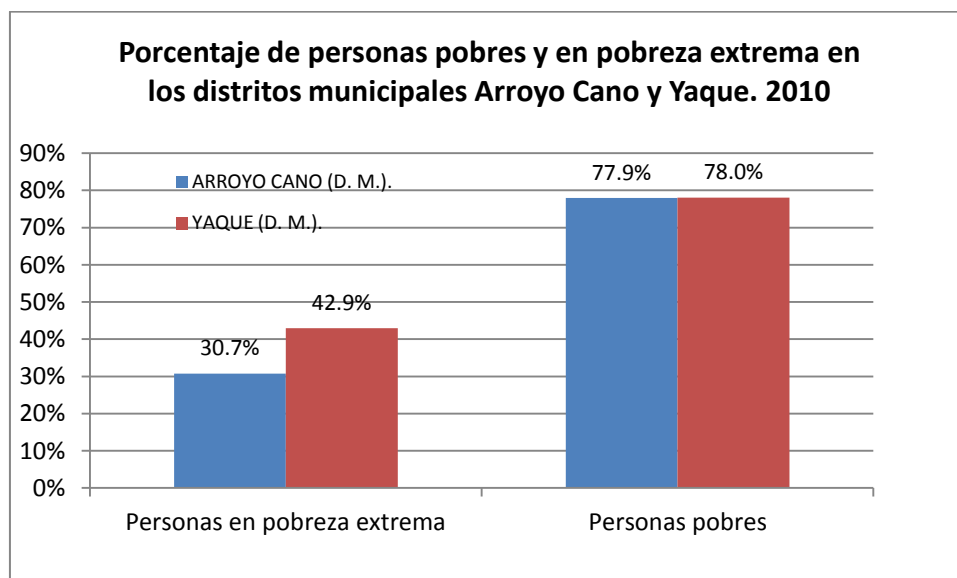
Necesidades Básicas Insatisfechas en hogares del Municipio San Juan y sus distritos municipales. Año 2010.																
Municipio y distrito municipal	% Hogares en vivienda con piso de tierra	% Hogares en vivienda con techo de materiales inadecuados	% Hogares en vivienda con paredes de materiales inadecuados	% Hogares que cocinan con carbón o leña	% Hogares sin instalación agua potable	% Hogares sin servicio sanitario adecuado	% Hogares sin energía eléctrica	% Hogares sin servicio de recolección basura	% Hogares con 2 ó menos equipos básicos (nevera, estufa, lavadora, TV)	% Hogares con adultos/as de 18 a 64 años semi-analfabetos	% Hogares con niños/as de 6 a 16 años que no asisten a la escuela	% Hogares que viven en barracón, casa en hilera, cuartería, parte atrás	% Hogares con más de 3.5 personas por cuarto	% Hogares sin medio de transporte privado (ni carro ni motocicleta)	% Hogares sin acceso a TICs: ni teléfono fijo ni celular ni PC	% Pobres por NBI*
<b>SAN JUAN (Municipio General)</b>	<b>16.8</b>	<b>5.7</b>	<b>5.7</b>	<b>30.8</b>	<b>23.6</b>	<b>33.1</b>	<b>8.1</b>	<b>4.9</b>	<b>39.2</b>	<b>39.5</b>	<b>3.9</b>	<b>6.9</b>	<b>11.7</b>	<b>56.1</b>	<b>27.6</b>	<b>50.4</b>
<b>SAN JUAN Municipio</b>	<b>6.5</b>	<b>6.0</b>	<b>4.2</b>	<b>15.3</b>	<b>11.1</b>	<b>26.2</b>	<b>2.0</b>	<b>3.0</b>	<b>27.3</b>	<b>30.4</b>	<b>2.8</b>	<b>10.5</b>	<b>9.6</b>	<b>48.2</b>	<b>18.6</b>	<b>36.3</b>
PEDRO CORTO (D. M.).	26.7	2.9	5.1	36.2	33.8	38.4	14.4	3.8	50.4	43.2	4.2	0.8	14.7	60.5	30.5	59.9
SABANETA (D. M.).	26.9	3.7	0.9	46.1	37.5	43.1	33.0	13.8	63.5	52.8	6.3	0.3	13.9	77.1	46.6	72.9
SABANA ALTA (D. M.).	14.6	1.5	6.5	31.2	20.7	55.8	3.4	2.6	40.8	45.8	3.6	1.4	11.8	61.2	22.7	57.9
EL ROSARIO (D. M.).	25.1	8.4	10.1	43.2	40.2	45.6	8.9	4.9	50.7	46.1	4.0	5.3	13.2	61.8	36.1	68.1
HATO DEL PADRE (D. M.).	31.8	2.8	12.1	49.2	59.7	35.0	8.1	5.4	51.7	51.0	4.9	1.9	10.5	56.4	29.4	65.7
GUANITO (D. M.).	12.6	9.6	8.3	29.8	18.4	44.0	2.6	2.0	38.3	46.7	3.9	3.0	13.1	67.9	25.5	58.0
LA JAGUA (D. M.).	65.6	14.7	7.6	89.3	62.4	42.4	28.8	17.6	77.7	63.7	6.0	0.1	18.8	79.6	57.2	91.5
LAS MAGUANAS-HATO NUEVO (D. M.).	16.3	1.2	0.7	47.8	26.1	31.8	6.2	3.2	46.2	44.0	3.4	0.6	10.8	66.3	35.1	59.5
LAS CHARCAS DE MARIA NOVA (D. M.).	34.8	7.8	9.3	65.3	29.5	47.2	14.2	13.0	54.5	52.1	5.6	4.8	16.3	64.8	32.2	72.6
LAS ZANJAS (D. M.).	47.2	4.1	13.0	75.4	56.4	46.9	31.3	9.1	70.2	67.1	9.1	1.4	20.0	74.3	62.1	84.3
* % Hogares con tres (3) ó más NBI, de quince (15) posibles																
Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana.																

Población del municipio Las Matas de Farfán y sus distritos municipales por sexo. Año 2010			
Municipio y Distritos	Hombres	Mujeres	Total
Las Matas de Farfán	17,815	16,666	34,481
Matayaya (D. M.)	2,242	2,025	4,267
Carrera de Yeguas (D. M.)	2,957	2,458	5,415
<b>Total</b>	<b>23,014</b>	<b>21,149</b>	<b>44,163</b>

Fuente: ONE. Tu Municipio en Cifras.  
<http://www.one.gob.do/themes/one/dmdocuments/TMC/San%20Juan/Las%20Matas%20de%20Farf%C3%A1n.pdf>



Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana.



Fuente: MEPLYD. Mapa de la Pobreza 2010 en la República Dominicana.

Número de hogares y personas en pobreza general y pobreza extrema en el municipio Bohechío y sus distritos municipales, por zona de residencia. Año 2010.						
Nombre del área geográfica	Hogares en pobreza extrema	Hogares pobres	Total de Hogares	Personas en pobreza extrema	Personas pobres	Total de personas
<b>BOHECHIO (Municipio general)</b>	<b>941</b>	<b>2,077</b>	<b>2,855</b>	<b>3,151</b>	<b>7,053</b>	<b>9,651</b>
<b>BOHECHIO</b>	<b>124</b>	<b>429</b>	<b>722</b>	<b>409</b>	<b>1,391</b>	<b>2,392</b>
Zona urbana	124	429	722	409	1,391	2,392
Zona rural	0	0	0	0	0	0
<b>ARROYO CANO (D. M.).</b>	<b>305</b>	<b>720</b>	<b>944</b>	<b>946</b>	<b>2,398</b>	<b>3,077</b>
Zona urbana	188	496	669	586	1,624	2,179
Zona rural	117	224	275	360	774	898
<b>YAQUE (D. M.).</b>	<b>512</b>	<b>928</b>	<b>1,189</b>	<b>1,796</b>	<b>3,264</b>	<b>4,182</b>
Zona urbana	308	445	476	1,160	1,663	1,795
Zona rural	204	483	713	636	1,601	2,387
Fuente: MEPLYD. Mapa de la Pobreza 2010 en la República Dominicana.						

