



**UNIVERSIDAD SAN FRANCISCO DE QUITO**

**Colegio de Postgrados**

**Design and implementation of a GIS zoning of major crops in the  
province of Santo Domingo de los Tsáchilas**

**Adrián Rolando Cevallos Dueñas**

**Richard Resl. PhDc., Director de Tesis**

Tesis de grado presentada como requisito para la obtención del título de Maestría en  
Sistemas de Información Geográfica

Quito, Abril 2013

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**HOJA DE APROBACIÓN DE TESIS**

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**Adrián Rolando Cevallos Dueñas**

Richard Resl. PhD (c).,  
Director de Tesis

---

Anton Eitzinger, Msc.,  
Miembro Comité de Tesis

---

Richard Resl. PhD (c).,  
Director de la Maestría en Sistemas  
de Información Geográfica

---

Stella de la Torre, Ph.D.,  
Decana del Colegio de  
Ciencias Biológicas y Ambientales

---

Victor Viteri Breedy, Ph.D.,  
Decano del Colegio de Postgrados

---

Quito, Abril 2013

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Nombre: Adrian Rolando Cevallos Dueñas

C. I.: 171418309-0

Fecha: 30 de Abril de 2013

## **DEDICATION**

### **To God**

He always helped me and blessed me at all times, for having guided me to achieve another goal in my life.

### **Estefany my beloved wife, my children, Adry and Alessandrito**

So long... so many years devoted to study, and I have taken time that belonged to you, that is why I want to dedicate to you this achievement, because you were essential and indispensable to get my goals, your love and your laughter prompted me to follow.

### **My parents Rolando and Astrid**

For always being supporting me, for being an example of perseverance and responsibility, for being good people and excellent parents, but mostly because of that great love you always have given to me.

### **My brothers Erick and Alondry**

Because their joy and their jokes were special incentives to move forward on this project so important in my life.

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To my beautiful little children Adrian and Alessandrito, my motivation was to share beautiful and fun moments with you, moments that have helped me keep going. I've worked at this job in order to give an example so that someday you can be good people, hardworking, consistent and right professionals.

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## **RESUMEN**

El actual trabajo de Tesis consiste en la creación de un Sistema de Información Geográfico que servirá a la Dirección Provincial del Ministerio de Agricultura, ganadería, Acuacultura y Pesca (MAGAP) en Santo Domingo, para identificar el potencial real de la provincia y con esto poder desarrollar estrategias de capacitación y asesorías hacia el agricultor.

La información que se adquirió fue por parte de una muestra considerable de agricultores (llamados informantes por parte del MAGAP) en toda la provincia, en la cual se obtuvo datos de que tienen sembrado, la variedad y las hectáreas sembradas, entre otros datos importantes para nuestra investigación. Estos datos se los geo-referenció para poderlos procesar espacialmente. Los datos fueron adquiridos por parte del personal técnico del MAGAP – Santo Domingo, por su interés en conocer el potencial real de la Provincia.

Consolidando y procesando toda la información (utilizando todo el software que ello implica), el proyecto radica en desarrollar el Sistema de Información Geográfico de tal forma que se lo pueda publicar en un Servidor Web local para que pueda ser visualizado y actualizado constantemente.

## **ABSTRACT**

The current thesis work involves the creation of a Geographic Information System that will serve the Provincial Directorate of the Ministry of Agriculture, Livestock, Aquaculture and Fisheries (MAGAP) in Santo Domingo, to identify the real potential of the province and with this be able to make strategies and training advice to the farmer.

The information was acquired by a large sample of farmers (called informers by the MAGAP) across the province, in which data was obtained of seed, variety and the hectares planted, among other important information for our research. These data are geo-spatially Referencing to process them. Data were acquired by the technical staff MAGAP - Santo Domingo, for their interest in knowing the real potential of the province.

Having consolidated and processed all the information (using all the software that implies), the project is to develop the Geographic Information System so that it can publish to a local Web Server so it can be displayed and updated.



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**CHAPTER I**  
**GENERALITIES**

# **CHAPTER I**

## **GENERALITIES**

### **1. INTRODUCTION**

#### **1.1 PROJECT JUSTIFICATION**

Geographic Information Systems (GIS and GIS English) worldwide have been becoming an important tool in making decisions of a lot of institutions, including the Government of Ecuador, through their institutions, are currently developing GIS various purposes, such as: control of afforestation, vegetation and wildlife inventories, price control in the market of plant and animals, among others. Bringing with it all more insight to optimize resources, making the best decisions (Taller: Manejo de coordenadas geográficas y dispositivos GPS – Instituto Geográfico Militar, 2012).

The research was conducted in the province of Santo Domingo de los Tsáchilas, this area is mainly dedicated to commerce and agriculture in general. The project covered 198,193.5 hectares, finding that the product mostly planted in the province was the cocoa with 16,047 ha, in contrast to the idea, in which it was assumed that the product mostly planted in the province was oil palm, but actually it isn't, it was determined in a hedge of 12,137 ha. That is why the research yielded unexpected results, leaving the light, the true power of the province (MAGAP, 2012).

Considering all the above mentioned, the Province, through the Ministry of Agriculture, Livestock, Aquaculture (MAGAP), Provincial Directorate of Santo Domingo, it is necessary, to know the real potential of the province, in order to develop strategies to assist the farmer to make the best decisions on their investment in the technical support that would provide the MAGAP, zoning of trainings according to the reality of the area (What is mostly planted in that area?), then with a GIS and the right information, you can know, what product on the market is saturated, what product will be in the near and distant future?, which according to the weather products can be seeded to maximize capital invested by the farmer.

Currently one of the most valuable resources of an enterprise is the information it has, and the information that can be generated based on it.

Obtaining information in many cases leads to high production costs, but once generated this, would reward their benefit exponentially, in particular, to the community as a public entity.

Currently, Provincial Directorate of MAGAP does not have this important tool to improve the performance of the institution, with regard to advice to farmers in the area, for this reason, it is necessary, the work of collecting information, and this, the design of the GIS, to provide effective advice to farmers, stroke strategies to promote agriculture and to make efforts even more effective and avoid unnecessary losses by the lack of appropriate strategies for the different areas of the province.

Summarizing, a GIS, with the information needed to capture the real potential of the province, you can actually know what products are most widely planted; beneficiary directly to farmers economically, avoiding products that invest in saturated or inappropriate for the climate of the province, the MAGAP can design training strategies in line with current realities. As a result, promote the economy of the province in general, optimizing agricultural sector.

## **1.2 PROBLEM**

Currently the MAGAP cannot establish the real potential of the province in the context of agriculture, as is generally thought that the product mostly planted in the province is the palm, but this cannot be determined exactly, not counting qualitative information accurate, and only based on empirical findings, rather this information is not taken, nor supported by a technical and field work to assert a reality regarding this subject.

The MAGAP cannot develop concrete strategies that are efficient in enhancing the work of the farmer, according to the potential of the province, its climate, and different variables that can affect a farmer's production.

Counseling is a key part in promoting the economy and good results in the production of the farmer and has no exact knowledge of what is being planted in the province, and where they are located to focus on where they should dictate the training and support (by the MAGAP) compared to the real needs of the area, based on what most have sown.

The problem is based on having no real information, methodically acquired to establish real situations, and could not identify the actual agricultural potential of the province, in order to develop strategies that enhance and effectuate farmer's effort.

### **1.3 OBJECTIVES**

#### **1.3.1 GENERAL OBJECTIVE**

Design and implement a GIS for MAGAP, the agricultural potential of the province of Santo Domingo de los Tsáchilas, to help creating advisory plans as regards: What to plant? What products are saturated or will? All this as a service to the local farmer based on exact reality of it.

#### **1.3.2 SPECIFIC OBJECTIVES**

- Collect information on what is currently planted in the province. Generating spreadsheet file with all the data collected.
- Boosting the economy of the province making effective efforts of farmers with real information potential of the area.
- Provide accurate information to the farmer who sows to avoid products that are saturated or near saturated.
- Determining areas of crops types of training schemes for designing specific needs.

### **1.4 THEORETICAL AND CONCEPTUAL FRAMEWORK**

#### **1.4.1 AGRICULTURE**

For our purposes, agriculture is the set of activities performed by the man with a productive purpose based primarily on land use and adapt rationally means to extract of cultivated plants and even spontaneous and pets economic performance in framework of a social system based on techniques and applying scientific and engineering principles.



Those activities should be developed within the framework of protection and preservation of the environment and sustainable development (Mateo Box, José M. 2008).

### 1.4.2 GEOGRAPHIC INFORMATION SYSTEM (GIS)

Geographic Information Systems are, first, information systems, i.e. programs designed to represent and manage large volumes of data on certain aspects of the world (Martín 1991 cit. en Gutiérrez and Gould 1994).

A Geographic Information System (GIS) is an information system designed to work with georeferenced data by geographic spatial coordinates (Star and Estes 1990 cit. in Gutiérrez and Gould 1994), i.e. geographic information (Gutiérrez and Gould 1994).

Then, a Geographic Information System (GIS) is a computer-aided system for the capture, storage, retrieval, analysis and display of spatial information, enabling process and generate new information derived from the existing based on concepts such as location, relationship, description and relational database (Araneda C., Edgardo 2005).

Geographic Information Systems (GIS) have been developed parallel to the techniques applied to mapping and spatial analysis. These systems have been demanded for various knowledge areas that have many similarities in their bases. Thus, there may be mentioned as core relationship to topography, thematic mapping, geography, civil engineering, urban and rural planning, soil science, inventoried, photogrammetry, etc. The latest additions have been the use of computer networks, remote sensing and satellite image analysis (Peña Llopis, Juan 2010).

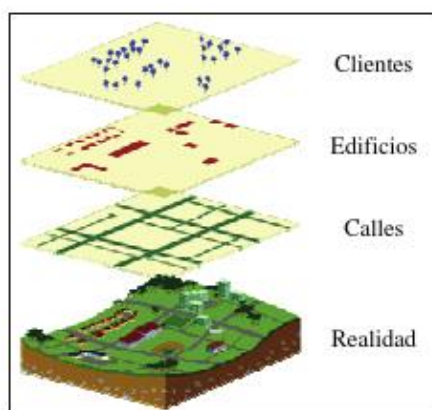


Figure1 – Example of GIS

### 1.4.2.1 COMPONENTS OF A GIS

**Users:** GIS technologies are of limited value without specialists manage the system and develop plans for implementation. Without expert staff development, information lags and wrongly handled, and the hardware and software is not handled to their full potential (Peña Llopis, Juan 2010).

**Software:** GIS programs provide the tools and features needed to store, analyze and display geographic information. Theme in components of GIS software are:

- Management system database.
- A graphical user interface (GUI) for easy access to tools.
- Tools for capturing and managing geographic information.
- Tools to support queries, analysis and visualization of geographic data.

Currently most GIS software vendors distribute products easy to use and can recognize geographic information structured in many different formats (Peña Llopis, Juan 2010).

**Hardware:** GIS work in a wide range of types of computers from centralized systems to individual or network configurations. This organization requires specific hardware to meet the needs of each application (Peña Llopis, Juan 2010).

**Data:** The most important component to a GIS is information. Good data is needed to support the GIS can solve problems and answer questions as accurate as possible. Achieving good data usually absorbs between 60 and 80% of the budget of the GIS implementation, and data collection is a long process that often delays the development of products that are useful. Geographic and alphanumeric data can be obtained by own funds or obtained by data providers. Maintain, organize and manage the data must be organizational policy (Peña Llopis, Juan 2010).

**Methods:** For SIG has a successful implementation must be based on good design and defined business rules, which are the models and operating practices unique to each organization (Peña Llopis, Juan 2010).

#### **1.4.2.2 STATIC MAPS**

It is the most basic form of publication; this is to generate a raster image into a standard format like. Gif or Pdf for example, and place it on a website commonplace. Such publication does not offer many possibilities; it does not allow large resolutions because the file size would be excessive. Nor can we get more information than that provided by the image, that is, we cannot access the alphanumeric information mapped elements. (Coll Aliaga, Eloína; Martínez Llario, José Carlos; Sanz Salinas, Jorge Gaspar. 2005)

#### **1.4.2.3 SENSITIVE STATIC MAPS**

These maps are still static, i.e., the image varies depending on the scale display or are connected directly to our map data. Instead offer some new options, such as zooming in on the mapping, or display any associated information. Although not directly linked to the GIS, in some cases are interesting. For example in cases where the data will not vary over time, as the level of a college campus or a tourist map. These maps are an alternative for its simplicity, not requiring large resources and its low cost. (Coll Aliaga, Eloína; Martínez Llario, José Carlos; Sanz Salinas, Jorge Gaspar. 2005)

#### **1.4.2.4 WHAT IS A GEOGRAPHIC INFORMATION SYSTEM (GIS)?**

A GIS is a set of software that has the ability to store, organize, analyze, and present spatial data. Those data with geographic references, e.g. insect densities (number of individuals per unit area), soil types, vegetation, roads, climate data, can be incorporated into a GIS and then be used in the manufacture of thematic maps or coverages that allow the visualization and analysis of integrated form of the original data and not as individual entities. The two types of data that are all geographical features (spatial and descriptive) are combined in GIS facilitating analyzing their interaction within a map or between several maps, and get a new one with its own characteristics.

#### **1.4.3 GLOBAL POSITIONING SYSTEM (GPS)**

The Global Positioning System (GPS) is a satellite-based navigation, developed and operated by the Department of Defense of the United States. Started in the early 80s, this system was declared fully operational on April 27, 1995. Fully operational means that the

system can be used to determine the position of a receiver 24 hours a day, anywhere on the earth. The system was originally conceived as an aid to navigation for the military forces of the United States, but now the GPS is also used for industrial, commercial and civil purposes. The service is available, free of charge, 24 hours a day and in all weather conditions (Universidad Iberoamericana de Ciencias y Tecnología 2007).

#### **1.4.3.1 DIFFERENTIAL CORRECTION**

There are a number of errors that reduce GPS accuracy, resulting in an error of between 5 and 20 m (prior to the removal of selective availability error amounted to 100 m). This can be useful for some activities but not for some uses in agriculture for the accuracy required in the standings. Therefore it requires a method for substantially improving the accuracy. The most common method today is the differential correction (DGPS Differential Global Positioning System).

#### **1.4.3.2 NUMBER OF VISIBLE SATELLITES**

The more satellites a receiver gets, the more precise position, as it decreases the area of uncertainty of position possible. The minimum satellites to locate a receiver in three dimensions is 4, each satellite is added to improve measurement accuracy. The theoretical maximum of satellites that can be received is 12, but generally they are too close to the horizon are not received. In practice it usually works with a maximum of 8, which results in a very good accuracy, it is recommended to work with at least 5 or more (Universidad Iberoamericana de Ciencias y Tecnología 2007).

#### **1.4.4 GIS AND WEB TECHNOLOGIES**

The Web server is responsible for receiving HTTP requests to web pages that are offered to the public Internet. Therefore, it appears as the first point of contact with our organization. Once the request is received by the web server will perform the necessary functions to retrieve the requested web page and send it to the applicant. If the requested HTML page is static, and does not contain transcendental, storage may be permitted directly on the server. But the web server usually will build relying on HTML page requests to other servers. (Aznar López, Andrés. 2005)

#### **1.4.4.1 MAP-BASED HTML**

With HTML you can assign a static image (.gif,.png,.jpeg, etc.) a number of "regions" from the coordinates in pixels. Each of these regions can be assigned a hyperlink to another website. In this way you can create maps with successive levels of zoom. (Coll Aliaga, Eloína; Martínez Llario, José Carlos; Sanz Salinas, Jorge Gaspar. 2005)

#### **1.4.4.2 FLASH-BASED LANGUAGE**

Flash was developed by Macromedia and revolutionized Internet. There are few sites that do not include this technology to present their content because of its great advantages is vector to generate animations in a simple, small footprint and allows interaction with the user in response to their actions. These features are ideally suited to the presentation of mapping content and are present for example in street as offered in <http://callejero.lanetro.com/>. This street (like many others) is not a sensitive static map service but an actual map server, delivering the "customer" a document. Swf (Flash file format) automatically generated from the mapping located in that server. In any case the working philosophy remains the same as in the previous cases: by any extension of our GIS software generates a swf file and the 'insert' on our website. This process, as before, is capable of being automated. An example is the tool of the French company GeoClip EMC3. (Coll Aliaga, Eloína; Martínez Llario, José Carlos; Sanz Salinas, Jorge Gaspar. 2005)

#### **1.4.4.3 LANGUAGE-BASED XML: SVG**

XML: The HTML language is the most widely used Internet to file any type of document is not a language but very useful when we want to represent other information. In order to create a more general language that could spread to other purposes, the consortium for the World Wide Web (W3C) has developed a language called XML (Extensible Markup Language) is aimed precisely that. By itself it is not a language but rather a way of structuring information. Depending on the objective of our project, we will adapt the language to our needs. (Coll Aliaga, Eloína; Martínez Llario, José Carlos; Sanz Salinas, Jorge Gaspar. 2005)

SVG: From XML, and also developed by the W3C, the language appears SVG (Scalable Vector Graphics). This language allows online display vector images. It is a standards-based alternative to Flash language. We can turn our maps to this format and post them online. For the computer "client" can handle this format requires a viewer or plug-in. Currently, the most common is developed by Adobe. Hopefully in the near future browsers accept this format natively. (Coll Aliaga, Eloína; Martínez Llario, José Carlos; Sanz Salinas, Jorge Gaspar. 2005)

### 1.4.5 MAP SERVERS

A map server is simply software able to interact with GIS data sources and present them on the Internet thanks to a web server. For parts: a web server is a program that allows the computer on which it resides is able to publish content on the Internet. Once a computer can publish on the Internet, then you may be added a map server to present such data. A simple diagram of this configuration is shown in the following figure (Coll Aliaga, Eloína; Martínez Llario, José Carlos; Sanz Salinas, Jorge Gaspar. 2005).