**Porcentaje de hogares y personas en pobreza general y pobreza extrema en el municipio Bohechío y sus distritos municipales, por zona de residencia. Año 2010.**

Nombre del área geográfica	Hogares en pobreza extrema	Hogares pobres	Personas en pobreza extrema	Personas pobres
<b>BOHECHIO (Municipio general)</b>	<b>33.0%</b>	<b>72.7%</b>	<b>32.6%</b>	<b>73.1%</b>
<b>BOHECHIO</b>	<b>17.2%</b>	<b>59.4%</b>	<b>17.1%</b>	<b>58.2%</b>
Zona urbana	17.2%	59.4%	17.1%	58.2%
Zona rural	0.0%	0.0%	0.0%	0.0%
<b>ARROYO CANO (D. M.).</b>	<b>32.3%</b>	<b>76.3%</b>	<b>30.7%</b>	<b>77.9%</b>
Zona urbana	28.1%	74.1%	26.9%	74.5%
Zona rural	42.5%	81.5%	40.1%	86.2%
<b>YAQUE (D. M.).</b>	<b>43.1%</b>	<b>78.0%</b>	<b>42.9%</b>	<b>78.0%</b>
Zona urbana	64.7%	93.5%	64.6%	92.6%
Zona rural	28.6%	67.7%	26.6%	67.1%

Fuente: MEPLYD. Mapa de la Pobreza 2010 en la República Dominicana.

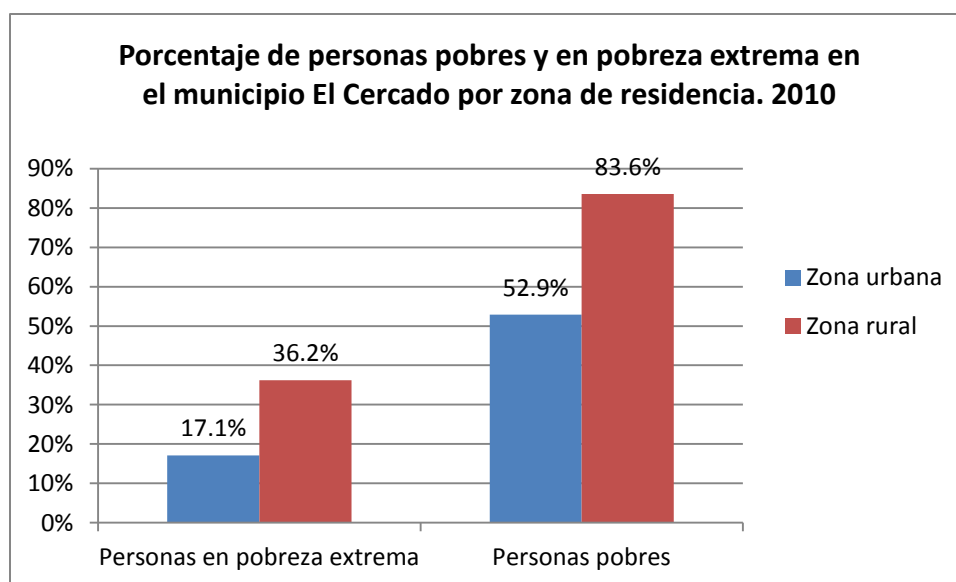
**Necesidades Básicas Insatisfechas en hogares del Municipio Bohechío y sus distritos municipales. Año 2010**

Indicadores	BOHECHIO (Municipio General)	BOHE-CHIO (Municipio)	ARROYO CANO (D. M.).	YAQUE (D. M.)
% Hogares en vivienda con piso de tierra	22.5	5.4	21.3	33.8
% Hogares en vivienda con techo de materiales inadecuados	2.3	0	2.9	3.3
% Hogares en vivienda con paredes de materiales inadecuados	2.9	0.3	2.2	5
% Hogares que cocinan con carbón o leña	33.3	23.4	24.6	46.3
% Hogares sin instalación agua potable	29.9	7.8	34.5	39.6
% Hogares sin servicio sanitario adecuado	57.9	62.7	62	51.8
% Hogares sin energía eléctrica	18.7	1.9	22.8	25.7
% Hogares sin servicio de recolección basura	13.5	2.4	20.6	14.7
% Hogares con 2 ó menos equipos básicos (nevera, estufa, lavadora, TV)	58.1	39.6	63	65.4
% Hogares con adultos/as de 18 a 64 años semi-analfabetos	46.7	28.8	47.2	57.2
% Hogares con niños/as de 6 a 16 años que no asisten a la escuela	4.1	2.5	3.7	5.5
% Hogares que viven en barracón, casa en hilera, cuartería, parte atrás	1.5	4.7	0.4	0.4
% Hogares con más de 3.5 personas por cuarto	12.5	8.7	13.6	14
% Hogares sin medio de transporte privado (ni carro ni motocicleta)	74.3	69.7	69	81.2
% Hogares sin acceso a TICs: ni teléfono fijo ni celular ni PC	46.1	27.7	36.3	64.9
% Pobres por NBI*	69.6	50.3	68.5	82.3

\* % Hogares con tres (3) ó más NBI, de quince (15) posibles

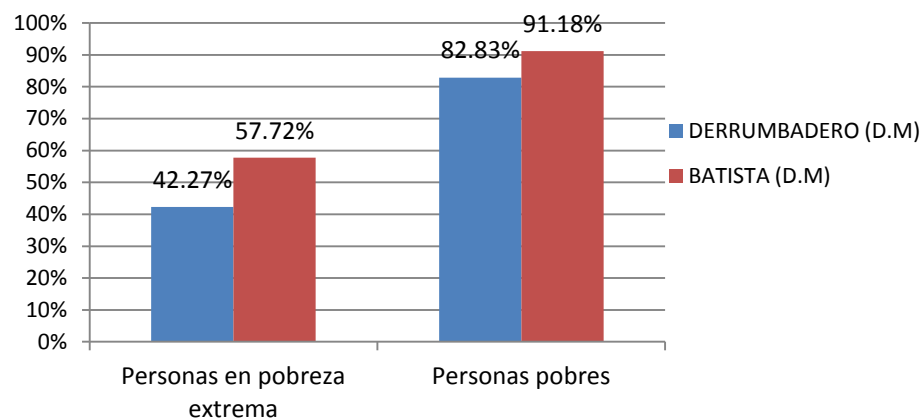
Fuente: MEPLYD. Mapa de la Pobreza 2010 en la República Dominicana.

Población del municipio El Cercado y sus distritos municipales por sexo. Año 2010			
Municipio y Distritos	Hombres	Mujeres	Total
El Cercado	7,297	6,314	13,611
Derrumbadero (D.M)	2,714	2,204	4,918
Batista (D.M)	1,301	1,013	2,314
<b>Total</b>	<b>11,312</b>	<b>9,531</b>	<b>20,843</b>
Fuente: ONE. Tu Municipio en Cifras. <a href="http://www.one.gob.do/themes/one/dmdocuments/TMC/San%20Juan/El%20Cercado.pdf">http://www.one.gob.do/themes/one/dmdocuments/TMC/San%20Juan/El%20Cercado.pdf</a>			



Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana.

**Porcentaje de personas pobres y en pobreza extrema en los distritos municipales Derrumbadero y Batista. 2010**



Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana.

**Número de hogares y personas en pobreza general y pobreza extrema en el municipio El Cercado y sus distritos municipales. Año 2010.**

Nombre del área geográfica	Hogares en pobreza extrema	Hogares pobres	Total de Hogares	Personas en pobreza extrema	Personas pobres	Total de personas
<b>EL CERCADO (Municipio general)</b>	<b>2,085</b>	<b>4,331</b>	<b>5,584</b>	<b>7,387</b>	<b>16,017</b>	<b>20,839</b>
<b>EL CERCADO</b>	<b>1,155</b>	<b>2,689</b>	<b>3,678</b>	<b>3,974</b>	<b>9,836</b>	<b>13,610</b>
Zona urbana	252	731	1,362	857	2,648	5,007
Zona rural	903	1,958	2,316	3,117	7,188	8,603
<b>DERRUMBADERO (D.M)</b>	<b>582</b>	<b>1,098</b>	<b>1,310</b>	<b>2,078</b>	<b>4,072</b>	<b>4,916</b>
Zona urbana	260	327	349	1,008	1,307	1,389
Zona rural	322	771	961	1,070	2,765	3,527
<b>BATISTA (D.M)</b>	<b>348</b>	<b>544</b>	<b>596</b>	<b>1,335</b>	<b>2,109</b>	<b>2,313</b>
Zona urbana	148	219	239	605	894	967
Zona rural	200	325	357	730	1,215	1,346

Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana.

**Porcentaje de hogares y personas en pobreza general y pobreza extrema en el municipio El Cercado y sus distritos municipales. Año 2010.**

Nombre del área geográfica	Hogares en pobreza extrema	Hogares pobres	Personas en pobreza extrema	Personas pobres
<b>EL CERCADO (Municipio general)</b>	<b>37.34%</b>	<b>77.56%</b>	<b>35.45%</b>	<b>76.86%</b>
<b>EL CERCADO</b>	<b>31.40%</b>	<b>73.11%</b>	<b>29.20%</b>	<b>72.27%</b>
Zona urbana	18.50%	53.67%	17.12%	52.89%
Zona rural	38.99%	84.54%	36.23%	83.55%
<b>DERRUMBADERO (D.M)</b>	<b>44.43%</b>	<b>83.82%</b>	<b>42.27%</b>	<b>82.83%</b>
Zona urbana	74.50%	93.70%	72.57%	94.10%
Zona rural	33.51%	80.23%	30.34%	78.40%
<b>BATISTA (D.M)</b>	<b>58.39%</b>	<b>91.28%</b>	<b>57.72%</b>	<b>91.18%</b>
Zona urbana	61.92%	91.63%	62.56%	92.45%
Zona rural	56.02%	91.04%	54.23%	90.27%
Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana.				

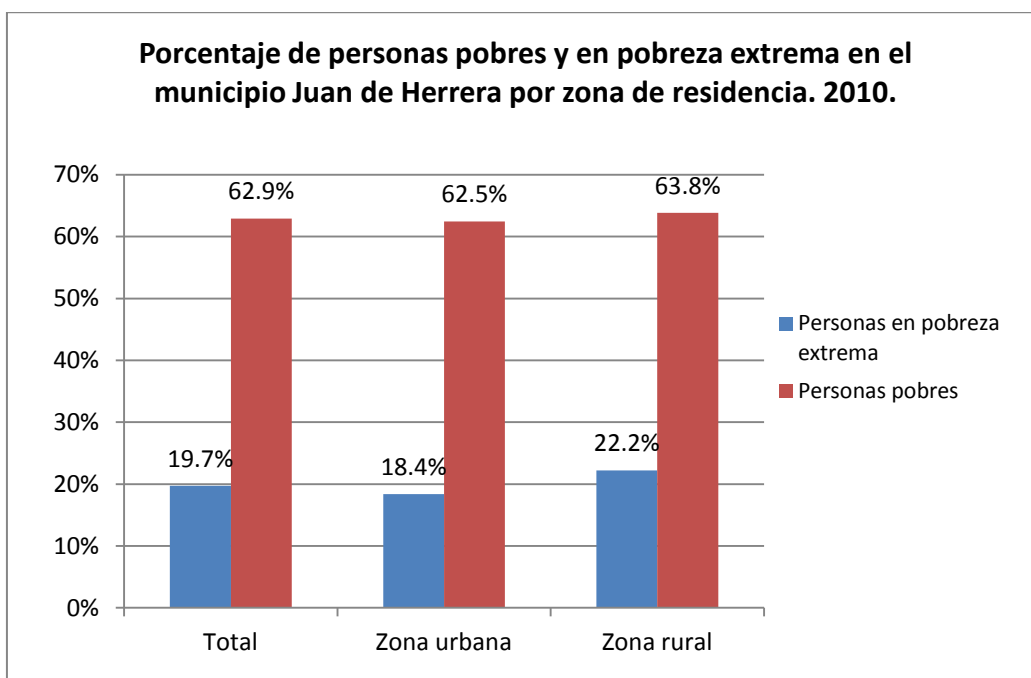
**Necesidades Básicas Insatisfechas en hogares del Municipio El Cercado y sus distritos municipales. Año 2010**

Indicadores	EL CERCADO (Municipio General)	EL CERCADO (Municipio)	DERRUMBADERO (D.M)	BATISTA (D.M)
% Hogares en vivienda con piso de tierra	32.8	29.2	39.2	40.8
% Hogares en vivienda con techo de materiales inadecuados	3.7	3.4	4.5	4.2
% Hogares en vivienda con paredes de materiales inadecuados	1.3	1.4	0.6	2.2
% Hogares que cocinan con carbón o leña	49.5	45.9	53	64.1
% Hogares sin instalación agua potable	35.9	31.1	51.8	30.5
% Hogares sin servicio sanitario adecuado	40.3	35.8	43.7	60.7
% Hogares sin energía eléctrica	14.1	14.3	9.2	24.2
% Hogares sin servicio de recolección basura	15.3	14.9	9.8	30.4
% Hogares con 2 ó menos equipos básicos (nevera, estufa, lavadora, TV)	57	51.7	64.5	73
% Hogares con adultos/as de 18 a 64 años semi-analfabetos	52.2	47.1	63.7	58.9
% Hogares con niños/as de 6 a 16 años que no asisten a la escuela	3.3	2.7	4.4	4.2
% Hogares que viven en barracón, casa en hilera, cuartería, parte atrás	0.4	0.4	0.1	1.2
% Hogares con más de 3.5 personas por cuarto	10.1	9.2	11.3	13.1
% Hogares sin medio de transporte privado (ni carro ni motocicleta)	74	70.5	77.9	86.7
% Hogares sin acceso a TICs: ni teléfono fijo ni	39.5	34.9	48.9	47.1

celular ni PC				
% Pobres por NBI*	69.6	62.6	81.4	86.6
* % Hogares con tres (3) ó más NBI, de quince (15) posibles				
Fuente: MEPLYD. Mapa de la Pobreza 2010 en la República Dominicana.				

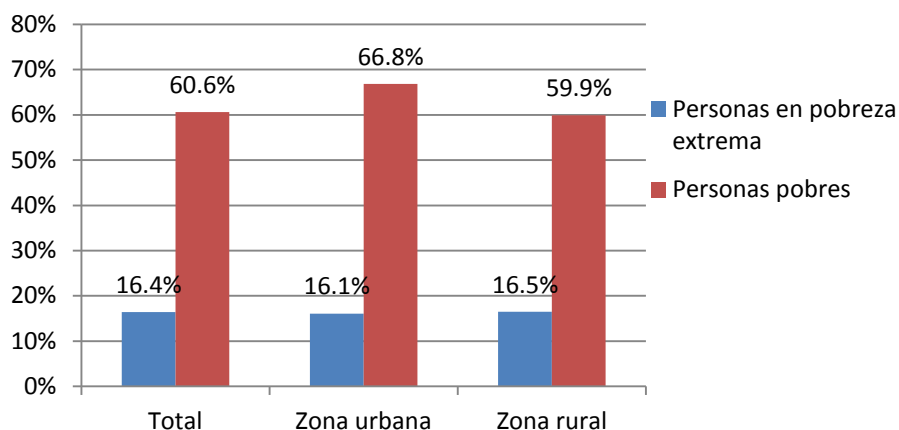
**Annex 12 Municipio Juan de Herrera. Estadísticas de población, pobreza y necesidades básicas insatisfechas (NBI) de los Distritos Municipales.**

Población del municipio Juan de Herrera y su distrito municipal por sexo. Año 2010			
Municipio y Distritos	Hombres	Mujeres	Total
Juan de Herrera	4,347	3,888	8,235
Jínova (D. M.)	2,544	2,283	4,827
<b>Total</b>	<b>6,891</b>	<b>6,171</b>	<b>13,062</b>
Fuente: ONE. Tu Municipio en Cifras.			
<a href="http://www.one.gob.do/themes/one/dmdocuments/TMC/San%20Juan/Juan%20de%20Herrera.pdf">http://www.one.gob.do/themes/one/dmdocuments/TMC/San%20Juan/Juan%20de%20Herrera.pdf</a>			



Fuente: MEPLYD. Mapa de la Pobreza 2010 en la República Dominicana.

**Porcentaje de personas pobres y en pobreza extrema en el distrito Jónova por zona de residencia. 2010.**



Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana.