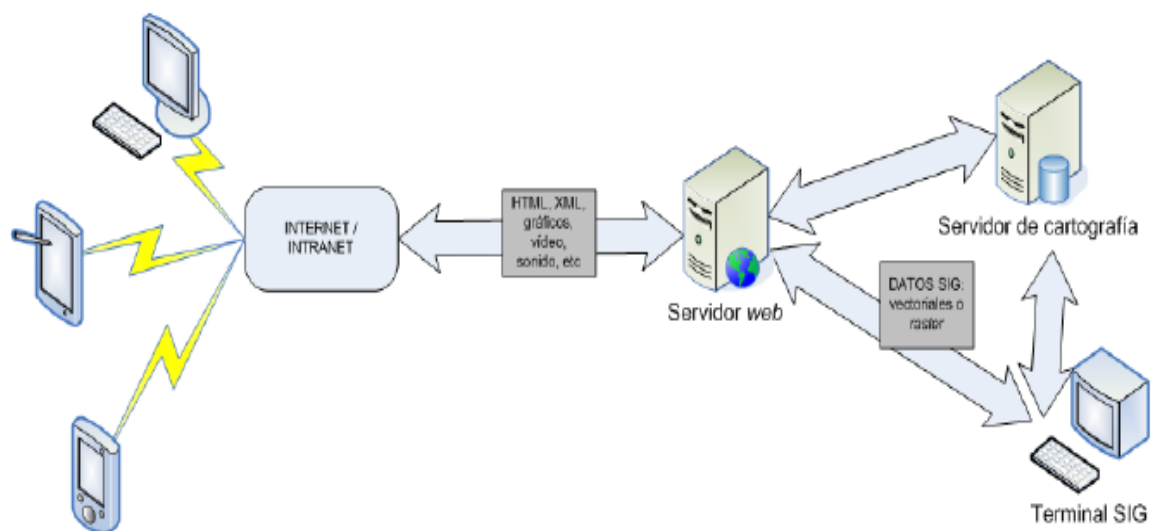


Figure2 - Schematic of a Map Server

#### 1.4.5.1 PROPRIETARY SOFTWARE ALTERNATIVES

Several software vendors provide GIS mapping servers that work with their storage formats and in some cases with other more or less standard formats. Some examples can be:

- ArcIMS from ESRI
- GeomediaWebMap from Intergraph
- MapXtreme from MapInfo
- MapGuide from Autodesk

#### **1.4.5.2 FREE SOFTWARE ALTERNATIVES**

More and more solutions for online publication are appearing; you can access the source code and use them freely. Just go digging on <http://www.freegis.org> and view projects that are added. They perform projects of any size. Some are offered as Java libraries capable of working with geographic data and present them in the client using an applet (16). The alternatives will be divided into two classes, which are offered as libraries for performing custom applications and server maps.

##### **Libraries**

**GeoTools:** Java libraries to present geographic data. It provides an implementation of OGC specifications.

**OpenMap:** This is an assembly of components for constructing Java Applets capable of displaying mapping.

**GDAL:** Access library able to manipulate raster images and convert files in many formats.

**OGR:** Library access to vector images that provides tools for reading and writing in various formats.

**PROJ.4:** Library generic coordinate conversion between different coordinate systems or datums.

##### **MAP SERVERS**

**Deegree:** Mapping server that meets the standards of the software block for building custom applications.

**Geoserver:** Project for the full implementation of the OGCWFS specification, with an integrated WMS server.

**UMNMapserver:** Open Source Project for building web applications with mapping of the University of Minnesota.

## **1.4.6 GISCLOUD.COM**

We provide building blocks for building next generation enterprise geo applications. Our platform runs on the cloud or on a firewall install (private cloud). Not only that you can host and visualize your data, but also you can use our APIs to customize and integrate GIS Cloud into third-party solutions. We take care of the hard work and let you focus on your specific development (giscloud.com .2012).

### **1.4.6.1 GISCLOUD.COM - MAP EDITOR**

GIS Cloud's Map Editor is a powerful cloud based map editor that enables you to easily build and share your maps. It supports number of vector and raster formats, rich GIS symbology and it has built-in collaboration capabilities (giscloud.com 2012).

Developed on the latest HTML5 technologies, it is the first of its kind application with full vector-based editing and real-time updates to the geo database (giscloud.com .2012).

## **1.5 METHODOLOGY**

The methodology applied for this study was participatory, since inputs of information collected was by the Provincial Directorate of MAGAP - Santo Domingo, specifically its technical staff, who visited the communities as major established from the point of view of production. The meetings were conducted for representatives of each community or authorities, who provided input for this project (MAGAP, 2011).

### **1.5.1 DATA COLLECTION**

For data collection a survey was representative of the community and thus obtained the following data:

- Overview comprising: geographic location of the Parish and the identification of sector representative, list of producers, list of legal communities.
- Social information comprising: legal sector, and legalization of land tenure and intervention and support.
- Agricultural information with the following information: main crops, planting and harvesting dates, destination of production, and estimated production per hectare of crop varieties that are planted crop.



- Livestock and fishing information that includes: livestock, animal husbandry, milk production estimated fish and information.
- Information Machinery, Equipment and Infrastructure: Ownership of machinery, equipment and irrigation infrastructure.

Once visited communities were planned and the information was obtained, we proceeded to organize, tabulate and analyze survey data, with the statistical tools ordering information through an array consolidated by the SINA's team. Variables were subsequently analyzed in more productive areas representative of the province, which gives rise to the information contained in this document (MAGAP, 2011).

### **1.5.2 GENERATION SPREADSHEET - TABULATION**

Information obtained, we proceeded to generate spreadsheets where information would be stored and then collected, tabulated in an electronic spreadsheet, and this will serve as a basis to generate the tables of a geo-database (Geographic Database).

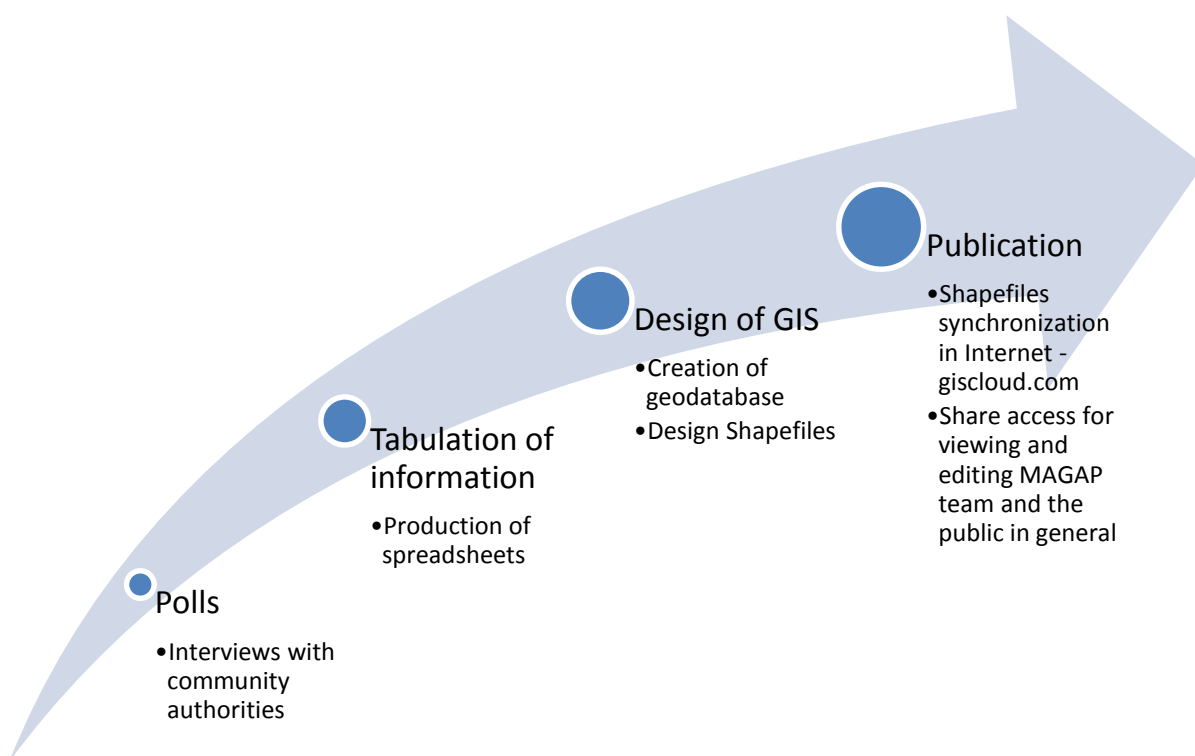
### **1.5.3 DESIGN GEO-DATABASE AND SHAPEFILES**

After obtaining the data based on surveys and interviews, we proceeded to process information to design shape file (shp), and let this information base to develop new knowledge in agriculture in the province. That is why the shape file be designed based on spreadsheets that were the basis for the creation of the geo-database, and from that point we can get what are the products mostly planted?, What is their distribution in the area?, where are located the greatest producers product?, etc.

### **1.5.4 PUBLICATION OF GIS ON THE WEB**

Shape file will be published on the Internet to be used by technical staff MAGAP, to keep the information and develop new information from published information also it may develop training strategies and decision-making on the part of the technical and provincial authorities, in order to realize the central government's efforts to promote agriculture in the province of Santo Domingo. To perform this task, we proceeded to use a very versatile tool and are free as GIS Cloud, this has an extension that can be installed in ESRI Arc Map and this in turn can upload files of our project directly to an account previously created, and

from there it is published on the web, for later reference or updating data. It's worth noting that you can sync directly from Arc Map to our account GIS Cloud any rate that was made in the data.



**Figure3 – Methodology for the Design of an agricultural GIS Santo Domingo Province**

**CHAPTER II**  
**RESULTS**

## CHAPTER II

### 2. RESULTS

#### 2.1 OVERVIEW OF THE STUDY AREA

The Province of Santo Domingo de los Tsáchilas is located geographically between  $0^{\circ} 40'53.3''$  and  $0^{\circ} 0'6.2''$  South latitude and  $79^{\circ} 32'16''$  and  $78^{\circ} 43'58.3''$  West longitude, located in the area of continental Ecuador, in the foothills of the Andes Mountains to 133 km west of the city of Quito. It is bordered to the north by the provinces of Esmeraldas and Pichincha, to the south by the province of Los Ríos, to the east by the province of Cotopaxi and to the west by the province of Manabi. It has an area of 3,532 km<sup>2</sup> in which sits a population of 331,126 inhabitants. It has an average elevation of 665 meters above sea level, the average temperature is  $23^{\circ} \text{C}$ , average annual precipitation ranges from 500 to 5,000 mm / year and average monthly humidity reaches 90.9% (GADPSDT, 2009).

It comprises seven rural parishes: Alluriquín, El Esfuerzo, Luz de América, Puerto Limón, San Jacinto del Búa, Santa María del Toachi and Valle Hermoso. (See Figure 4). And it has 6 urban parishes: Santo Domingo de los Colorados, Chiguilpe, Rio Verde, Abraham Calazacón, Bomboli and Zaracay.



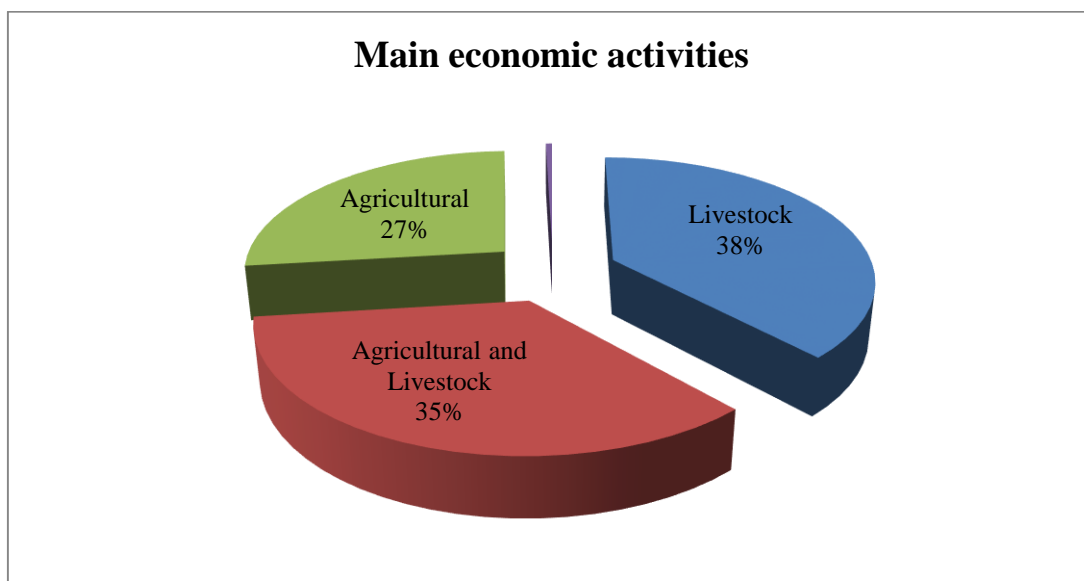
Figure4: Political Map of the Province of Santo Domingo de los Tsáchilas, GPSDT - GEOPLADES, 2009

In the province of Santo Domingo, we found about 5 sub-basins, including the quote from the rivers Blanco, Daule and Vinces, which in turn belong to the basins of the rivers Esmeraldas and Guayas respectively, and about 44 micro-basins (MAGAP, 2011).

The eastern part of the province comprises the western foothills of Alluriquín sector. In this province sits Tsáchila ethnicity, which named the province. In 1995 this ethnic acquired legal status as the Folklore Foundation (MAGAP, 2011).

## 2.2 TABULATION OF DATA

The province of Santo Domingo de los Tsáchilas, is known for its productive vocation in agriculture with **82% of the land dedicated to agricultural and livestock production** (MAGAP, 2011).



**Figure5 - Main economic activities in the province of Santo Domingo de los Tsáchilas**

*Fuente: UZIs – Santo Domingo SINAGAP – MAGAP 2011*

Given this perspective, we proceeded to scan the information to a spreadsheet file where the information was tabulated with the following columns:

1. **ID:** unique number or code tabulated record
2. **FECHA:** Date on which the survey was conducted
3. **NEncuesta:** Number of survey
4. **Provincia:** Province where the survey was conducted
5. **Cantón:** Canton where the survey was conducted
6. **Parroquia:** Parish where the survey was conducted
7. **Sector Caserío Recinto:** Type of political organization where the survey was conducted
8. **X:**Coordinate (Horizontal) UTM

9. **Y:**Coordinate (Vertical) UTM
10. **Z:**Coordinate (height) UTM
11. **Cultivos Sembrados:** Crop Name
12. **Ha:** Hectares
13. **Variedad Sembrada:** Crop Variety
14. **Semilla Certificada:** Indication if used for certified seed cultivation
15. **Producción Total:** Production units
16. **Nombre:** Name of the production unit
17. **EquivLIBRA:** Equivalence production in pounds
18. **Semilla Porcentaje:** Percentage of production destined for use as seed
19. **Auto Consumo Porcentaje:** Percentage of domestic consumption
20. **Mercado Porcentaje:** Percentage consumption market production.
21. **Localidad:** Location where production is marketed

Research (interviews and surveys, see Figure 6) was conducted on a sample of 81.47% of the total acres devoted to agriculture in the province. Below are the following general data of the Province (Table 1) and the size of the investigation.

- 183,864 hectares of sampling information gathered by the SINAGAP
- 225,675 hectares of agricultural land in the province, 64% of the total area of the province (SINAGRO, 2009)
- 353196.68 Total area (hectares) of the Province (GADPSDT)
- 81.47% obtained by sampling SINAGAP

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	
1	ID	FECHA	Enc	Provincia	Canton	Parroquia	Sector/Caserio/Recin	X	Y	Z	Cultivos/Sembra	Ha	riedadSemb	laCe	oduccion	Nomb	quivUl	laPc	sum	doPc	Localidad	Tm	
2	1	07-07-2011	1	Santo Domingo de los T	Santo Domingo	Alluriquín	El Maitón	720878	9959807	1143	pitahaya	20	amarilla	no	80000,00	kg	2,20	0%	0%	100%	Santo Domingo	80,00	
3	2	07-07-2011	1	Santo Domingo de los T	Santo Domingo	Alluriquín	El Maitón	720878	9959807	1143	Pastos Cultivados	600	miel										
4	3	07-07-2011	1	Santo Domingo de los T	Santo Domingo	Alluriquín	El Maitón	720878	9959807	1143	Montes y Bosques	10											
5	4	07-07-2011	2	Santo Domingo de los T	Santo Domingo	Alluriquín	San Vicente	721201	9959468	1147	Pastos Cultivados	200	miel										
6	5	07-07-2011	2	Santo Domingo de los T	Santo Domingo	Alluriquín	San Vicente	721201	9959468	1147	Montes y Bosques	3											
7	6	15-07-2011	3	Santo Domingo de los T	Santo Domingo	Alluriquín	Bellavista	739989	9972052	2008	narajilla	20	jugo	no	1200,00	quintal	100,00	0%	0%	100%	Santo Domingo	54,55	
8	7	15-07-2011	3	Santo Domingo de los T	Santo Domingo	Alluriquín	Bellavista	739989	9972052	2008	Pastos Cultivados	4000	miel										
9	8	15-07-2011	3	Santo Domingo de los T	Santo Domingo	Alluriquín	Bellavista	739989	9972052	2008	Montes y Bosques	6000											
10	9	15-07-2011	4	Santo Domingo de los T	Santo Domingo	Alluriquín	Lindiche Alto	721168	9972230	946	caña guadua	3	brava	no	3600,00	caña	40,00	0%	0%	100%	Santo Domingo	65,45	
11	10	15-07-2011	4	Santo Domingo de los T	Santo Domingo	Alluriquín	Lindiche Alto	721168	9972230	946	Pastos Cultivados	750	Brachiaria										
12	11	15-07-2011	4	Santo Domingo de los T	Santo Domingo	Alluriquín	Lindiche Alto	721168	9972230	946	Montes y Bosques	5											
13	12	15-07-2011	5	Santo Domingo de los T	Santo Domingo	Alluriquín	El Transito	738070	9966096	1564	Pastos Cultivados	500	miel										
14	13	15-07-2011	5	Santo Domingo de los T	Santo Domingo	Alluriquín	El Transito	738070	9966096	1564	Montes y Bosques	40											
15	14	18-07-2011	6	Santo Domingo de los T	Santo Domingo	Alluriquín	San José de Pilaton	727257	9967005	1069	Pastos Cultivados	1000	gramalote	no									
16	15	18-07-2011	6	Santo Domingo de los T	Santo Domingo	Alluriquín	San José de Pilaton	727257	9967005	1069	Montes y Bosques	100											
17	16	13-07-2011	7	Santo Domingo de los T	Santo Domingo	Alluriquín	San Miguel de Lelia	719709	9960251	896	Pastos Cultivados	500	miel										
18	17	13-07-2011	7	Santo Domingo de los T	Santo Domingo	Alluriquín	San Miguel de Lelia	719709	9960251	896	Montes y Bosques	20											
19	18	19-07-2011	8	Santo Domingo de los T	Santo Domingo	Alluriquín	12 de Octubre	720374	9975530	895	cacao	4	CCN51	no	60,00	quintal	100,00	0%	0%	100%	Santo Domingo	2,73	
20	19	19-07-2011	8	Santo Domingo de los T	Santo Domingo	Alluriquín	12 de Octubre	720374	9975530	895	narajilla	4	jugo	no	120,00	quintal	100,00	1%	10%	89%	Santo Domingo	5,45	
21	20	19-07-2011	8	Santo Domingo de los T	Santo Domingo	Alluriquín	12 de Octubre	720374	9975530	895	Pastos Cultivados	500	Brachiaria										
22	21	19-07-2011	8	Santo Domingo de los T	Santo Domingo	Alluriquín	12 de Octubre	720374	9975530	895	Montes y Bosques	60											
23	22	19-07-2011	9	Santo Domingo de los T	Santo Domingo	Alluriquín	La Magdalena	720660	9967399	910	Naranja	8	criolla	no	3200,00	ciento	50,00	0%	5%	95%	Santo Domingo	72,73	
24	23	19-07-2011	9	Santo Domingo de los T	Santo Domingo	Alluriquín	La Magdalena	720660	9967399	910	Pastos Cultivados	1540	Brachiaria										
25	24	19-07-2011	9	Santo Domingo de los T	Santo Domingo	Alluriquín	La Magdalena	720660	9967399	910	Montes y Bosques	15											
26	25	19-07-2011	10	Santo Domingo de los T	Santo Domingo	Alluriquín	La Florida	720537	9969308	963	Pastos Cultivados	1500	Brachiaria										
27	26	19-07-2011	10	Santo Domingo de los T	Santo Domingo	Alluriquín	La Florida	720537	9969308	963	Montes y Bosques	50											
28	27	18-07-2011	11	Santo Domingo de los T	Santo Domingo	Alluriquín	San José del Meme	724881	9967807	974	Pastos Cultivados	600	Brachiaria										
29	28	18-07-2011	11	Santo Domingo de los T	Santo Domingo	Alluriquín	San José del Meme	724881	9967807	974	Montes y Bosques	100											
30	29	18-07-2011	12	Santo Domingo de los T	Santo Domingo	Alluriquín	Buenos Aires	726227	9970567	1247	Pastos Cultivados	600	miel										
31	30	18-07-2011	12	Santo Domingo de los T	Santo Domingo	Alluriquín	Buenos Aires	726227	9970567	1247	Montes y Bosques	20											
32	31	18-07-2011	13	Santo Domingo de los T	Santo Domingo	Alluriquín	El Dorado	728424	9976260	732	Pastos Cultivados	1000	Brachiaria										
33	32	18-07-2011	13	Santo Domingo de los T	Santo Domingo	Alluriquín	El Dorado	728424	9976260	732	Montes y Bosques	600											
34	33	18-07-2011	14	Santo Domingo de los T	Santo Domingo	Alluriquín	America Libre	729765	9969285	1202	Pastos Cultivados	1000	gramalote	no									
35	34	18-07-2011	14	Santo Domingo de los T	Santo Domingo	Alluriquín	America Libre	729765	9969285	1202	Montes y Bosques	100											
36	35	21-07-2011	15	Santo Domingo de los T	Santo Domingo	Alluriquín	Caldas de Atahualpa	727651	9961451	1258	caña de azucar	15	negra	no	75,00	tm	2200,00	5%	5%	90%	Santo Domingo	75,00	
37	36	21-07-2011	15	Santo Domingo de los T	Santo Domingo	Alluriquín	Caldas de Atahualpa	727651	9961451	1258	Pastos Cultivados	260	Brachiaria										
38	37	21-07-2011	15	Santo Domingo de los T	Santo Domingo	Alluriquín	Caldas de Atahualpa	727651	9961451	1258	Montes y Bosques	15											
39	38	21-07-2011	16	Santo Domingo de los T	Santo Domingo	Alluriquín	Unión del Toachi	727733	9964616	837	caña de azucar	5	piojota	no	45,00	tm	2200,00	5%	95%	0%	Santo Domingo	45,00	

Figure6 - Spreadsheet with the data obtained from surveys

#	PARISH	SAMPLE SOURCES IN AGAP								GPS DT	ESPAC, 2010			SIGAGRO, 2009		
		agriculture and livestock hectares	Agriculture and Livestock % parish	agriculture (crops) hectares	provincial agricultural %	agricultural % parish	livestock (pasture) hectares	% provincial livestock	% parish livestock	total area / ha parish	agriculture and livestock hectares	agriculture (crops) hectares	livestock (pasture) hectares	agriculture and livestock hectares	agriculture (crops) hectares	livestock (pasture) hectares
1	<b>Alluriquín</b>	31750	17,27 %	350	0,60%	1,10%	31400	25,10 %	98,90%	66515,33	37698,38	387,44	38468,67	38970,01	435,78	38279,66
2	<b>El Esfuerzo</b>	12473	6,78%	1157	1,97%	9,28%	11316	9,05 %	90,72%	28433,60	14809,82	1280,75	13863,42	15309,38	1440,56	13795,31
3	<b>Luz de América</b>	20585	11,20 %	13845	23,56 %	67,26 %	6740	5,39 %	32,74%	31343,44	24441,61	15325,88	8257,29	25266,07	17238,11	8216,72
4	<b>Puerto Limón</b>	16087	8,75%	8477	14,42 %	52,69 %	7610	6,08 %	47,31%	30726,60	19100,91	9383,71	9323,14	19745,21	10554,53	9277,33
5	<b>San Jacinto</b>	14346	7,80%	11051	18,80 %	77,03 %	3295	2,63 %	22,97%	19180,78	17033,73	12233,03	4036,76	17608,31	13759,36	4016,93
6	<b>Santa María del Toachi</b>	18952	10,31 %	4552	7,75%	24,02 %	14400	11,51 %	75,98%	43157,52	22502,67	5038,89	17641,68	23261,72	5667,60	17555,00
7	<b>Santo Domingo</b>	51490	28,00 %	12736	21,67 %	24,73 %	38754	30,98 %	75,27%	31162,85	61136,67	14098,26	47478,18	63198,92	15857,32	47244,90
8	<b>Valle Hermoso</b>	18181	9,89%	6601	11,23 %	36,31 %	11580	9,26 %	63,69%	10267,656	21587,22	7307,05	14186,85	22315,39	8218,76	14117,15
	<b>PROVINCE</b>	<b>183864</b>	<b>100,00 %</b>	<b>58769</b>	<b>100,00 %</b>		<b>125095</b>	<b>100,00 %</b>		<b>353196,68</b>	<b>218311,00</b>	<b>65055,00</b>	<b>153256,00</b>	<b>225675,00</b>	<b>73172,00</b>	<b>152503,00</b>
	<b>% REAL - SINAGAP</b>	<b>225675,00</b>	<b>100,00 %</b>	<b>72133,17</b>	<b>31,96 %</b>		<b>153541,83</b>	<b>68,04 %</b>		100,00%	<b>61,81%</b>	29,80%	70,20%	<b>63,89%</b>	32,42%	67,58%

Table1 - General Summary of use of the surface



### 2.3 MOST ATTRACTIVE PRODUCTS PLANTING

Once the information is digitized in a spreadsheet we proceed to import the data to a GIS specialist software, such as ESRI Arc Map, once the data is imported from the spreadsheet, we proceed to process them in a Shape file (shp) attaching them to a geo-database. After processing this information we can see the distribution of points of all information obtained. *See Figure 7.*

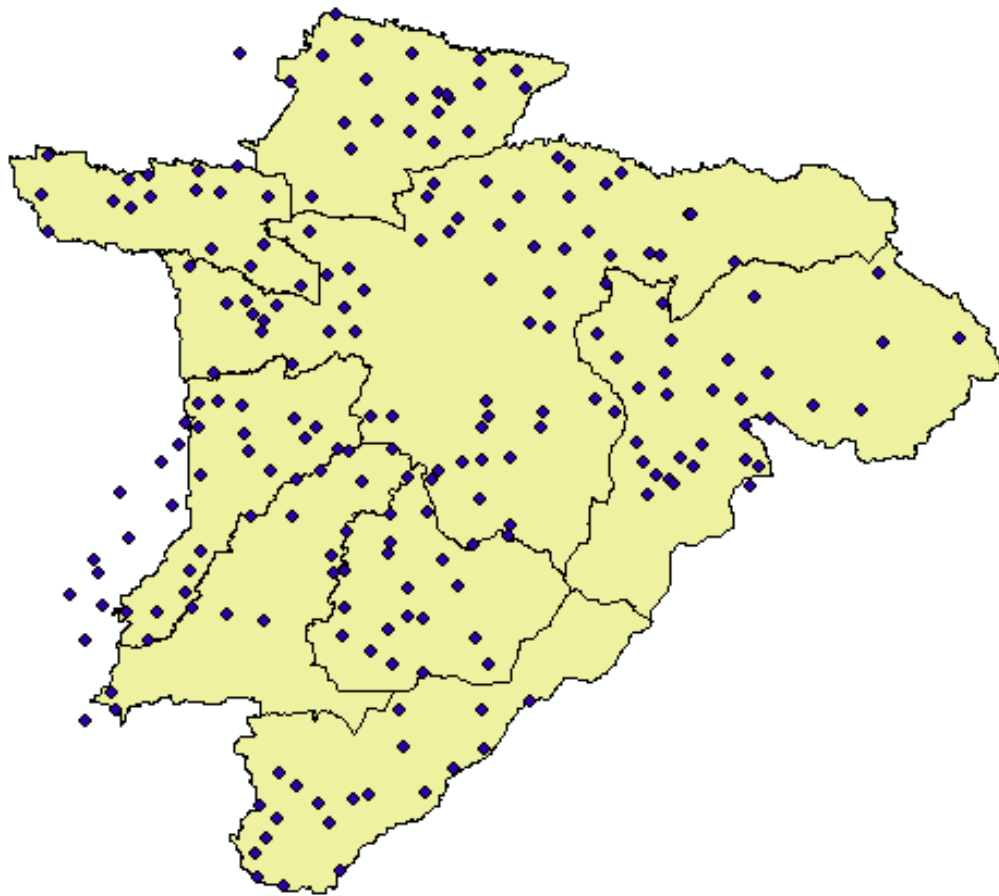


Figure7 - Distribution points all surveys (Venues or hamlets)

At this point we can process the information to determine valuable information such as:

### 2.3.1 HIGHER-VALUE CROPS IN THE MODE

To develop plans and projects of the authorities of the province, it is necessary to know what the real potential of the province is, it is essential to know which the most attractive crops are for farmers in the reality of the province. To obtain this information, we will rely on a popular tool in statistics, as is the Mode, to find out what the most crops have been planted (see Figure 8), but in the case of our study, we only focus on the five most planted (see Table 2) in the province.

#	Crops	Hamlets
1	Cocoa	159
2	Banana	89
3	Yucca	36
4	Oil Palm	26
5	Palmetto	26

Table2 - Crops with the highest values in the Mode of the enclosures or hamlets

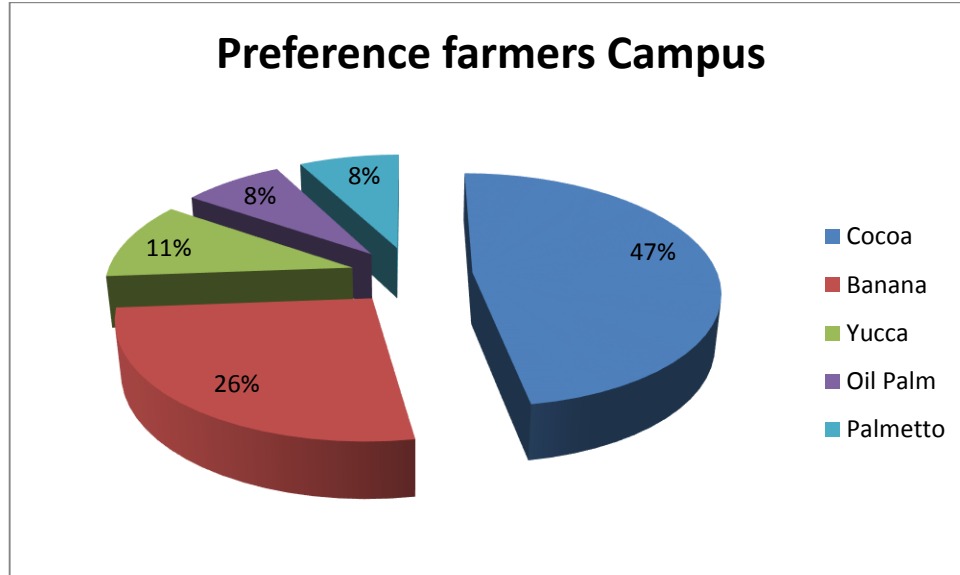


Figure8 - The most cultivated crops in the Province

With the information tabulated and processed in Arc Map, we found that cocoa is the product more attractive to plant among farmers in the province, with the Mode enclosures planted 159 cacao.

### 2.3.1.1 COCOA

As seen in Figure 9, Cocoa crops are distributed throughout much of the territory of the province, specifically in the area with warmer temperature, away from the area of the Andes that has a lower temperature. In conclusion, the Agricultural Production Cocoa Alley occupies much of the territory of the province, especially near the coast with a warmer climate.