**Número de hogares y personas en pobreza general y pobreza extrema en el municipio Juan de Herrera y su distrito municipal. Año 2010.**

Nombre del área geográfica	Hogares en pobreza extrema	Hogares pobres	Total de Hogares	Personas en pobreza extrema	Personas pobres	Total de personas
<b>JUAN DE HERRERA (Municipio general)</b>	<b>801</b>	<b>2,457</b>	<b>3,791</b>	<b>2,407</b>	<b>8,080</b>	<b>13,019</b>
<b>JUAN DE HERRERA</b>	<b>534</b>	<b>1,559</b>	<b>2,395</b>	<b>1,614</b>	<b>5,156</b>	<b>8,194</b>
Zona urbana	307	967	1,524	991	3,365	5,388
Zona rural	227	592	871	623	1,791	2,806
<b>JÍNOVA (D. M.).</b>	<b>267</b>	<b>898</b>	<b>1,396</b>	<b>793</b>	<b>2,924</b>	<b>4,825</b>
Zona urbana	33	107	154	78	324	485
Zona rural	234	791	1,242	715	2,600	4,340

Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana.

Porcentaje de hogares y personas en pobreza general y pobreza extrema en el municipio Juan de Herrera y su distrito municipal. Año 2010.				
Nombre del área geográfica	Hogares en pobreza extrema	Hogares pobres	Personas en pobreza extrema	Personas pobres
JUAN DE HERRERA (Municipio general)	21.1%	64.8%	18.5%	62.1%
JUAN DE HERRERA	22.3%	65.1%	19.7%	62.9%
Zona urbana	20.1%	63.5%	18.4%	62.5%
Zona rural	26.1%	68.0%	22.2%	63.8%
JÍNOVA (D. M.).	19.1%	64.3%	16.4%	60.6%
Zona urbana	21.4%	69.5%	16.1%	66.8%
Zona rural	18.8%	63.7%	16.5%	59.9%
Fuente: MEPLYD. Mapa de la Pobreza 2010 en la República Dominicana.				

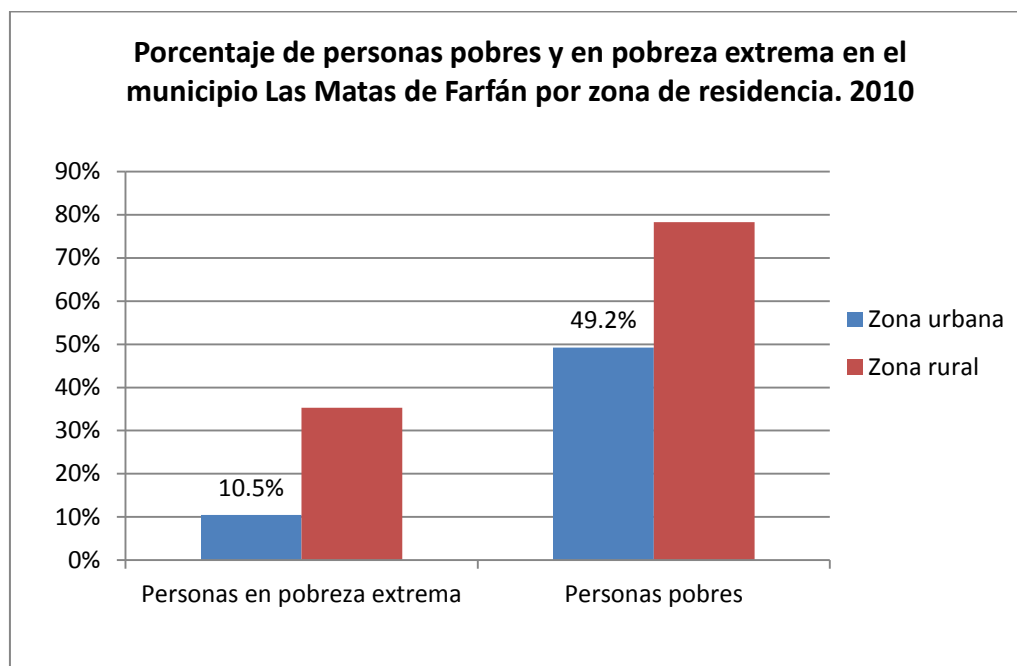
Necesidades Básicas Insatisfechas en hogares del Municipio Juan de Herrera y su distrito municipal. Año 2010			
Indicadores	JUAN DE HERRERA (Municipio General)	JUAN DE HERRERA	JÍNOVA (D. M.)
% Hogares en vivienda con piso de tierra	20.6	18.3	24.4
% Hogares en vivienda con techo de materiales inadecuados	2	1.6	2.6
% Hogares en vivienda con paredes de materiales inadecuados	5.7	7.2	3.1
% Hogares que cocinan con carbón o leña	30.3	22.7	43.4
% Hogares sin instalación agua potable	27.1	23.3	33.6
% Hogares sin servicio sanitario adecuado	41.6	50.7	26.1
% Hogares sin energía eléctrica	7.5	6.6	9.2
% Hogares sin servicio de recolección basura	4.1	4.2	3.9
% Hogares con 2 ó menos equipos básicos (nevera, estufa, lavadora, TV)	43.5	41.7	46.6
% Hogares con adultos/as de 18 a 64 años semi-analfabetos	49.9	47.7	53.7
% Hogares con niños/as de 6 a 16 años que no asisten a la escuela	3.5	3.8	3.1
% Hogares que viven en barracón, casa en hilera, cuartería, parte atrás	2.5	2.3	2.7
% Hogares con más de 3.5 personas por cuarto	10.1	8.9	12
% Hogares sin medio de transporte privado (ni carro ni motocicleta)	58	57.6	58.8
% Hogares sin acceso a TICs: ni teléfono fijo ni celular ni PC	31.5	30.1	34.1
% Pobres por NBI*	56.7	54.7	60.2
* % Hogares con tres (3) ó más NBI, de quince (15) posibles			

Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana.

**Annex 13**      **Municipio Las Matas de Farfán. Estadísticas de población, pobreza y necesidades básicas insatisfechas (NBI) de los Distritos Municipales.**

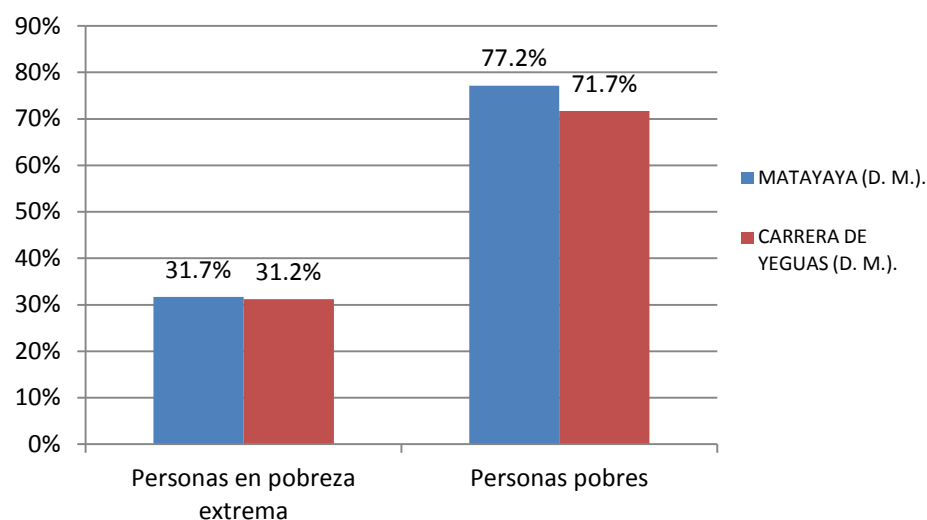
<b>Población del municipio Las Matas de Farfán y sus distritos municipales por sexo. Año 2010</b>			
<b>Municipio y Distritos</b>	<b>Hombres</b>	<b>Mujeres</b>	<b>Total</b>
Las Matas de Farfán	17,815	16,666	34,481
Matayaya (D. M.)	2,242	2,025	4,267
Carrera de Yeguas (D. M.)	2,957	2,458	5,415
<b>Total</b>	<b>23,014</b>	<b>21,149</b>	<b>44,163</b>

Fuente: ONE. Tu Municipio en Cifras.  
<http://www.one.gob.do/themes/one/dmdocuments/TMC/San%20Juan/Las%20Matas%20de%20Farf%C3%A1n.pdf>



Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana.

**Porcentaje de personas pobres y en pobreza extrema en los distritos municipales Matayaya y Carrera de Yeguas. 2010**



Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana.

**Número de hogares y personas en pobreza general y pobreza extrema en el municipio Las Matas de Farfán y sus distritos municipales, por zona de residencia. Año 2010.**

Nombre del área geográfica	Hogares en pobreza extrema	Hogares pobres	Total de Hogares	Personas en pobreza extrema	Personas pobres	Total de personas
<b>LAS MATAS DE FARFAN (Municipio general)</b>	<b>2,795</b>	<b>7,530</b>	<b>12,000</b>	<b>9,461</b>	<b>27,428</b>	<b>44,156</b>
<b>LAS MATAS DE FARFAN</b>	<b>1,920</b>	<b>5,521</b>	<b>9,312</b>	<b>6,420</b>	<b>20,255</b>	<b>34,474</b>
Zona urbana	726	3,030	6,199	2,428	11,393	23,154
Zona rural	1,194	2,491	3,113	3,992	8,862	11,320
<b>MATAYAYA (D. M.).</b>	<b>392</b>	<b>916</b>	<b>1,185</b>	<b>1,352</b>	<b>3,292</b>	<b>4,267</b>
Zona urbana	165	312	400	584	1,085	1,396
Zona rural	227	604	785	768	2,207	2,871
<b>CARRERA DE YEGUAS (D. M.).</b>	<b>483</b>	<b>1,093</b>	<b>1,503</b>	<b>1,689</b>	<b>3,881</b>	<b>5,415</b>
Zona urbana	120	189	230	457	680	834
Zona rural	363	904	1,273	1,232	3,201	4,581

Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana.

**Porcentaje de hogares y personas en pobreza general y pobreza extrema en el municipio Las Matas de Farfán y sus distritos municipales, por zona de residencia. Año 2010.**

Nombre del área geográfica	Hogares en pobreza extrema	Hogares pobres	Personas en pobreza extrema	Personas pobres
<b>LAS MATAS DE FARFAN (Municipio general)</b>	<b>23.3%</b>	<b>62.8%</b>	<b>21.4%</b>	<b>62.1%</b>
<b>LAS MATAS DE FARFAN</b>	<b>20.6%</b>	<b>59.3%</b>	<b>18.6%</b>	<b>58.8%</b>
Zona urbana	11.7%	48.9%	10.5%	49.2%
Zona rural	38.4%	80.0%	35.3%	78.3%
<b>MATAYAYA (D. M.).</b>	<b>33.1%</b>	<b>77.3%</b>	<b>31.7%</b>	<b>77.2%</b>
Zona urbana	41.3%	78.0%	41.8%	77.7%
Zona rural	28.9%	76.9%	26.8%	76.9%
<b>CARRERA DE YEGUAS (D. M.).</b>	<b>32.1%</b>	<b>72.7%</b>	<b>31.2%</b>	<b>71.7%</b>
Zona urbana	52.2%	82.2%	54.8%	81.5%
Zona rural	28.5%	71.0%	26.9%	69.9%
Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana.				

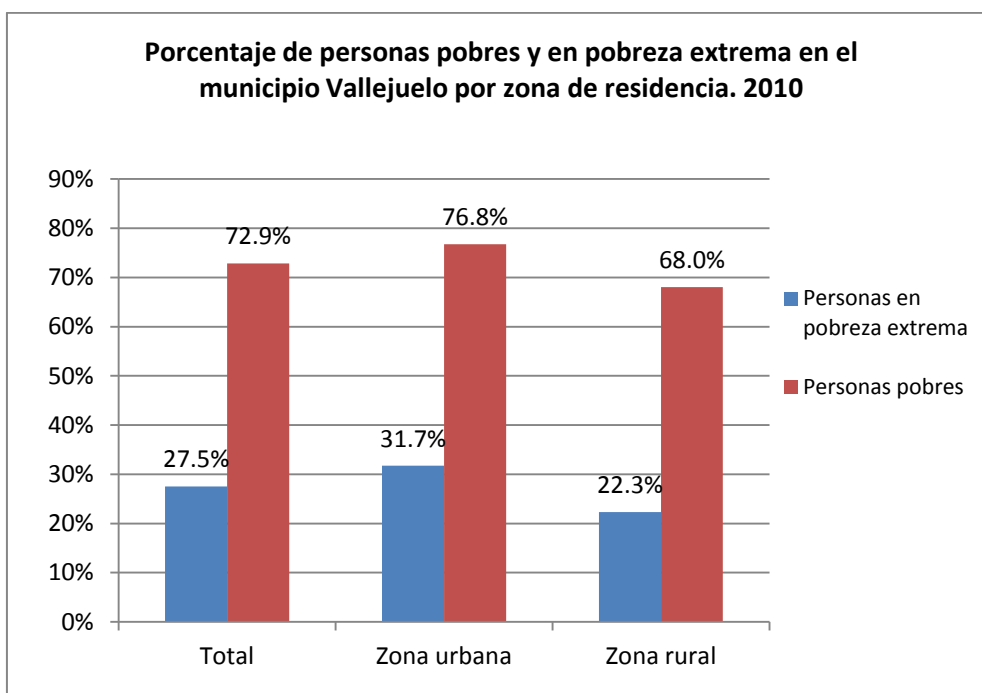
**Necesidades Básicas Insatisfechas en hogares del Municipio Las Matas de Farfán y sus distritos municipales. Año 2010**

Indicadores	LAS MATAS DE FARFAN (Municipio General)	LAS MATAS DE FARFAN	MATAYAYA (D. M.).	CARRERA DE YEGUAS (D. M.).
% Hogares en vivienda con piso de tierra	20.7	18.9	28.4	25.5
% Hogares en vivienda con techo de materiales inadecuados	3	2.9	2.2	4.1
% Hogares en vivienda con paredes de materiales inadecuados	4.7	3.8	7.2	8.4
% Hogares que cocinan con carbón o leña	39.1	33.2	60.7	58.6
% Hogares sin instalación agua potable	29.2	24.2	59.7	36.1
% Hogares sin servicio sanitario adecuado	37.8	38.5	40.3	31.2
% Hogares sin energía eléctrica	14.6	11.3	24.2	27.5
% Hogares sin servicio de recolección basura	4.4	4.2	3.1	7.2
% Hogares con 2 ó menos equipos básicos (nevera, estufa, lavadora, TV)	48.4	44.7	61.9	60.4
% Hogares con adultos/as de 18 a 64 años semi-analfabetos	37	33.8	41.5	53.2
% Hogares con niños/as de 6 a 16 años que no asisten a la escuela	4.1	3.7	4.1	6.5
% Hogares que viven en barracón, casa en hilera, cuartería, parte atrás	2.9	3.6	1	0.2
% Hogares con más de 3.5 personas por cuarto	8.4	8.1	8.4	10.4
% Hogares sin medio de transporte privado (ni carro ni motocicleta)	65.6	63.6	71.7	73.4

% Hogares sin acceso a TICs: ni teléfono fijo ni celular ni PC	32	29.7	32.3	45.7
% Pobres por NBI*	57.5	53.1	74.5	71.7
* % Hogares con tres (3) ó más NBI, de quince (15) posibles				
Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana.				