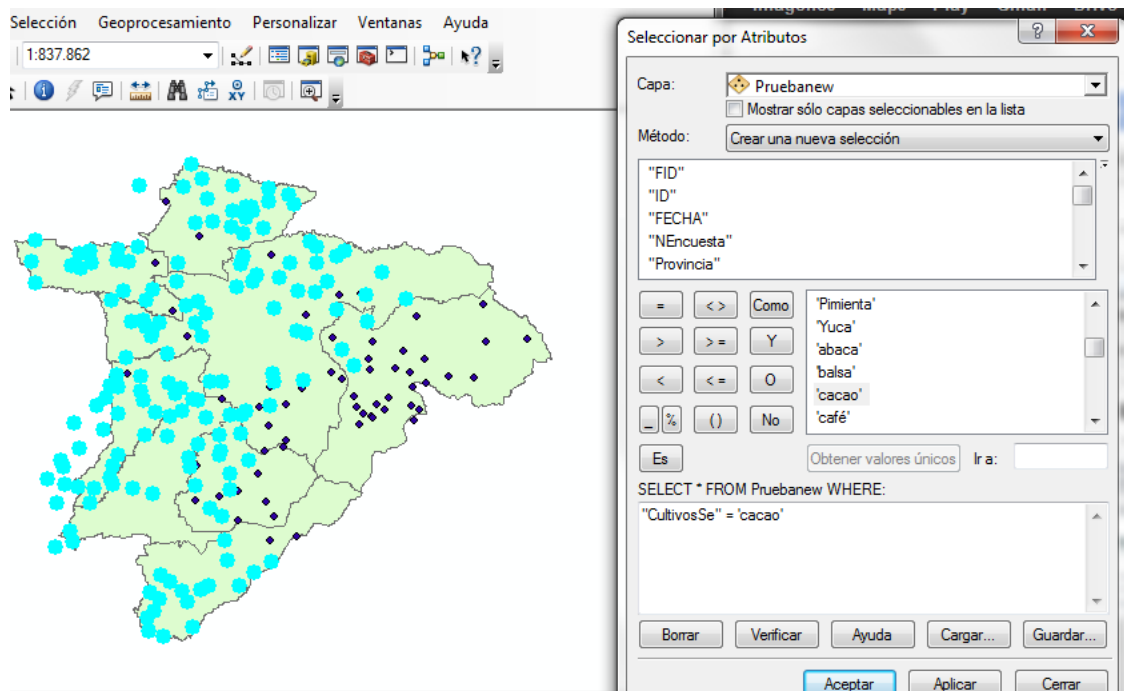


Figure9 - Distribution Points of Farmers who have planted Cocoa

Statistical Cocoa:

Average = 100.92 hectares planted by hamlet

Hamlets = 159

Total hectares in the province = 16.047

	A	B	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	ID	FECHA	Parroquia	Sector/Casero/Recin	X	Y	Z	Cultivos/Sembra	Ha	Arriedad/Semb	lata	Produccion	Nomb	quintal	lata	sumo	lata	Localidad	Tm	
548	647	13-07-2011	Santo Domingo	Delicias del Muirute	710839	9988688	586	cacao	20	CCNS1	no	500,00	quintal	100,00	0%	0%	100%	Santo Domingo	22,73	
550	650	13-07-2011	Santo Domingo	18 de Noviembre	718498	9987356	658	cacao	15	CCNS1	no	300,00	quintal	100,00	0%	0%	100%	Santo Domingo	13,64	
553	653	14-07-2011	Santo Domingo	San Miguel del Toachi	699161	9985094	427	cacao	30	CCNS1	no	540,00	quintal	100,00	0%	0%	100%	Santo Domingo	24,55	
664	659	14-07-2011	Santo Domingo	Nuevo Esperanza	701195	9982050	465	cacao	20	CCNS1	no	560,00	lata	100,00	0%	0%	100%	Santo Domingo	25,45	
664	663	14-07-2011	Santo Domingo	km 13 via quininde	698584	9981313	461	cacao	140	CCNS1	no	2800,00	quintal	100,00	0%	0%	100%	Exportacion	127,27	
668	667	14-07-2011	Santo Domingo	San Antonio del Toachi	708416	9973796	597	cacao	20	CCNS1	no	300,00	quintal	100,00	0%	0%	100%	Santo Domingo	13,64	
671	670	14-07-2011	Santo Domingo	Praderas del Toachi	704778	9977785	541	cacao	80	CCNS1	no	1600,00	quintal	100,00	0%	0%	100%	Santo Domingo	72,73	
677	676	14-07-2011	Santo Domingo	La Pichincha	699701	9986404	421	cacao	100	CCNS1	no	300,00	quintal	100,00	0%	0%	100%	Santo Domingo	22,73	
681	682	14-07-2011	Santo Domingo	Miraflores	682949	9973788	321	cacao	200	CCNS1	no	6000,00	quintal	100,00	0%	0%	100%	Santo Domingo	272,73	
688	687	06-07-2011	Santo Domingo	Avisspa Chila	677803	9978953	290	cacao	300	CCNS1	no	7500,00	quintal	100,00	0%	0%	100%	Santo Domingo	340,91	
695	694	06-07-2011	Santo Domingo	La Y	683443	9974584	969	cacao	4	CCNS1	no	80,00	quintal	100,00	0%	0%	100%	Santo Domingo	5,64	
697	696	06-07-2011	Santo Domingo	Libertad Lojana	681097	9975544	312	cacao	40	nacional	si	1000,00	quintal	100,00	0%	0%	100%	Santo Domingo	45,45	
700	699	08-07-2011	Santo Domingo	La Perla	711828	9985214	560	cacao	100	CCNS1	no	2000,00	quintal	100,00	0%	0%	100%	Santo Domingo	90,91	
703	702	08-07-2011	Santo Domingo	Alianza del progreso	711600	9980423	569	cacao	30	CCNS1	no	600,00	quintal	100,00	0%	0%	100%	Santo Domingo	27,27	
706	705	08-07-2011	Santo Domingo	Achotillo	715123	9986405	636	cacao	40	nacional	no	800,00	quintal	100,00	0%	0%	100%	Santo Domingo	36,36	
711	712	04-07-2011	Santo Domingo	Primavera	692717	9973050	418	cacao	100	CCNS1	no	2000,00	quintal	100,00	0%	0%	100%	Santo Domingo	90,91	
721	720	04-07-2011	Santo Domingo	Eden del Rio Chila	685603	9973388	441	cacao	12	CCNS1	no	180,00	quintal	100,00	0%	0%	100%	Santo Domingo	6,18	
724	723	18-07-2011	Santo Domingo	10 de Agosto	722702	9983595	736	cacao	100	CCNS1	si	1000,00	quintal	100,00	0%	0%	100%	Santo Domingo	45,45	
727	726	19-07-2011	Santo Domingo	Puerto Nuevo	726777	9979286	634	cacao	10	CCNS1	no	8000,00	caja	44,40	0%	0%	100%	Santo Domingo	161,45	
731	730	02-07-2011	Santo Domingo	Santa Lucia del Toachi	710171	9973500	618	cacao	8	CCNS1	no	96,00	quintal	100,00	0%	0%	100%	Santo Domingo	4,36	
734	733	19-07-2011	Santo Domingo	6 de Enero	713653	9982078	610	cacao	50	CCNS1	no	1200,00	quintal	100,00	0%	0%	100%	Santo Domingo	54,55	
740	739	06-07-2011	Santo Domingo	El Vergel	684509	9974046	330	cacao	10	CCNS1	no	300,00	quintal	100,00	0%	0%	100%	Santo Domingo	13,64	
741	743	27-06-2011	Santo Domingo	Nuevo Israel	684319	9973023	554	cacao	300	CCNS1	si	3000,00	quintal	100,00	0%	0%	100%	Guayaquil	136,36	
747	749	30-06-2011	Santo Domingo	La Loretta	709642	9965757	638	cacao	40	CCNS1	no	800,00	quintal	100,00	0%	0%	100%	Santo Domingo	27,27	
753	752	30-06-2011	Santo Domingo	Colinas de Porfidio	704705	9965483	498	cacao	5	CCNS1	no	125,00	quintal	100,00	0%	0%	100%	Santo Domingo	5,68	
758	758	30-06-2011	Santo Domingo	Los Anturios	704479	9966899	490	cacao	8	nacional	no	240,00	quintal	100,00	0%	0%	100%	Santo Domingo	10,91	
766	765	04-07-2011	Santo Domingo	Baba Otongo	699488	9959860	488	cacao	20	CCNS1	no	120,00	quintal	100,00	0%	0%	100%	Santo Domingo	5,45	
776	775	04-07-2011	Santo Domingo	Paraiso de Otongo	699261	9956907	536	cacao	58	CCNS1	si	580,00	quintal	100,00	0%	0%	100%	Guayaquil	26,36	
781	780	04-07-2011	Santo Domingo	Los Lojanos	700190	9960611	452	cacao	2	CCNS1	si	10,00	quintal	100,00	0%	0%	100%	Santo Domingo	0,45	
784	783	04-07-2011	Santo Domingo	Union Carchense	704026	9961587	480	cacao	100	CCNS1	no	700	quintal	1000	0%	0%	100%	Santo Domingo	318,18	
791	790	12-07-2011	Santo Domingo	Colorados del Bua	688620	9982033	30	cacao	300	CCNS1	no	8000	quintal	100	0%	0%	100%	Santo Domingo	272,73	
796	795	26-06-2011	Santo Domingo	Las Mercedes	720015	9979956	800	cacao	50	nacional	si	750,00	quintal	100,00	0%	0%	100%	Santo Domingo	34,09	
798	798	05-07-2011	Santo Domingo	El Recreo	690127	99780831	361	cacao	250	CCNS1	si	6250,00	quintal	100,00	0%	0%	100%	Santo Domingo	284,09	
801	801	04-07-2011	Santo Domingo	San Pablo de Chila	693539	9976757	412	cacao	150	CCNS1	no	3750,00	quintal	100,00	0%	0%	100%	Santo Domingo	170,45	
805	804	04-07-2011	Santo Domingo	Nueva Esperanza	691779	9975257	398	cacao	130	CCNS1	no	2600,00	quintal	100,00	0%	0%	100%	Santo Domingo	118,18	
808	808	04-07-2011	Santo Domingo	La Montañita	692112	9978725	386	cacao	200	CCNS1	no	4000,00	quintal	100,00	0%	0%	100%	Santo Domingo	181,82	
812																				
813																				

Figure10 - Spreadsheet with information collected Cocoa

### 2.3.1.2 OIL PALM

Empirically it was thought some years ago that the province was mainly an area where oil palm cultivation was the main, but now we can conclude with certainty that it is not so, that today, the Mode among farmers, the oil Palm ranks fourth after cocoa, banana and yucca.

As shown in Figure 11, the alley of agricultural production of oil palm is located in the north and in the south of the province, to the west of it, looking for the warmer climate of the coast.

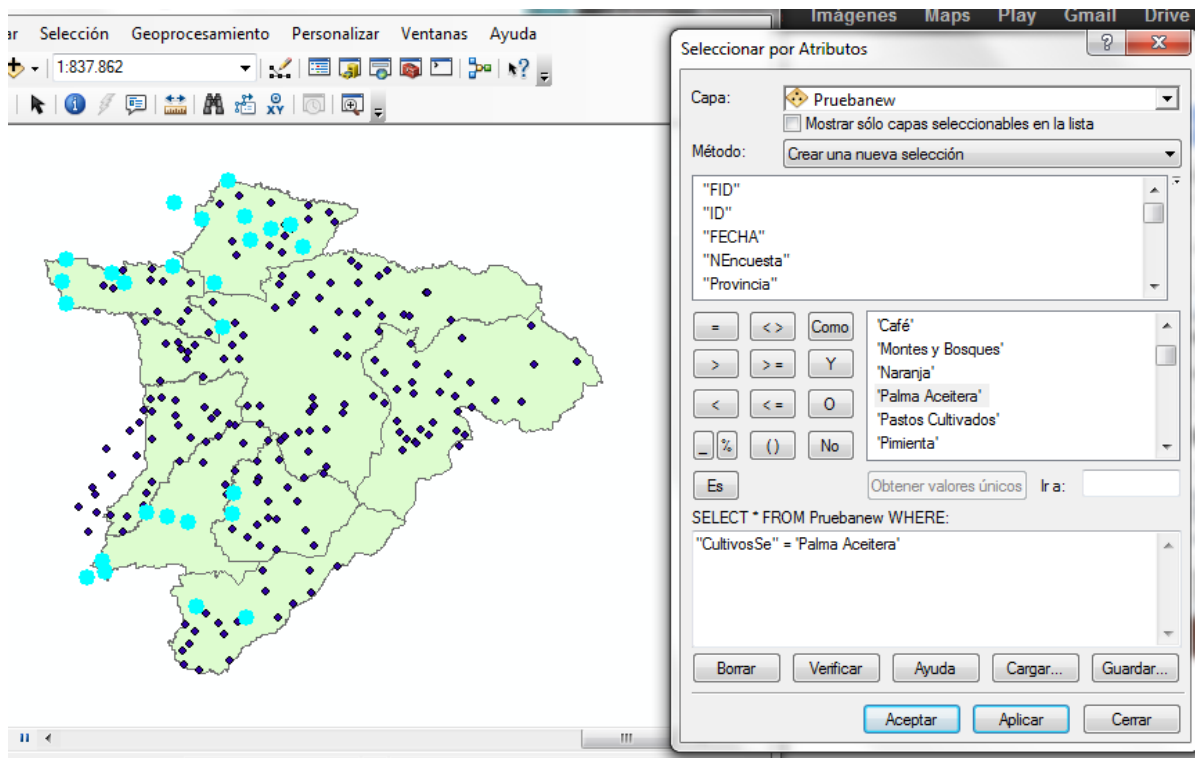


Figure11 - Distribution Points of Farmers who have planted oil palm

Statistical Oil Palm:

Average = 466.81 hectares planted by hamlet

Hamlets = 26

Total hectares in the province = 12137

	A	B	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	ID	FECHA	Parrquia	SectorCaserioRecin	X	Y	Z	CultivosSembra	Ha	ariedadSemb	luc	roduccion	Nomb	quivLT	APC	sum	ldoPC	Localidad	Tm	
92	91	05-07-2011	El Esfuerzo	La Mina	691820	9951510	287	Palma Aceitera	40	tenera	si	960,00	tm	2200,00	0%	0%	100%	Santo Domingo	960,00	
98	95	05-07-2011	El Esfuerzo	El Bolo- Dos Rios	691690	9948295	247	Palma Aceitera	17	tenera	no	432,00	tm	2200,00	0%	0%	100%	Santo Domingo	432,00	
165	164	05-07-2011	Luz de América	La Primavera	684488	9946963	0	Palma Aceitera	2500	tenera	si	75000,00	tm	2200,00	0%	0%	100%	Santo Domingo	75000,00	
175	174	05-07-2011	Luz de América	12 de octubre	671241	9938936	0	Palma Aceitera	50	tenera	si	1500,00	tm	2200,00	0%	0%	100%	Santo Domingo	1500,00	
178	178	05-07-2011	Luz de América	San Fernando	670745	9940600	0	Palma Aceitera	60	tenera	si	1560,00	tm	2200,00	0%	0%	100%	Santo Domingo	1560,00	
181	180	05-07-2011	Luz de América	Unión 71	688434	9938070	0	Palma Aceitera	1500	tenera	si	30000,00	tm	2200,00	0%	0%	100%	Santo Domingo	30000,00	
186	185	05-07-2011	Luz de América	San Francisco	677269	9948303	0	Palma Aceitera	300	tenera	si	7500,00	tm	2200,00	0%	0%	100%	Santo Domingo	7500,00	
190	189	05-07-2011	Luz de América	El Cisne	681267	9947707	0	Palma Aceitera	300	tenera	si	3600	tm	2200	0%	0%	100%	Santo Domingo	3600,00	
351	356	22-07-2011	San Jacinto	San Francisco de Chila	665150	9981984	192	Palma Aceitera	200	tenera	si	4400,00	tm	2200,00	0%	0%	100%	El Carmen	4400,00	
361	361	12-07-2011	San Jacinto	San Vicente del Bua	672313	9986756	226	Palma Aceitera	2500	tenera	si	50000,00	tm	2200,00	0%	0%	100%	Santo Domingo	50000,00	
367	366	12-07-2011	San Jacinto	San Pablo de Guabal	664509	9985384	228	Palma Aceitera	1500	tenera	si	30000,00	tm	2200,00	0%	0%	100%	Santo Domingo	30000,00	
376	375	12-07-2011	San Jacinto	La Esperanza	674403	9985154	242	Palma Aceitera	60	tenera	si	900,00	tm	2200,00	0%	0%	100%	Santo Domingo	900,00	
381	381	12-07-2011	San Jacinto	Mocache 2	665168	9988880	211	Palma Aceitera	200	tenera	si	3000	tm	2200	0%	0%	100%	La Concordia	3000,00	
406	404	12-07-2011	San Jacinto	Los Laureles	682131	9987829	290	Palma Aceitera	700	tenera	si	12500,00	tm	2200,00	0%	0%	100%	Santo Domingo	12500,00	
461	461	06-07-2011	Santa Maria del T	San Luis	685943	9933331	223	Palma Aceitera	15	tenera	no	210,00	tm	2,20	0%	0%	100%	patricia pilar	0,21	
468	467	07-07-2011	Santa Maria del T	Corina del Parra	693821	9931478	359	Palma Aceitera	100	tenera	si	1000,00	tm	2200,00	0%	0%	100%	Santo Domingo	1000,00	
534	533	04-07-2011	Valle Hermoso	Flor del Valle	682457	9998138	228	Palma Aceitera	300	tenera	si	4500,00	tm	2200,00	0%	0%	100%	Santo Domingo	4500,00	
540	539	04-07-2011	Valle Hermoso	El 35	686794	9995518	243	Palma Aceitera	80	tenera	si	1120,00	tm	2200,00	0%	0%	100%	Santo Domingo	1120,00	
545	544	04-07-2011	Valle Hermoso	La Dolorosa	694623	9992049	378	Palma Aceitera	60	tenera	si	900,00	tm	2200,00	0%	0%	100%	Santo Domingo	900,00	
556	555	04-07-2011	Valle Hermoso	El Km 10 Via Cristobal	697893	9993967	399	Palma Aceitera	150	tenera	si	1500,00	tm	2200,00	0%	0%	100%	Santo Domingo	1500,00	
566	565	05-07-2011	Valle Hermoso	Union Ganadera	690999	10001356	319	Palma Aceitera	150	tenera	si	2250,00	tm	2200,00	0%	0%	100%	La Concordia	2250,00	
576	574	05-07-2011	Valle Hermoso	Chiguilpe	693990	9995814	372	Palma Aceitera	35	tenera	si	770,00	tm	2200,00	0%	0%	100%	Santo Domingo	770,00	
581	580	05-07-2011	Valle Hermoso	Cristobal Colon	700880	9994417	466	Palma Aceitera	100	tenera	si	1200,00	tm	2200,00	0%	0%	100%	Santo Domingo	1200,00	
591	591	05-07-2011	Valle Hermoso	Autenticos Campesino	702931	9990959	439	Palma Aceitera	200	tenera	si	2000,00	tm	2200,00	0%	0%	100%	Santo Domingo	2000,00	
613	612	20-07-2011	Valle Hermoso	Asuncion	688892	9985130	346	Palma Aceitera	500	tenera	si	5000,00	tm	2200,00	0%	0%	100%	Santo Domingo	5000,00	
798	797	05-07-2011	Santo Domingo	El Recreo	690127	9978083	361	Palma Aceitera	300	tenera	no	6000,00	tm	2200,00	0%	0%	100%	Santo Domingo	6000,00	

Figure12 - Spreadsheet with information collected Oil Palm

### 2.3.1.3 BANANA

Banana is the second most valuable product in the Mode, and as we can see the distribution of points in *Figure 13*, the alley Banana agricultural production is mostly in the western part of the province, mostly in the parish of Puerto Limon and lesser extent in the parishes of San Jacinto and Santa Maria del Toachi.