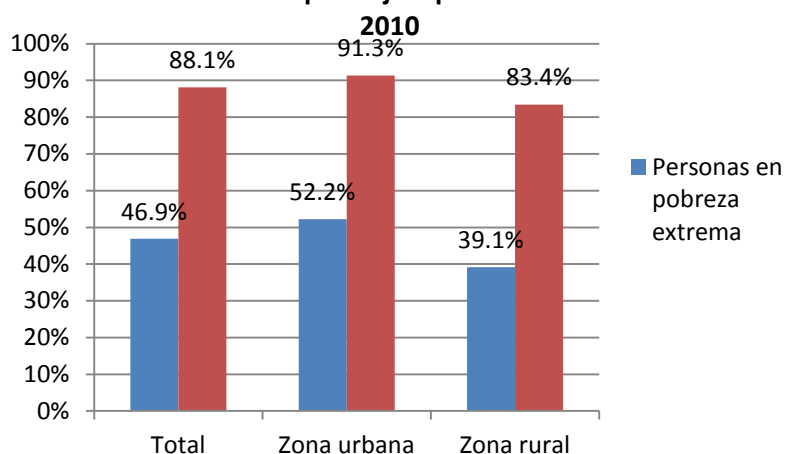
**Annex 14 Municipio Vallejuelo. Estadísticas de población, pobreza y necesidades básicas insatisfechas (NBI) de los Distritos Municipales.**

Población del municipio Vallejuelo y su distrito municipal por sexo. Año 2010			
Municipio y Distrito	Hombres	Mujeres	Total
Vallejuelo	5,173	4,552	9,725
Jorjillo (D. M.)	1,497	1,181	2,678
<b>Total</b>	<b>6,670</b>	<b>5,733</b>	<b>12,403</b>
Fuente: ONE. Tu Municipio en Cifras.			
<a href="http://www.one.gob.do/themes/one/dmdocuments/TMC/San%20Juan/Vallejuelo.pdf">http://www.one.gob.do/themes/one/dmdocuments/TMC/San%20Juan/Vallejuelo.pdf</a>			



Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana

**Porcentaje de personas pobres y en pobreza extrema en el distrito municipal Jorjillo por zona de residencia.**



Fuente: MEPLYD. Mapa de la Pobreza 2010 en la República Dominicana

**Número de hogares y personas en pobreza general y pobreza extrema en el municipio Vallejuelo y su distrito municipal, por zona de residencia. Año 2010.**

Nombre del área geográfica	Hogares en pobreza extrema	Hogares pobres	Total de Hogares	Personas en pobreza extrema	Personas pobres	Total de personas
<b>VALLEJUELO (Municipio general)</b>	<b>1,013</b>	<b>2,349</b>	<b>3,075</b>	<b>3,919</b>	<b>9,411</b>	<b>12,356</b>
<b>VALLEJUELO</b>	<b>684</b>	<b>1,757</b>	<b>2,410</b>	<b>2,663</b>	<b>7,051</b>	<b>9,678</b>
Zona urbana	424	997	1,311	1,694	4,099	5,339
Zona rural	260	760	1,099	969	2,952	4,339
<b>JORJILLO (D. M.).</b>	<b>329</b>	<b>592</b>	<b>665</b>	<b>1,256</b>	<b>2,360</b>	<b>2,678</b>
Zona urbana	211	367	400	831	1,454	1,592
Zona rural	118	225	265	425	906	1,086

Fuente: MEPLYD. Mapa de la Pobreza 2010 en la República Dominicana.

Porcentaje de hogares y personas en pobreza general y pobreza extrema en el municipio Vallejuelo y su distrito municipal, por zona de residencia. Año 2010.				
Nombre del área geográfica	Hogares en pobreza extrema	Hogares pobres	Personas en pobreza extrema	Personas pobres
<b>VALLEJUELO (Municipio general)</b>	<b>32.9%</b>	<b>76.4%</b>	<b>31.7%</b>	<b>76.2%</b>
<b>VALLEJUELO</b>	<b>28.4%</b>	<b>72.9%</b>	<b>27.5%</b>	<b>72.9%</b>
Zona urbana	32.3%	76.0%	31.7%	76.8%
Zona rural	23.7%	69.2%	22.3%	68.0%
<b>JORJILLO (D. M.).</b>	<b>49.5%</b>	<b>89.0%</b>	<b>46.9%</b>	<b>88.1%</b>
Zona urbana	52.8%	91.8%	52.2%	91.3%
Zona rural	44.5%	84.9%	39.1%	83.4%
Fuente: MEPLYD. Mapa de la Pobreza 2010 en la República Dominicana.				

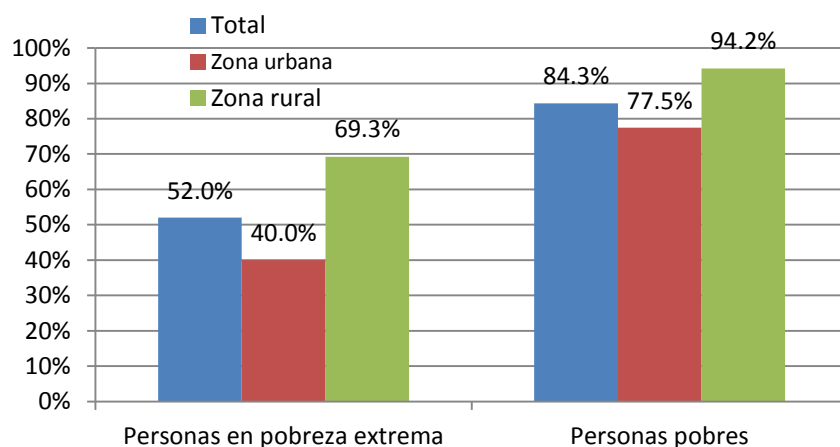
Necesidades Básicas Insatisfechas en hogares del Municipio Vallejuelo y su distrito municipal. Año 2010			
Indicadores	VALLEJUELO (Municipio general)	VALLEJUELO (Municipio)	JORJILLO (D. M.).
% Hogares en vivienda con piso de tierra	29.5	24.8	46.6
% Hogares en vivienda con techo de materiales inadecuados	4.3	2.7	10.4
% Hogares en vivienda con paredes de materiales inadecuados	12.2	10.2	19.4
% Hogares que cocinan con carbón o leña	40.9	38.4	50.1
% Hogares sin instalación agua potable	27.7	21.9	48.7
% Hogares sin servicio sanitario adecuado	53.8	49.1	70.8
% Hogares sin energía eléctrica	11.6	11.9	10.5
% Hogares sin servicio de recolección basura	9.5	8.3	13.7
% Hogares con 2 ó menos equipos básicos (nevera, estufa, lavadora, TV)	54.9	49.0	75.9
% Hogares con adultos/as de 18 a 64 años semi-analfabetos	56.4	53.4	67.4
% Hogares con niños/as de 6 a 16 años que no asisten a la escuela	5.5	4.3	9.9
% Hogares que viven en barracón, casa en hilera, cuartería, parte atrás	3.0	3.6	0.8
% Hogares con más de 3.5 personas por cuarto	14.8	13.8	18.5
% Hogares sin medio de transporte privado (ni carro ni motocicleta)	70.3	67.9	78.9
% Hogares sin acceso a TICs: ni teléfono fijo ni celular ni PC	36.5	32.7	50.2
% Pobres por NBI*	70.6	65.9	87.8
* % Hogares con tres (3) ó más NBI, de quince (15) posibles			
Fuente: MEPLYD. Mapa de la Pobreza 2010 en la República Dominicana.			

Población del municipio Hondo Valle y su distrito municipal por sexo. Año 2010			
Municipio y Distrito	Hombres	Mujeres	Total
Hondo Valle	3,782	3,412	7,194
Rancho de la Guardia (D. M.)	1,856	1,537	3,393
<b>Total</b>	<b>5,638</b>	<b>4,949</b>	<b>10,587</b>

Fuente: ONE. Tu Municipio en Cifras.