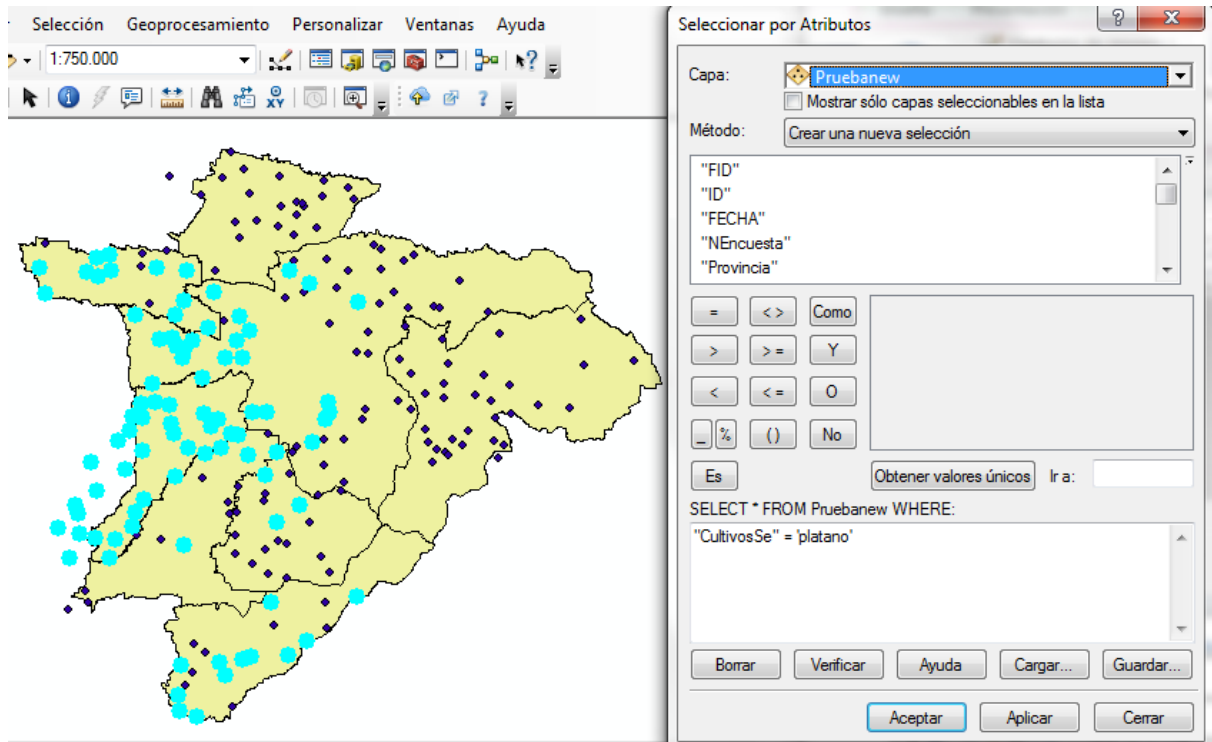


Figure13 - Distribution Points of Farmers who have planted Banano

Statistical Banano:

Average = 164.03hectares planted by hamlet

Hamlets = 97

Total hectares in the province = 15747

	A	B	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	ID	FECHA	Parroquia	SectorCaserioRecin	X	Y	Z	CultivosSembr	Ha	VariedadSembr	laCe	oducción	Nomb	quivLt	laPc	sum	doPc	Localidad	Tm	
111	111	27-06-2011	El Esfuerzo	Paraiso Alto	697458	9950078	500	plátano	4	dominico	no	2400,00	racimo	60,00	0%	5%	95%	Santo Domingo	65,45	
120	120	07-06-2011	El Esfuerzo	Pedro Pablo Gómez	700634	9952453	605	plátano	6	dominico	no	3000,00	racimo	60,00	0%	10%	90%	Quito	61,82	
150	149	28-06-2011	El Esfuerzo	Nueva Esperanza	697430	9959940	357	plátano	40	dominico	no	20000	racimo	60,00	0%	10%	90%	Quito	545,45	
156	155	28-06-2011	El Esfuerzo	Santa Marianita	695771	9956649	359	plátano	30	dominico	no	18000,00	racimo	66,00	0%	10%	90%	Quito	540,00	
168	168	05-07-2011	Luz de América	La Primavera	684488	9946963	0	plátano	200	barraganete	no	100000,00	racimo	66,00	0%	0%	100%	Santo Domingo	9000,00	
200	202	05-07-2011	Luz de América	Bellavista	683351	9956507	0	plátano	60	barraganete	no	30000,00	racimo	40,00	0%	0%	100%	puerto limon	545,45	
208	207	05-07-2011	Luz de América	Congoma Chico	692152	9962286	0	plátano	150	dominico	no	75000,00	racimo	40,00	0%	0%	100%		1363,64	
218	212	05-07-2011	Luz de América	Congoma Medio	689562	9960547	0	plátano	100	dominico	no	60000,00	racimo	40,00	0%	0%	100%	Santo Domingo	1090,91	
218	217	06-07-2011	Luz de América	Congoma	687462	9959753	0	plátano	260	dominico	no	104000,00	racimo	66,00	0%	0%	100%	Santo Domingo	3120,00	
227	226	06-07-2011	Luz de América	2 de Agosto	668523	9945232	0	plátano	30	dominico	no	27000,00	racimo	66,00	1%	1%	98%	Santo Domingo	610,00	
232	231	18-07-2011	Luz de América	San Andres	693345	9959482	375	plátano	40	barraganete	no	16000,00	caja	35,00	0%	0%	100%	Exportacion	400,00	
234	233	18-07-2011	Luz de América	La Paragua	691136	9962538	357	plátano	30	dominico	no	30000,00	racimo	66,00	0%	0%	100%	luz de america	900,00	
238	237	27-06-2011	Puerto Limon	La Y	676266	9957409	229	plátano	50	barraganete	no	96000,00	caja	80,00	0%	0%	100%	Santo Domingo	1509,09	
241	240	27-06-2011	Puerto Limon	Naranjito Chiva	678773	9960114	251	plátano	60	barraganete	no	14400,00	caja	80,00	0%	0%	100%	Exportacion	533,64	
244	241	27-06-2011	Puerto Limon	Rocafuerte	678773	9960114	250	plátano	300	barraganete	no	144000,00	caja	80,00	0%	20%	80%	Quito	5236,36	
244	244	27-06-2011	Puerto Limon	Paraiso del Pupusa	671536	9958510	217	plátano	100	dominico	no	9600,00	racimo	60,00	0%	1%	99%	Santo Domingo	261,82	
248	247	07-07-2011	Puerto Limon	San Miguel de los Coli	694075	9965400	402	plátano	200	barraganete	no	60000,00	racimo	70,00	0%	0%	100%	Santo Domingo	1909,09	
253	252	07-07-2011	Puerto Limon	Taguasa	689181	9964362	338	plátano	20	dominico	no	14000,00	racimo	60,00	0%	0%	100%	Santo Domingo	381,82	
257	256	07-07-2011	Puerto Limon	La Providencia	687255	9965201	324	plátano	300	dominico	no	210000,00	racimo	60,00	0%	0%	100%	Santo Domingo	5727,27	
261	260	07-07-2011	Puerto Limon	El Progreso	688256	9963531	322	plátano	250	dominico	no	125000,00	racimo	60,00	0%	0%	100%	Santo Domingo	3409,09	
267	266	07-07-2011	Puerto Limon	la Union	685061	9960469	298	plátano	200	dominico	no	160000,00	racimo	60,00	0%	0%	100%	Santo Domingo	4363,64	
272	271	27-06-2011	Puerto Limon	la Marina II	669352	9952497	203	plátano	50	dominico	no	24000,00	caja	80,00	0%	0%	100%	Exportacion	672,73	
276	275	27-06-2011	Puerto Limon	La Valencia	672324	9954464	216	plátano	200	barraganete	no	72000,00	caja	80,00	0%	1%	99%	Santo Domingo	2618,18	
280	279	27-06-2011	Puerto Limon	Carlos Julio Arosemena	667051	9949350	191	plátano	100	barraganete	no	70000,00	racimo	70,00	0%	1%	99%	Santo Domingo	2227,27	
284	283	27-06-2011	Puerto Limon	la Marina I	669741	9951261	205	plátano	15	barraganete	no	12000,00	racimo	70,00	0%	5%	95%	Santo Domingo	381,82	
288	286	27-06-2011	Puerto Limon	Bananeras Ecuatorian	669959	9948516	199	plátano	30	dominico	no	9600,00	racimo	60,00	0%	20%	80%	Santo Domingo	261,82	
294	293	27-06-2011	Puerto Limon	San Vicente del Nila	674140	9945209	164	plátano	10	barraganete	no	8000,00	racimo	70,00	0%	20%	80%	Santo Domingo	254,55	
299	298	27-06-2011	Puerto Limon	San Francisco de Peripa	672189	9947928	198	plátano	30	barraganete	no	30000,00	racimo	70,00	0%	5%	95%	Santo Domingo	954,55	
303	302	27-06-2011	Puerto Limon	San Luis	678902	9953229	225	plátano	40	dominico	no	24000,00	racimo	60,00	0%	0%	100%	Santo Domingo	654,55	
308	305	27-06-2011	Puerto Limon	Nuevo Porvenir	676902	9962932	253	plátano	300	barraganete	no	156000,00	caja	80,00	0%	5%	95%	El Carmen	5672,73	
310	309	29-06-2011	Puerto Limon	Numancia	682528	9966413	265	plátano	30	barraganete	no	21600,00	caja	80,00	0%	0%	100%	Quito	765,45	
316	313	29-06-2011	Puerto Limon	La Palmita	675316	9961425	242	plátano	60	barraganete	no	60000,00	caja	80,00	0%	0%	100%	Exportacion	2181,82	
318	317	27-06-2011	Puerto Limon	Palo Blanco	674900	9947830	200	plátano	20	dominico	no	12000,00	racimo	60,00	0%	0%	100%	Santo Domingo	327,27	
321	320	29-06-2011	Puerto Limon	Guichipe	680037	9969399	485	plátano	300	barraganete	no	36000,00	buito	280,00	0%	1%	99%	Quito	4581,82	
326	325	29-06-2011	Puerto Limon	San Juan	680451	9966807	282	plátano	40	barraganete	no	9600,00	caja	80,00	0%	10%	90%	El Carmen	349,09	
329	328	27-06-2011	Puerto Limon	La Polvareda	677443	9949540	214	plátano	300	barraganete	no	150000,00	caja	80,00	0%	0%	100%	Santo Domingo	5454,55	
335	334	27-06-2011	Puerto Limon	San Remo	677837	9951496	221	plátano	20	dominico	no	14000,00	racimo	60,00	0%	10%	90%	Santo Domingo	381,82	
338	337	29-06-2011	Puerto Limon	Los Naranjos	682690	9963911	291	plátano	300	barraganete	no	150000	caja	80	0%	0%	100%	Santo Domingo	5454,55	

Figure14 - Spreadsheet with information collected Banano

### 2.3.1.4 YUCCA

Yucca is the third highest in the Mode, being located its alley farmland productive in the center of the province (see Figure 15), around the urban area of Santo Domingo.

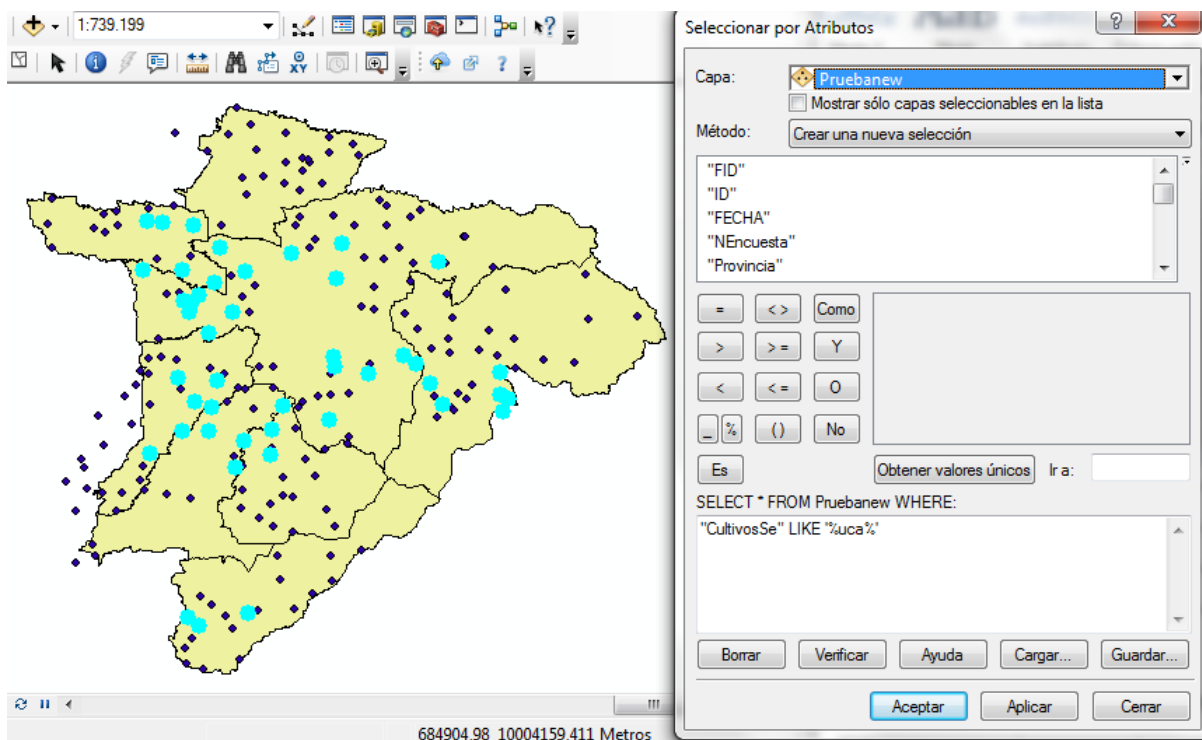


Figure15 - Distribution Points of Farmers who have planted Yucca



Statistical Yucca:

Average = 74.72 hectares planted by hamlet

Hamlets = 36

Total hectares in the province = 2690

ID	FECHA	Parroquia	Sector/Caserío/Recin	X	Y	Z	Cultivos/Sembra	Ha	Variedad/Semb	Acce	Produccion	Nomb	quivil	Paq	sum	IdoPc	Localidad	Tm	
104	103	30-06-2011	El Esfuerzo	Los Herederos	690757	9951324	255	yuca	30	amarga	no	6000,00	saco	150,00	0%	0%	100%	Santo Domingo	409,09
143	142	28-06-2011	El Esfuerzo	Milton Murillo	695573	9953202	556	yuca	20	amarga	no	4000,00	saco	150,00	0%	0%	100%	Santo Domingo	272,73
148	147	28-06-2011	El Esfuerzo	9 de Octubre	692010	9955123	320	yuca	6	amarga	no	1200,00	saco	150,00	0%	0%	100%	Santo Domingo	61,82
152	151	28-06-2011	El Esfuerzo	Nuevo Esperanza	697430	9959940	357	yuca	20	amarga	no	4000,00	saco	150,00	0%	0%	100%	Santo Domingo	272,73
158	154	28-06-2011	El Esfuerzo	Santa Marianita	695771	9956649	359	yuca	40	amarga	no	8000,00	saco	150,00	0%	0%	100%	Santo Domingo	545,45
190	196	05-07-2011	Luz de América	Pre Coop Luz de Améri	687101	9956376	0	yuca	100	jema de huevo	no	150000,00	saco	150,00	0%	0%	100%	Santo Domingo	10227,27
204	203	05-07-2011	Luz de América	Bellavista	683331	9956507	0	yuca	60	amarga	no	12000,00	saco	150,00	0%	0%	100%	Guayaquil	618,18
219	218	06-07-2011	Luz de América	Congoma	687462	9959753	0	yuca	170	amarga	no	17000,00	saco	150,00	0%	0%	100%	Santo Domingo	1159,09
263	262	07-07-2011	Puerto Limon	El Progreso	688256	9963531	322	yuca	20	amarga	no	3400,00	saco	150,00	0%	0%	100%	Santo Domingo	231,82
269	268	07-07-2011	Puerto Limon	la Union	685061	9960469	298	yuca	50	valencia	no	7500,00	saco	150,00	0%	0%	100%	Santo Domingo	511,36
304	303	27-06-2011	Puerto Limon	San Luis	678902	9953229	225	yuca	30	valencia	no	6000,00	saco	150,00	0%	0%	100%	Santo Domingo	409,09
341	340	29-06-2011	Puerto Limon	Los Naranjos	682690	9963911	291	yuca	40	valencia	no	8000,00	saco	150,00	0%	0%	100%	Santo Domingo	545,45
399	398	12-07-2011	San Jacinto	El Triunfo	683382	9978972	307	yuca	20	valencia	no	2400,00	saco	150,00	0%	10%	90%	Quito	163,64
417	416	14-07-2011	San Jacinto	Bellavista	680682	9985491	280	yuca	8	valencia	no	1600,00	saco	150,00	0%	10%	90%	San Jacinto	109,09
428	422	11-07-2011	San Jacinto	Umpe Chico	684923	9985147	323	yuca	30	valencia	no	6000,00	saco	150,00	0%	0%	100%	Guayaquil	409,09
428	427	11-07-2011	San Jacinto	La Fiecha	678535	9985755	257	yuca	20	valencia	no	2000,00	saco	150,00	0%	0%	100%	Santo Domingo	136,36
430	431	11-07-2011	San Jacinto	San Pedro de Laurel	687011	9970112	336	yuca	40	valencia	si	4000,00	saco	150,00	0%	0%	100%	Santo Domingo	272,73
435	434	11-07-2011	San Jacinto	Riobambeños de Chilli	687849	9977222	343	yuca	60	valencia	no	12000,00	saco	150,00	0%	0%	100%	Ambato	618,18
454	453	06-07-2011	Santa Maria del T	Santa Cecilia	692584	9931007	848	yuca	80	valencia	no	14400,00	saco	150,00	0%	0%	100%	Guayaquil	981,82
496	495	13-07-2011	Santa Maria del T	Tigre Alto	685758	9929264	389	yuca	8	amarga	no	1600,00	saco	150,00	0%	0%	100%	La Mana	109,09
510	509	13-07-2011	Santa Maria del T	La Morena	684184	9930357	149	yuca	10	valencia	no	2500,00	saco	150,00	0%	0%	100%	Ambato	170,45
691	690	13-07-2011	Santo Domingo	El Porvenir	705719	9982688	508	yuca	20	valencia	no	2000,00	quintal	100,00	0%	0%	100%	Santo Domingo	90,91
666	664	14-07-2011	Santo Domingo	km 13 via quininde	698584	9981313	461	yuca	20	valencia	no	2000,00	quintal	100,00	0%	0%	100%	Santo Domingo	90,91
674	673	14-07-2011	Santo Domingo	Praderas del Toachi	704778	9977785	541	yuca	15	amarga	no	2700,00	saco	100,00	0%	0%	100%	Santo Domingo	122,73
688	688	06-07-2011	Santo Domingo	Avișpa Chila	677803	9978953	290	yuca	200	valencia	no	40000,00	quintal	100,00	0%	5%	95%	Quito	1818,18
694	693	06-07-2011	Santo Domingo	La Y	683443	9974584	369	yuca	8	valencia	no	1600	saco	100,00	0%	5%	95%	Guayaquil	72,73
709	708	04-07-2011	Santo Domingo	Santa Lucia	690290	9973057	396	yuca	10	valencia	no	1500,00	saco	150,00	0%	5%	95%	Quito	102,27
720	719	04-07-2011	Santo Domingo	Eden del Rio Chila	685603	9975338	441	yuca	40	valencia	no	4000,00	saco	150,00	0%	5%	95%	Quito	272,73
742	741	06-07-2011	Santo Domingo	El Vergel	684509	9974046	330	yuca	5	valencia	no	1000,00	saco	150,00	0%	5%	95%	Quito	68,18
746	745	27-06-2011	Santo Domingo	Nuevo Israel	684319	9973023	554	yuca	800	valencia	si	160000,00	saco	150,00	0%	0%	100%	Santo Domingo	10909,09
751	753	30-06-2011	Santo Domingo	Colinas de Porfidio	704705	9965483	498	yuca	5	valencia	no	750,00	saco	150,00	0%	1%	99%	Santo Domingo	51,14
757	756	30-06-2011	Santo Domingo	Los Anturios	704479	9968899	490	yuca	15	valencia	no	2250,00	saco	150,00	0%	0%	100%	Santo Domingo	153,41
761	760	30-06-2011	Santo Domingo	El Pedregal	709296	9964453	625	yuca	30	valencia	no	6000,00	saco	150,00	0%	0%	100%	Santo Domingo	409,09
773	772	30-06-2011	Santo Domingo	Estero frio	703955	9958074	812	yuca	10	amarga	no	1500,00	saco	150,00	0%	0%	100%	Santo Domingo	102,27
790	789	12-07-2011	Santo Domingo	Colorados del Bua	688620	9982033	30	yuca	600	valencia	no	60000,00	saco	150,00	0%	0%	100%	Santo Domingo	4090,91
811	810	04-07-2011	Santo Domingo	La Montañita	692212	9978725	386	yuca	50	Valencia	no	7500,00	saco	150,00	0%	5%	95%	Quito	511,36
812																			
813																			

Figure16 - Spreadsheet with information collected Yucca

### 2.3.1.5 MOUNTAINS AND FORESTS

Although, mountains and forests are not considered crop production, they are considered in this study to show that even in much of the province where there are grounds can not be exploited for the sowing, due to very steep terrain with slopes very steep, river banks, etc.

On the distribution of points can be seen that there is a nearly uniform distribution throughout the province (see Figure 17).



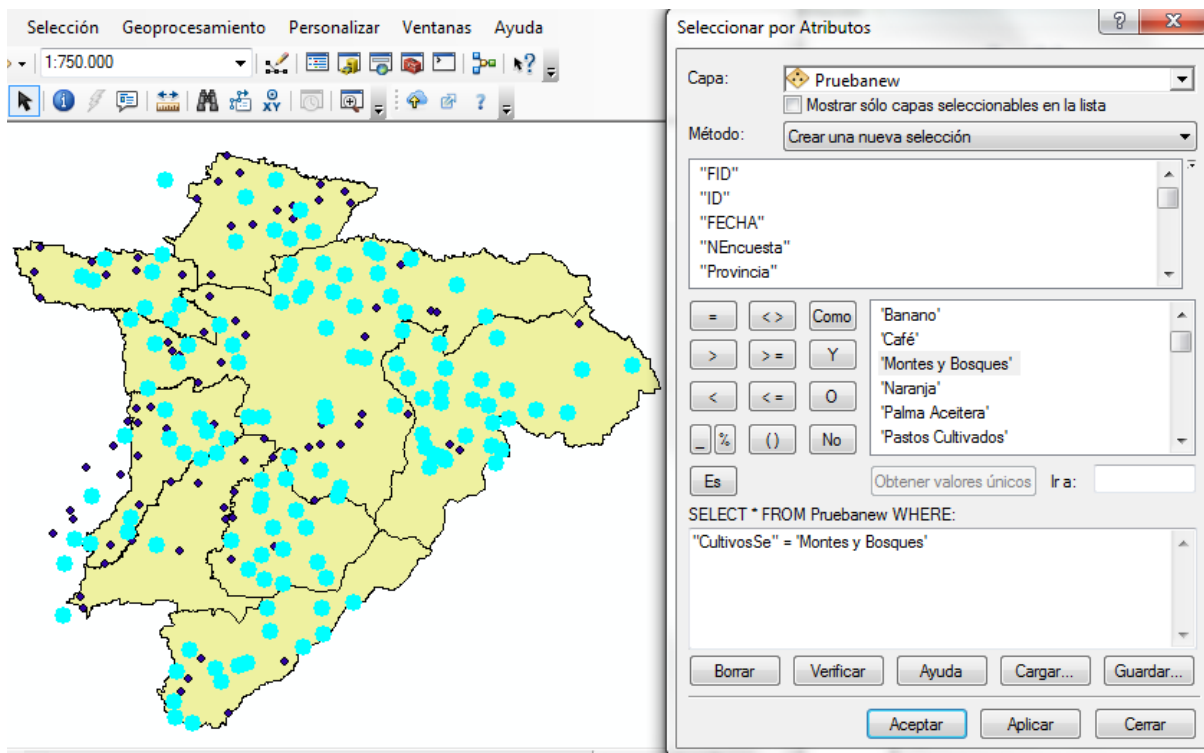


Figure17 - Distribution Points of Farmers who have planted Mountains and Forests

Statistical Mountains and Forests:

Average = 107.74 hectares planted by hamlet

Hamlets = 133

Total hectares in the province = 14329.5

	A	B	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	ID	FECHA	Parroquia	Sector/Caserio/Recin	X	Y	Z	CultivosSembra	Ha	riedadSemb	MaCe	oducior	Nomb	quivLI	laPc	sum	adoPc	Localidad	Tm	
4	3	07-07-2011	Alluriquin	El Maltón	720878	9959807	1143	Montes y Bosques	10											
6	5	07-07-2011	Alluriquin	San Vicente	721201	9959468	1147	Montes y Bosques	3											
9	8	15-07-2011	Alluriquin	Bellavista	739989	9972052	2008	Montes y Bosques	6000											
12	11	15-07-2011	Alluriquin	Lindiche Alto	721168	9972330	946	Montes y Bosques	5											
14	13	15-07-2011	Alluriquin	El Tránsito	738070	9966096	1564	Montes y Bosques	40											
16	15	18-07-2011	Alluriquin	San José de Piloton	727257	9967005	1069	Montes y Bosques	100											
18	17	13-07-2011	Alluriquin	San Miguel de Lelia	719709	9960251	896	Montes y Bosques	20											
23	21	19-07-2011	Alluriquin	12 de Octubre	720374	9975530	895	Montes y Bosques	60											
25	24	19-07-2011	Alluriquin	La Magdalena	720660	9967399	910	Montes y Bosques	15											
27	26	19-07-2011	Alluriquin	La Florida	720537	9969308	963	Montes y Bosques	50											
29	28	18-07-2011	Alluriquin	San José del Meme	724881	9967807	974	Montes y Bosques	100											
31	30	18-07-2011	Alluriquin	Buenos Aires	726227	9970567	1247	Montes y Bosques	20											
33	32	18-07-2011	Alluriquin	El Dorado	728424	9976260	732	Montes y Bosques	600											
35	34	18-07-2011	Alluriquin	America Libre	729765	9969285	1202	Montes y Bosques	100											
38	37	21-07-2011	Alluriquin	Caldas de Atahualpa	727651	9961451	1258	Montes y Bosques	15											
41	40	21-07-2011	Alluriquin	Unión del Toachi	727733	9964616	837	Montes y Bosques	20											
45	44	21-07-2011	Alluriquin	San Pablo de la Plata	728118	9959123	1358	Montes y Bosques	20											
48	47	21-07-2011	Alluriquin	Chimborazo	723918	9962858	1061	Montes y Bosques	10											
50	49	22-07-2011	Alluriquin	Agua Fria	715700	9979972	639	Montes y Bosques	150											
53	52	22-07-2011	Alluriquin	Eden Ganadero	715182	9977356	668	Montes y Bosques	40											
56	55	22-07-2011	Alluriquin	Trinidad	718072	9968037	913	Montes y Bosques	80											
59	58	22-07-2011	Alluriquin	La Florida del Tanti	714279	9967027	879	Montes y Bosques	10											
61	60	22-07-2011	Alluriquin	San Francisco de Pisot	714492	9972838	758	Montes y Bosques	20											
65	64	22-07-2011	Alluriquin	Ecuador	716106	9970797	790	Montes y Bosques	20											
71	70	22-07-2011	Alluriquin	Bellavista de la Plata	728944	9960884	1388	Montes y Bosques	40											
74	73	07-07-2011	Alluriquin	La Bolivar	717950	9963051	1041	Montes y Bosques	20											
76	75	07-07-2011	Alluriquin	Cristal de Lelia	718996	9958491	977	Montes y Bosques	1000											
79	78	07-07-2011	Alluriquin	San Miguel de Lelia	719709	9960251	896	Montes y Bosques	8											
83	80	07-07-2011	Alluriquin	Luis Felipe	718485	9961297	994	Montes y Bosques	500											
86	85	22-07-2011	Alluriquin	Dos Rios	730768	9966349	1202	Montes y Bosques	300											
88	87	22-07-2011	Alluriquin	La Palma	729965	9965266	888	Montes y Bosques	300											
90	89	22-07-2011	Alluriquin	Gualalito	746936	9972475	1996	Montes y Bosques	1000											
97	96	05-07-2011	El Esfuerzo	El Bolo- Dos Rios	691690	9948295	247	Montes y Bosques	4			no								
111	110	28-06-2011	El Esfuerzo	Pedro Luis	695789	9954045	456	Montes y Bosques	10			no								
115	114	27-06-2011	El Esfuerzo	Paraiso Alto	697458	9950078	500	Montes y Bosques	60			no								
118	118	08-07-2011	El Esfuerzo	Buena Vista	695748	9946324	524	Montes y Bosques	30			no								
122	122	07-06-2011	El Esfuerzo	Pedro Pablo Gómez	700634	9952453	605	Montes y Bosques	50			no								
126	125	07-07-2011	El Esfuerzo	La Reforma	701993	9950203	727	Montes y Bosques	3			no								

Figure18 - Spreadsheet with information collected Mountains and Forests

### 2.3.1.6 GRASSES GROWN

In our research, we do not consider the grasses grown as a study of agronomy, therefore it is more related to livestock (cattle feed), although cultivated grasses has the largest number of hectares planted throughout the province (see Figure 19), showing that the livestock industry is one of the main economic activities in the region.