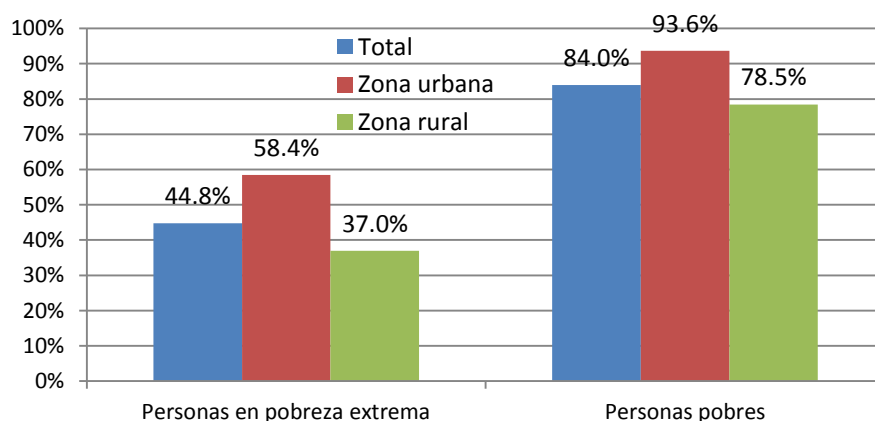
<http://www.one.gob.do/themes/one/dmdocuments/TMC/Elias%20Pi%C3%B1a/Hondo%20Valle.pdf>

**Porcentaje de personas pobres y en pobreza extrema en el municipio Hondo Valle por zona de residencia. 2010.**



Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana

**Porcentaje de personas pobres y en pobreza extrema en el distrito municipal Rancho de la Guardia por zona de residencia. 2010**



Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana

Número de hogares y personas en pobreza general y pobreza extrema en el municipio Hondo Valle y su distrito municipal, por zona de residencia. Año 2010.						
Nombre del área geográfica	Hogares en pobreza extrema	Hogares pobres	Total de Hogares	Personas en pobreza extrema	Personas pobres	Total de personas
<b>HONDO VALLE (Municipio general)</b>	<b>1,362</b>	<b>2,311</b>	<b>2,724</b>	<b>5,258</b>	<b>8,911</b>	<b>10,580</b>
<b>HONDO VALLE</b>	<b>941</b>	<b>1,531</b>	<b>1,808</b>	<b>3,738</b>	<b>6,061</b>	<b>7,187</b>
Zona urbana	422	820	1,060	1,691	3,278	4,232
Zona rural	519	711	748	2,047	2,783	2,955
<b>RANCHO DE LA GUARDIA (D. M.).</b>	<b>421</b>	<b>780</b>	<b>916</b>	<b>1,520</b>	<b>2,850</b>	<b>3,393</b>
Zona urbana	213	331	352	724	1,160	1,239
Zona rural	208	449	564	796	1,690	2,154
Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana.						

**Porcentaje de hogares y personas en pobreza general y pobreza extrema en el municipio Hondo Valle y su distrito municipal, por zona de residencia. Año 2010.**

Nombre del área geográfica	Hogares en pobreza extrema	Hogares pobres	Personas en pobreza extrema	Personas pobres
<b>HONDO VALLE (Municipio general)</b>	<b>50.0%</b>	<b>84.8%</b>	<b>49.7%</b>	<b>84.2%</b>
<b>HONDO VALLE</b>	<b>52.0%</b>	<b>84.7%</b>	<b>52.0%</b>	<b>84.3%</b>
Zona urbana	39.8%	77.4%	40.0%	77.5%
Zona rural	69.4%	95.1%	69.3%	94.2%
<b>RANCHO DE LA GUARDIA (D. M.).</b>	<b>46.0%</b>	<b>85.2%</b>	<b>44.8%</b>	<b>84.0%</b>
Zona urbana	60.5%	94.0%	58.4%	93.6%
Zona rural	36.9%	79.6%	37.0%	78.5%
Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana.				

**Necesidades Básicas Insatisfechas en hogares del Municipio Hondo Valle y su distrito municipal. Año 2010**

Indicadores	HONDO VALLE (Municipio general)	HONDO VALLE (Municipio)	RANCHO DE LA GUARDIA (D. M.).
% Hogares en vivienda con piso de tierra	32.6	33.2	31.4
% Hogares en vivienda con techo de materiales inadecuados	4.1	4.6	3.3
% Hogares en vivienda con paredes de materiales inadecuados	2.5	3.2	1
% Hogares que cocinan con carbón o leña	48.1	50.1	44.3
% Hogares sin instalación agua potable	42.7	45.9	36.2
% Hogares sin servicio sanitario adecuado	60.5	62.7	56.3
% Hogares sin energía eléctrica	19.5	23.2	12.3
% Hogares sin servicio de recolección basura	22.3	26.1	15
% Hogares con 2 ó menos equipos básicos (nevera, estufa, lavadora, TV)	67.1	65.7	70
% Hogares con adultos/as de 18 a 64 años semi-analfabetos	59.7	56.4	66.4
% Hogares con niños/as de 6 a 16 años que no asisten a la escuela	8.8	9.1	8.1
% Hogares que viven en barracón, casa en hilera, cuartería, parte atrás	2.7	2.7	2.8
% Hogares con más de 3.5 personas por cuarto	19.3	17.9	22.3
% Hogares sin medio de transporte privado (ni carro ni motocicleta)	83.3	81.8	86.1
% Hogares sin acceso a TICs: ni teléfono fijo ni celular ni PC	43.2	41.6	46.4
% Pobres por NBI*	78	76.4	81

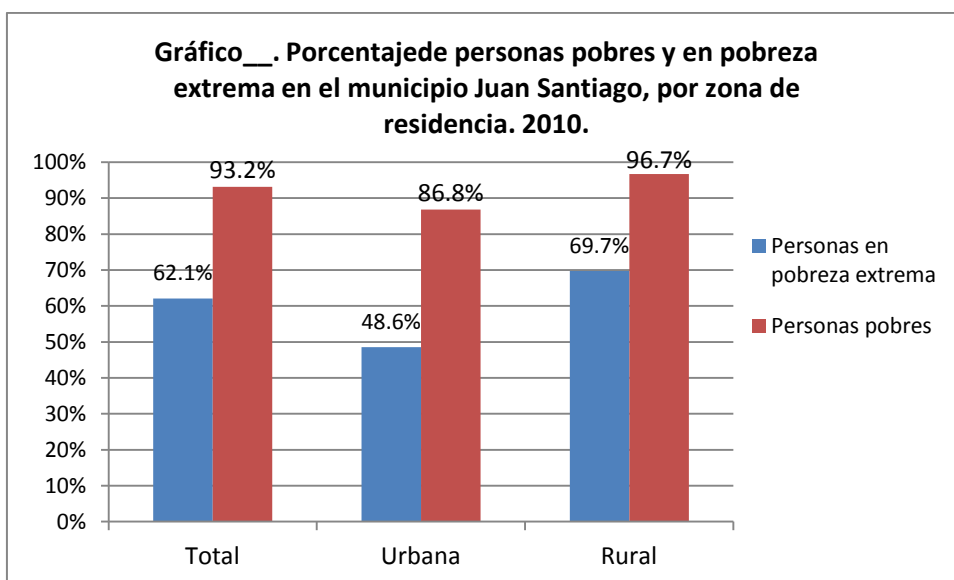
\* % Hogares con tres (3) ó más NBI, de quince (15) posibles  
Fuente: MEPLYD. Mapa de la Pobreza 2010 en la República Dominicana.

**Annex 16 Municipio Juan Santiago. (No tiene Distritos Municipales)**

**Estadísticas de población, pobreza y necesidades básicas insatisfechas (NBI)**

<b>Población del municipio Juan Santiago, por sexo. Año 2010</b>			
<b>Municipio</b>	<b>Hombres</b>	<b>Mujeres</b>	<b>Total</b>
Juan Santiago	2,394	1,966	4,360
<b>Total</b>	<b>2,394</b>	<b>1,966</b>	<b>4,360</b>

Fuente: ONE. Tu Municipio en Cifras.  
<http://www.one.gob.do/themes/one/dmdocuments/TMC/Elias%20Pi%C3%B1a/Juan%20Santiago.pdf>



Fuente: MEPLYD. Mapa de la Pobreza 2010 en la República Dominicana

**Número de hogares y personas en pobreza general y pobreza extrema en el municipio Juan Santiago, por zona de residencia. Año 2010.**

Nombre del área geográfica	Hogares en pobreza extrema	Hogares pobres	Total de Hogares	Personas en pobreza extrema	Personas pobres	Total de personas
<b>JUAN SANTIAGO (Municipio general)</b>	<b>620</b>	<b>940</b>	<b>1,016</b>	<b>2,706</b>	<b>4,059</b>	<b>4,356</b>
Zona urbana	174	311	365	758	1,355	1,561
Zona rural	446	629	651	1,948	2,704	2,795

Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana.

**Porcentaje de hogares y personas en pobreza general y pobreza extrema en el municipio Juan Santiago, por zona de residencia. Año 2010.**

Nombre del área geográfica	Hogares en pobreza extrema	Hogares pobres	Personas en pobreza extrema	Personas pobres
<b>JUAN SANTIAGO (Municipio general)</b>	<b>61.02%</b>	<b>92.52%</b>	<b>62.12%</b>	<b>93.18%</b>
Zona urbana	47.67%	85.21%	48.56%	86.80%
Zona rural	68.51%	96.62%	69.70%	96.74%

Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana.