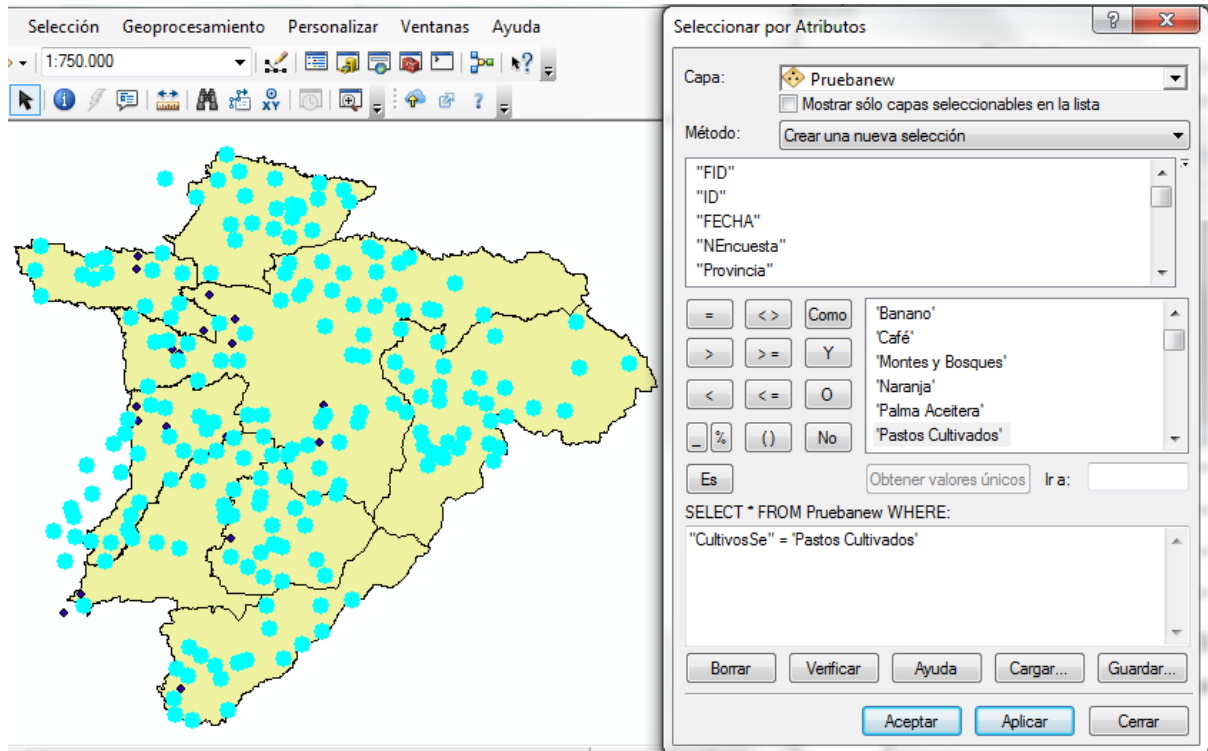


Figure19 - Distribution Points of Farmers who have planted Grasses Grown

Statistical Grasses Grownt:

Average = 616.23 hectares planted by hamlet

Hamlets = 204

Total de hectáreas sembradas = 125095

	A	B	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	ID	FECHA	Parroquia	Sector/Caserío/Recin	X	Y	Z	Cultivos/Sembra	Ha	riedad/Semb	Ca	oduccior	Nomb	quivLI	APC	sumy	doPC	Localidad	Tm	
2	07-07-2011	Alluriquin	El Maltón	720878	9959807	1143	Pastos Cultivados	600	miel											
3	07-07-2011	Alluriquin	San Vicente	721201	9959468	1147	Pastos Cultivados	200	miel											
4	15-07-2011	Alluriquin	Bellavista	739989	9972052	2008	Pastos Cultivados	4000	miel											
5	15-07-2011	Alluriquin	Lindiche Alto	721158	9972230	946	Pastos Cultivados	750	Brachiaria											
6	15-07-2011	Alluriquin	El Tránsito	738070	9966096	1554	Pastos Cultivados	500	miel											
7	18-07-2011	Alluriquin	San José de Pilaton	727257	9967005	1069	Pastos Cultivados	1000	gramalote	no										
8	13-07-2011	Alluriquin	San Miguel de Lelia	719709	9960251	896	Pastos Cultivados	500	miel											
9	19-07-2011	Alluriquin	12 de Octubre	720374	9973530	895	Pastos Cultivados	500	Brachiaria											
10	19-07-2011	Alluriquin	La Magdalena	720660	9967399	910	Pastos Cultivados	1540	Brachiaria											
11	19-07-2011	Alluriquin	La Florida	720537	9969308	963	Pastos Cultivados	1500	Brachiaria											
12	18-07-2011	Alluriquin	San José del Meme	724881	9967807	974	Pastos Cultivados	600	Brachiaria											
13	18-07-2011	Alluriquin	Buenos Aires	726227	9970567	1247	Pastos Cultivados	600	miel											
14	18-07-2011	Alluriquin	El Dorado	728424	9976260	732	Pastos Cultivados	1000	Brachiaria											
15	18-07-2011	Alluriquin	América Libre	729765	9969285	1202	Pastos Cultivados	1000	gramalote	no										
16	21-07-2011	Alluriquin	Caldas de Atahualpa	727651	9961451	1258	Pastos Cultivados	260	Brachiaria											
17	21-07-2011	Alluriquin	Unión del Toachi	727733	9964616	837	Pastos Cultivados	600	miel											
18	21-07-2011	Alluriquin	San Pablo de la Plata	728118	9959123	1358	Pastos Cultivados	600	miel											
19	21-07-2011	Alluriquin	Chimborazo	723918	9962858	1061	Pastos Cultivados	1000	miel											
20	22-07-2011	Alluriquin	Aguas Frías	715700	9979972	639	Pastos Cultivados	1000	Brachiaria											
21	22-07-2011	Alluriquin	Eden Ganadero	715182	9977356	668	Pastos Cultivados	1500	Brachiaria											
22	22-07-2011	Alluriquin	Tinajandía	718072	9968037	913	Pastos Cultivados	900	Brachiaria											
23	22-07-2011	Alluriquin	La Florida del Tanti	714279	9967027	879	Pastos Cultivados	1000	miel											
24	22-07-2011	Alluriquin	San Francisco de Pisot	714492	9972838	758	Pastos Cultivados	1000	Brachiaria											
25	22-07-2011	Alluriquin	Ecuador	716106	9970797	790	Pastos Cultivados	2250	Brachiaria											
26	07-07-2011	Alluriquin	Jesús del Gran Poder	715958	9965904	921	Pastos Cultivados	500	Brachiaria											
27	21-07-2011	Alluriquin	San José de las Damas	723098	9960907	1067	Pastos Cultivados	150	miel											
28	22-07-2011	Alluriquin	Bellavista de la Plata	728944	9960884	1388	Pastos Cultivados	200	miel											
29	07-07-2011	Alluriquin	La Bolívar	717950	9963051	1041	Pastos Cultivados	250	saboya											
30	07-07-2011	Alluriquin	Cristal de Lelia	718996	9958491	977	Pastos Cultivados	2000	miel											
31	07-07-2011	Alluriquin	San Miguel de Lelia	719709	9960251	896	Pastos Cultivados	800	miel											
32	07-07-2011	Alluriquin	Luis Felipe	718485	9961297	994	Pastos Cultivados	900	Brachiaria											
33	07-07-2011	Alluriquin	Seiva Alegre	721774	9961674	1069	Pastos Cultivados	200	miel											
34	22-07-2011	Alluriquin	Iberamerica	739588	9978251	1841	Pastos Cultivados	500	Brachiaria	no										
35	22-07-2011	Alluriquin	Dos Ríos	733768	9966349	1202	Pastos Cultivados	700	Brachiaria	no										
36	22-07-2011	Alluriquin	La Palma	729965	9965266	888	Pastos Cultivados	400	Brachiaria	no										
37	22-07-2011	Alluriquin	Guajalito	746956	9972475	1996	Pastos Cultivados	400	Brachiaria	no										
38	05-07-2011	El Esfuerzo	La Mina	691820	9951510	287	Pastos Cultivados	300	saboya	no										
39	05-07-2011	El Esfuerzo	Las Maravillas	691648	9943744	296	Pastos Cultivados	150	saboya	no										

Figure20 - Spreadsheet with information collected Grasses Grown to

## 2.3.2 ANALYSIS BY NUMBER OF HECTARES PLANTED

For proper analysis and diagnosis of the real potential of the province by the present investigation it was determined, which are the most important groups and influence in the area, by deducting the number of hectares planted, so, as Table 3, we can see the five products mostly planted crops from the point of view of total hectares.

#	Crops	Total hectaresplanted
1	Cocoa	16047
2	Banano	15747
3	Oil Palm	12137
4	Palmetto	4358
5	Yucca	2690

Table3 - Total hectares per product

Based on this data, we conclude that Cocoa, by the mode (Number of campuses that have sown) and the largest number of hectares in the province, is the product with greater reception and influence in the region, followed relatively close to the banana and oil palm.

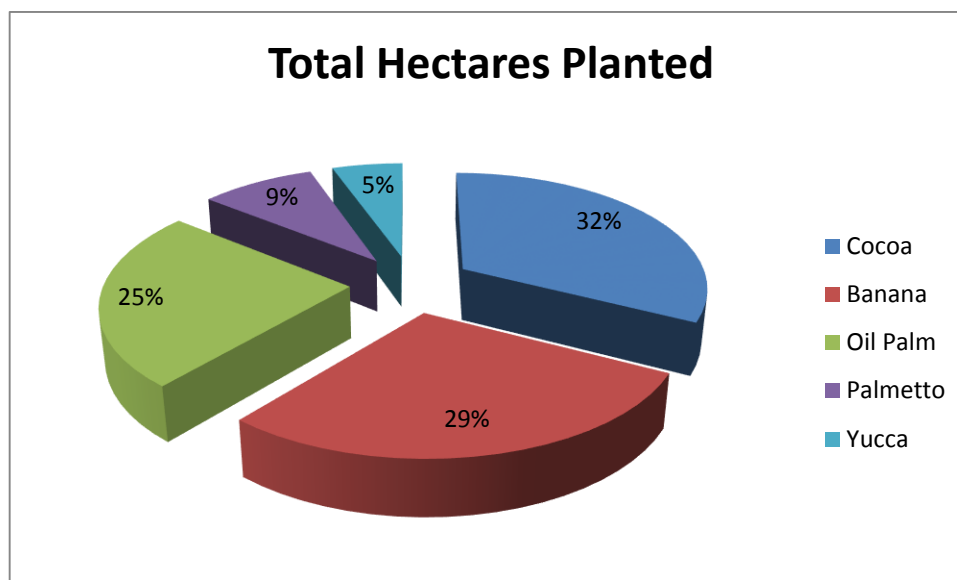


Figure21 - Comparison among five products most planted

Although it varies by product, the number of hectares to consider a farmer as small, medium or large, we can say that, although the total hectares planted, and fewer farmers (within an enclosure or settlement) that sow versus cocoa and bananas, palm oil has a greater number of large producers, due to the greater number of hectares planted by hamlet.

#	Crops	Average hectares planted by Hamlet
1	Oil Palm	466,81
2	Palmetto	167,62
3	Banano	164,03
4	Cocoa	100,92
5	Yucca	74,72

Table4 - Average hectares per hamlet

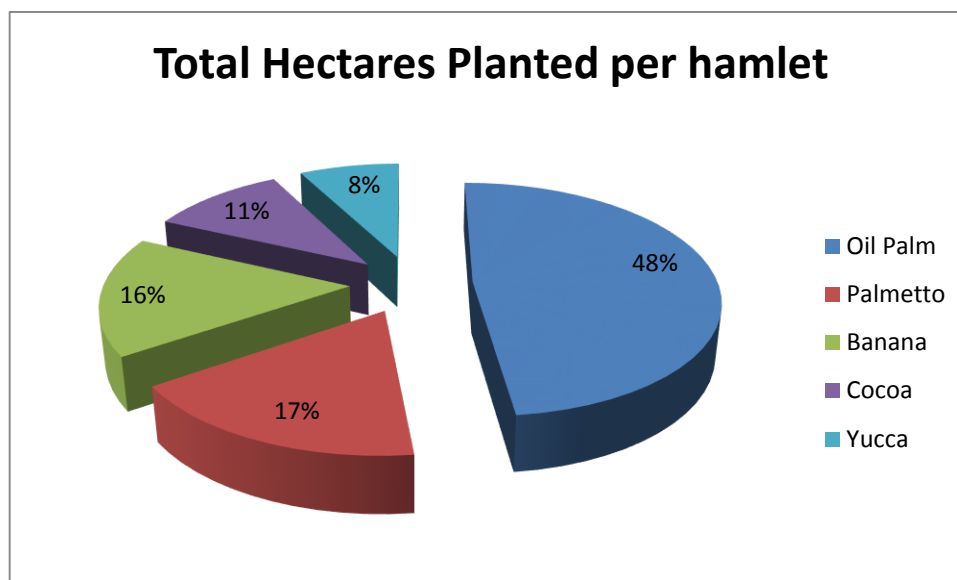


Figure22 - Comparison of average per farmer planted among five most popular crops

### 2.3.3 CROPS PLANTED IN THE PROVINCE

After completing the surveys and interviews, it was found several crops, a total of twenty-four types of products grown in the province (Table 5), but where they highlight the top five on the list, the largest number of hectares planted and the host of many farmers. We can also see in Figure 23, which cultivated grasses up 63% of total hectares planted, but discarded for the present study fall within the livestock industry, leaving us as the main and most important crops Cocoa, Banana and Palm oil, with 8%, 7% and 6% respectively of total hectares in the province.

#	Crop	Average hectares planted by Hamlet	Hamlets	Total hectares in the province
1	Grasses grown	616,23	203	125095
2	Cocoa	100,92	159	16047
3	Banano	164,03	97	15747
4	Mountains and Forests	107,74	133	14330
5	Oil Palm	466,81	26	12137
6	Palmetto	167,62	26	4358
7	Yucca	74,72	36	2690
8	Passion fruit	61,90	28	2352

9	Abaca	151,67	9	1365
10	Rubber	223,00	5	1115
11	Corn	62,86	14	880
12	Pineapple	70,00	10	700
13	Raft	82,00	6	492
14	Sugarcane	24,20	10	242
15	Pepper	23,33	6	140
16	Naranjilla	10,08	13	131
17	Cafe	22,75	4	91
18	Orange	13,00	7	91
19	Papaya	26,67	3	80
20	Bamboo	21,50	2	43
21	Tropical Flowers	20,00	1	20
22	Pitahaya	20,00	1	20
23	Malanga	18,00	1	18
24	Lemon	10,00	1	10

Table5 - Crops in the Province

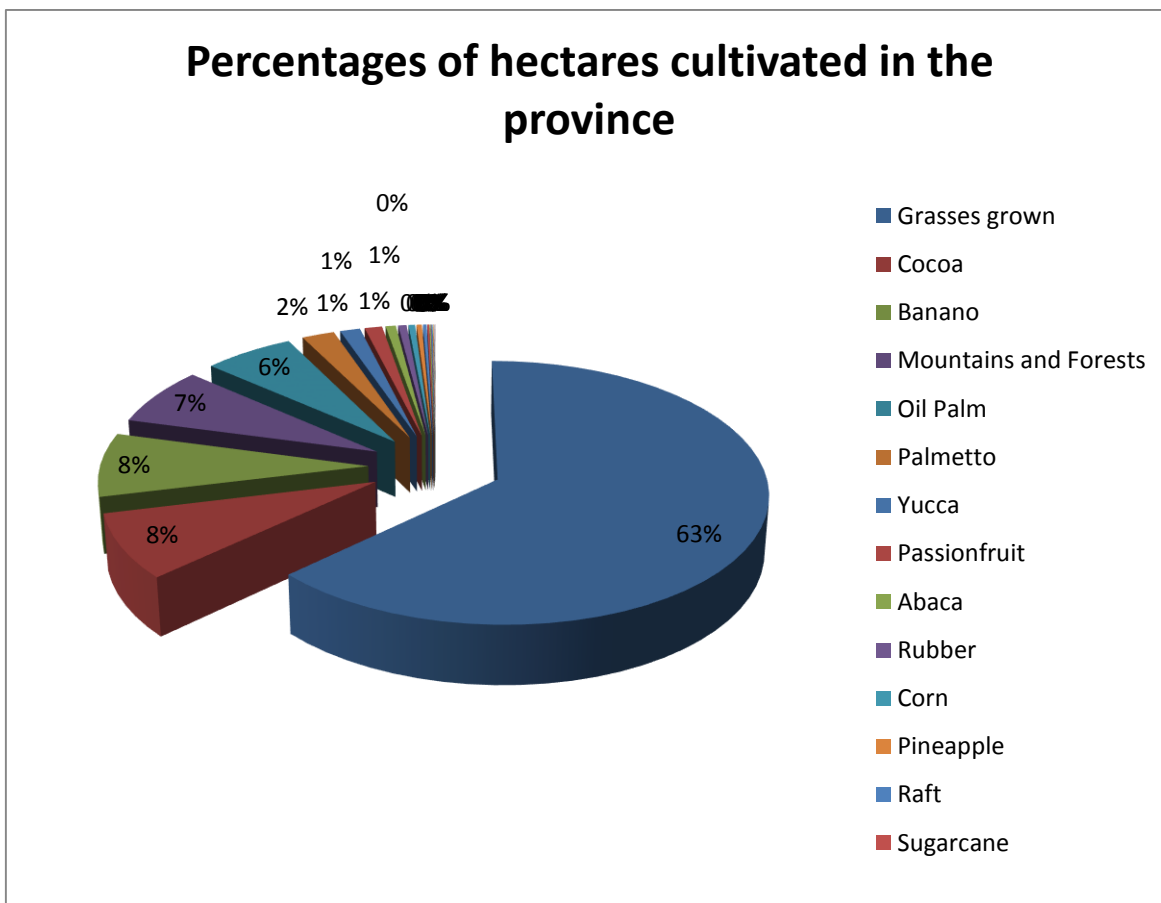


Figure23 - Comparison percentage of crops in the Province

## 2.4 ANALYSIS OF DISTRIBUTION OF POINTS

Once the data is tabulated and analyzed this information to find out which are the most important crops, we proceeded to generate the shapefile thereof, to analyze their geographical distribution in territory and find alleys or areas of major agricultural production.

The distribution of points (enclosures or farmhouses) which are the most important crops in the province are shown in *Figure 24*, in which we can observe are: cocoa, banana, oil palm, palmetto and pastures.