**Necesidades Básicas Insatisfechas en hogares del municipio Juan Santiago.  
Año 2010**

<b>Indicadores</b>	<b>Porcentaje</b>
% Hogares en vivienda con piso de tierra	45.3
% Hogares en vivienda con techo de materiales inadecuados	3.7
% Hogares en vivienda con paredes de materiales inadecuados	0.6
% Hogares que cocinan con carbón o leña	66.4
% Hogares sin instalación agua potable	41.0
% Hogares sin servicio sanitario adecuado	47.9
% Hogares sin energía eléctrica	29.9
% Hogares sin servicio de recolección basura	16.3
% Hogares con 2 ó menos equipos básicos (nevera, estufa, lavadora, TV)	74.5
% Hogares con adultos/as de 18 a 64 años semi-analfabetos	65.7
% Hogares con niños/as de 6 a 16 años que no asisten a la escuela	7.7
% Hogares que viven en barracón, casa en hilera, cuartería, parte atrás	0.5
% Hogares con más de 3.5 personas por cuarto	18.4
% Hogares sin medio de transporte privado (ni carro ni motocicleta)	85.4
% Hogares sin acceso a TICs: ni teléfono fijo ni celular ni PC	47.5
% Pobres por NBI*	87.3
* % Hogares con tres (3) ó más NBI, de quince (15) posibles	
Fuente: MEPYD. Mapa de la Pobreza 2010 en la República Dominicana	



## SAN JUAN

Date 16 Julio – Technical Workshops with Communities San Juan Technicians

  
 REPUBLICA DOMINICANA  
**MINISTERIO DE AGRICULTURA**  
 DIRECCION REGIONAL AGROPECUARIA, ZONA SUROESTE  
 UNIDAD REGIONAL DE PLANIFICACION Y ECONOMIA (URPE)  
 "Año Nacional de la Superación del Analfabetismo"

RELACION DE TECNICOS QUE PARTICIPARAN EN EL "TALLER DE CONSULTA A ACTORES CLAVE DEL SECTOR  
 AGROPECUARIO DE LA PROVINCIA DE SAN JUAN"  
 CONTROL DE ASISTENCIA (16/07/2014)

No.	NOMBRES	CARGO	FIRMA
1	ANTONIO PANIAGUA ENC.	ENC. REGIONAL URPE	<i>Antonio Paniagua</i>
2	GABINO VIOLA MANZUETA	ENC. REGIONAL UNIDAD DE PRODUCCION	<i>Gabino Viola</i>
3	JOSE M. MATOS SANCHEZ	ENC. REGIONAL UNIDAD DE EXTENSION	<i>Jose M. Matos</i>
4	DOMINGO ANT. AQUINO	ENC. SECCION DE PROYECTOS (URPE)	<i>Domingo Ant. Aquino</i>
5	FAUSTINO MONTERO	ENC. ZONA URPE SAN JUAN	<i>Faustino Montero</i>
6	HECTOR MATEO	ENC. PROGRAMA DE LEGUMINOSAS	<i>Hector Mateo</i>
7	JUANA MORENO SUERO	ENC. SECCION SEGUIMIENTO (URPE)	<i>Juana Moreno S.</i>
8	CASIMIRO SUERO	ENC. FOMENTO ARROCERO	<i>Casimiro Suero</i>
9	MIGUEL VARGAS	ENC. PROGRAMA MAIZ Y SORGO	<i>Miguel Vargas</i>
10	CESAR SANCHEZ	ENC. PROGRAMA DE HORTALIZAS	<i>Cesar Sanchez</i>
11	FRANCISCO RECIO	ENC. ZONA PROGRAMA DE MUSACEAS	<i>Francisco Recio</i>
12	JUAN BTA. RAMIREZ	ENC. ZONA AGRICOLA SAN JUAN	<i>Juan Bta. Ramirez</i>
13	MANUEL E. HERRERA MATEO	ENC. SECCION DE ANALISIS (URPE)	<i>Manuel E. Herrera</i>
14	JUAN DE LA CRUZ BENZAN	ENC. ORGANIZACIÓN RURAL	<i>Juan de la Cruz Benzan</i>
15	ORLANDO BIDO MONTERO	ENC. FITOSANIDAD	<i>Orlando Bido Montero</i>
16	LUIS MIGUEL NUÑEZ	FITOSANIDAD	<i>Luis Miguel Nuñez</i>
17	AGUSTO DE LOS SANTOS TURBI	ENC. SUB-ZONA JUAN HERRERA	<i>Agusto de los Santos Turbi</i>
18	BIENVENIDO MORA TAPIA	ENC. SUB-ZONA SABANA ALTA	<i>Bienvenido Mora Tapia</i>
19	SANTOS MONTERO	ENC. SUB-ZONA PEDRO CORTO	<i>Santos Montero</i>
20	MIGUEL D. SUZAÑA	ENC. SUB-ZONA BOHECHIO	<i>Miguel D. Suzaña</i>
21	QUENNY ANT. SANCHEZ <i>Diamas Mateo</i>	ENC. SUB-ZONA ARROYO LORO	<i>Quenny Ant. Sanchez</i>
22	MAXIMA MONTERO <i>Rochas Talleda</i>	ENC. SUB-ZONA EL CERCADO	<i>Maxima Montero</i>
23	RAMON RODRIGUEZ LUGO	ENC. SUB-ZONA LAS MATAS DE FARFAN	<i>Ramon Rodriguez Lugo</i>

# Date 16 July – Technical Workshops with Communities San Juan Technicians

24	JOSE AUGUSTO DIEGUEZ	ENC. SUB-ZONA VALLEJUELO	
25	LUIS EMILIO MENDEZ	MEDIO AMBIENTE	<i>[Signature]</i>
26	VICTORIA LORENZO RAMIREZ	MEDIO AMBIENTE	<i>[Signature]</i>
27	MERCEDES RAMIREZ VILLEGAS	OFICINA SECTORIAL DE LA MUJER RURAL	<i>[Signature]</i>
28	PEDRO BAEZ	TECNICO MEDIO AMBIENTE	<i>[Signature]</i>
29	JONATHAN VALDEZ	TECNICO MEDIO AMBIENTE	
30	PEDRO BEATO <i>(Daura M. Rola)</i>	ENCARGADO REGIONAL MEDIO AMBIENTE	<i>[Signature]</i>
31	FREDDY FRIAS	IDRHI	<i>[Signature]</i>
32	CELSE CANARIO	SUB-GERENTE (I.A.D)	<i>[Signature]</i>
33	JOSE MONTERO M.	ENC. PRODUCCION (I.A.D)	<i>[Signature]</i>
34	MANUEL ENCARNACION	ENCARGADO EST. EXP, ARROYOLORO (IDIAF)	
35	TIRSO BIDO JIMENEZ	TECNICO DE LA JUNTA DE REGANTE	<i>[Signature]</i>
36	MODESTO DE LEON	ENCARGADO REG. CODOCAFE	<i>[Signature]</i>
37	Fiorm. Durañ Reyes	Enc. Reg. Extension	<i>[Signature]</i>
38	Mahin Alcantara	Enc. F. recurso forestal	<i>[Signature]</i>
39	José Nova Rosado		<i>[Signature]</i> M.A.
40	David del Rosario	coord. Ext. CODOCAFE	<i>[Signature]</i>
41 José Ant de León M.A			<i>[Signature]</i>
42 Wilian Mojica Romo			<i>[Signature]</i>



FUNDACION  
PLENITUD

Talleres en San Juan de la Maguana

VCA - Agricultura

17 de julio, 2014

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25	Adriano Montero	Cooperadora Tca.	-
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27			
28			
29			
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32			
33			

# Date 23 July – Workshops with Communities Hondo Valle producers and farmers



FUNDACION  
PLENITUD

Taller Comunitario en Sub-zona Hondo Valle

VCA – Agricultura

23 de julio, 2014

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# Anexo 18: List of National Consultation Workshop participants



Talleres De Consulta \* VCA – Agricultura  
Hotel Barceló Santo Domingo  
30 de octubre, 2014 \* 9 am a 4 pm

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