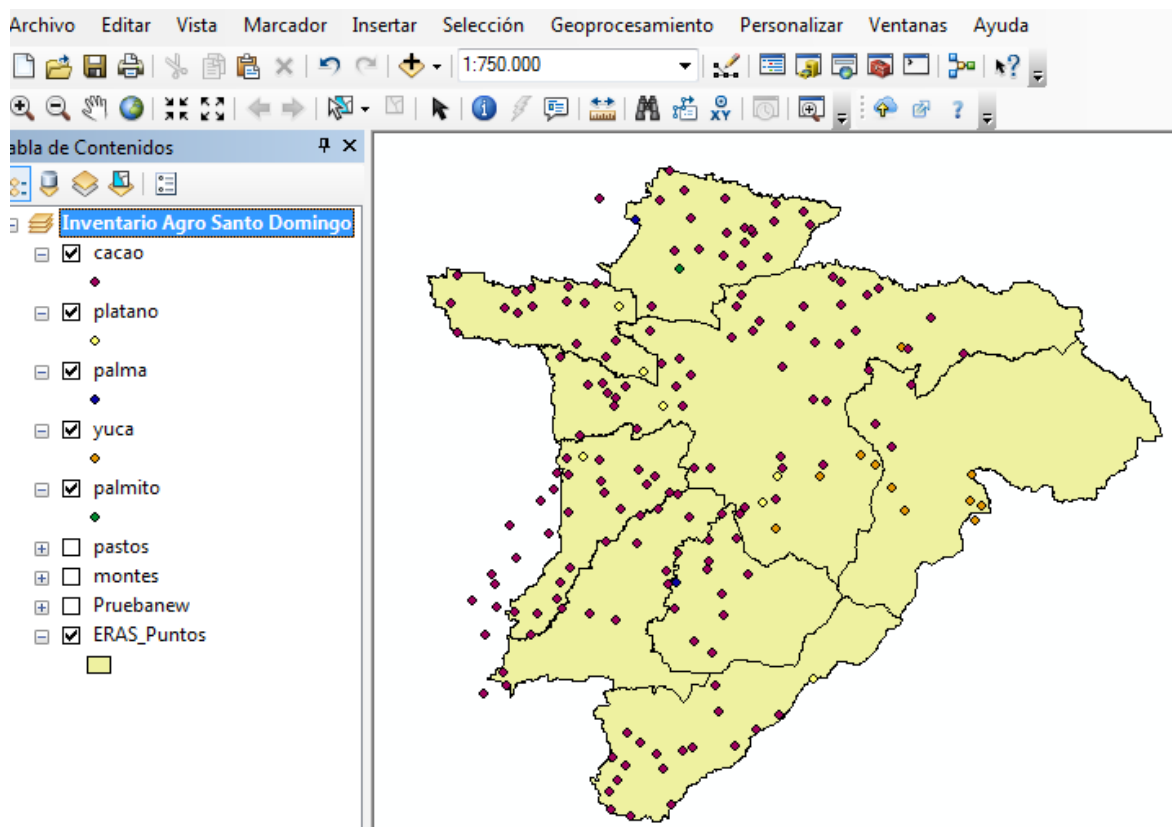


Figure24 - Distribution of points of major crops

### 2.4.1 COCOA

As can be seen in the distribution of points Cocoa (see Figure 25) is the most popular for planting by farmers, and as we appreciated in Figure 25, 159 hamlets, in most of the territory of the province have planted this cultivation. It is equally important to determine the area or alley farming (Figure 26) and for this we use the tool Directional Distribution (Standard Deviation Ellipse) ArcMap (spatial statistics tools - Measurement of Geographical distributions), so that we determine that the agricultural production area is in the western part of the province distributed randomly, covering practically every parish of the same (except Alluriquin).



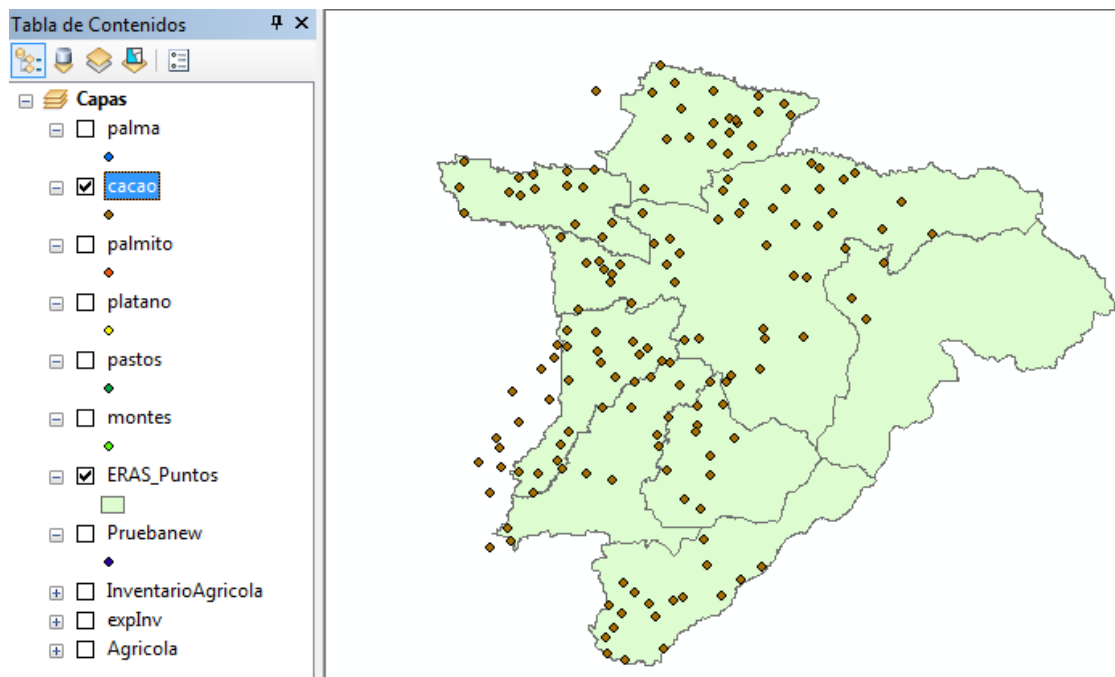


Figure25 - Distribution of points of cocoa cultivation

Other findings in the crop varied sizes exist but in many hamlets will reach very high yields ranging mostly in ranges from 350 to 600 hectares (see *Figures 27 and 28*)

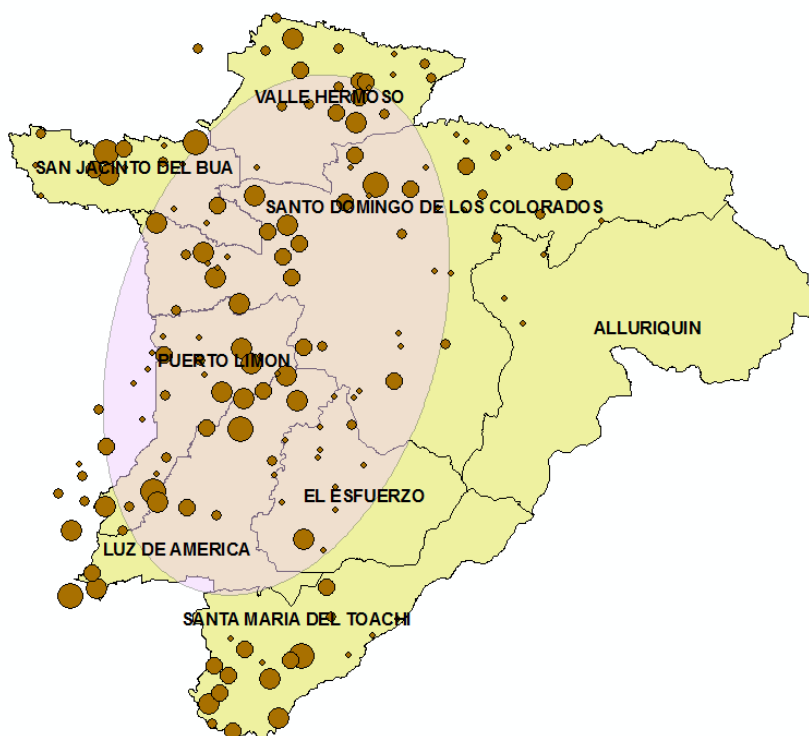


Figure26 - Ellipse of Distribution of points of cocoa cultivation

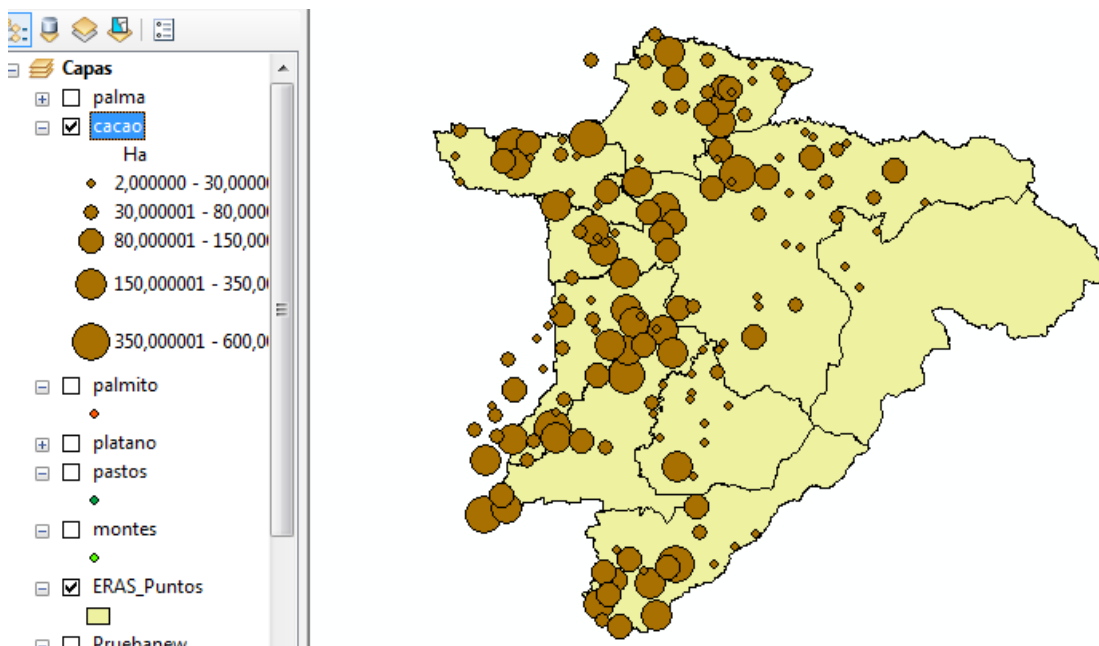


Figure27 - Sizes cocoa crops by enclosures

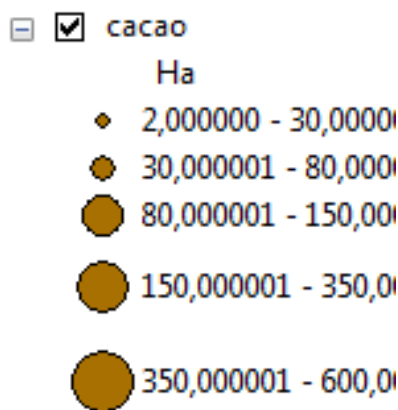


Figure28 - Class distribution of the planting of cocoa

According to the above information, there is a great welcome by many farmers for planting cocoa in most parts of the province (central and western), but it is important to note that Santo Domingo is not an area to provide the best conditions for this crop, due to cloud cover, shortening the hours of sunlight it needs cocoa, slightly lower temperatures for optimum plant needs it. Currently 70% of the area planted to the variety CCN51 and 30% for the national variety (MAGAP - Santo Domingo. 2012).

## 2.4.2 OIL PALM

Formerly the most important crop in the province (now in third position), was gradually being displaced by cocoa, because it has been suffering from diseases, farmers were replacing palm plantations for cocoa, mainly by disease its causative agent remains unknown (common mind known as the yellowing of leaves), but basically caused by the humid climate of the area. Palm cultivation has been moving mostly toward the north, as shown in Figure 29 (near the provincial boundaries of Esmeraldas and Santo Domingo), due to the lack of optimal temperature (Santo Domingo temperature ranges from 14 ° - 24 ° on average) and daylength (MAGAP - Provincial Santo Domingo. 2012). Even with all the problems mentioned above, there are a large number of hectares in the province, as shown in Figure 30, having some precincts in the class of 700 to 2500 hectares (Figure 31)

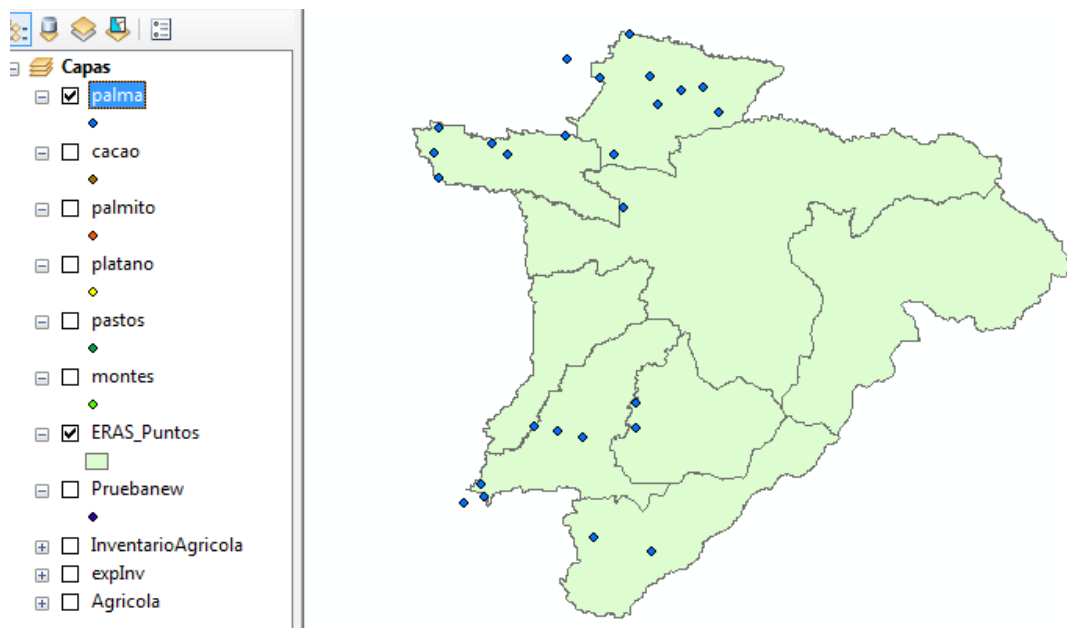


Figure29 - Distribution of points of oil Palm

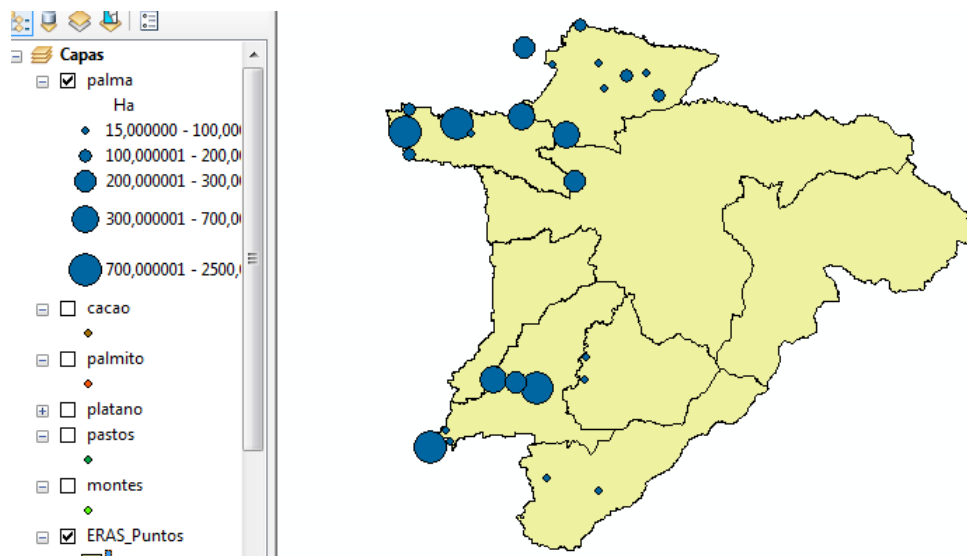


Figure30 - Sizes Oil Palm crops by enclosures

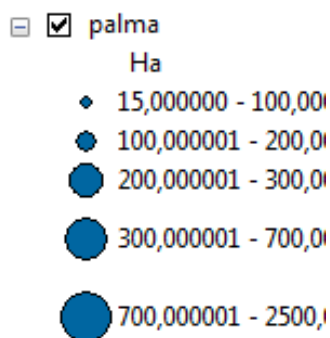


Figure31 - Class distribution of the planting of Oil Palm

The alley is analogous to cocoa agro-production, is in the western part of the province, as close to the coast, looking for higher temperatures (Figure 32).

Parishes with greater presence of this crop are: San Jacinto del Bua, Luz de America and in less proportion Valle Hermoso.

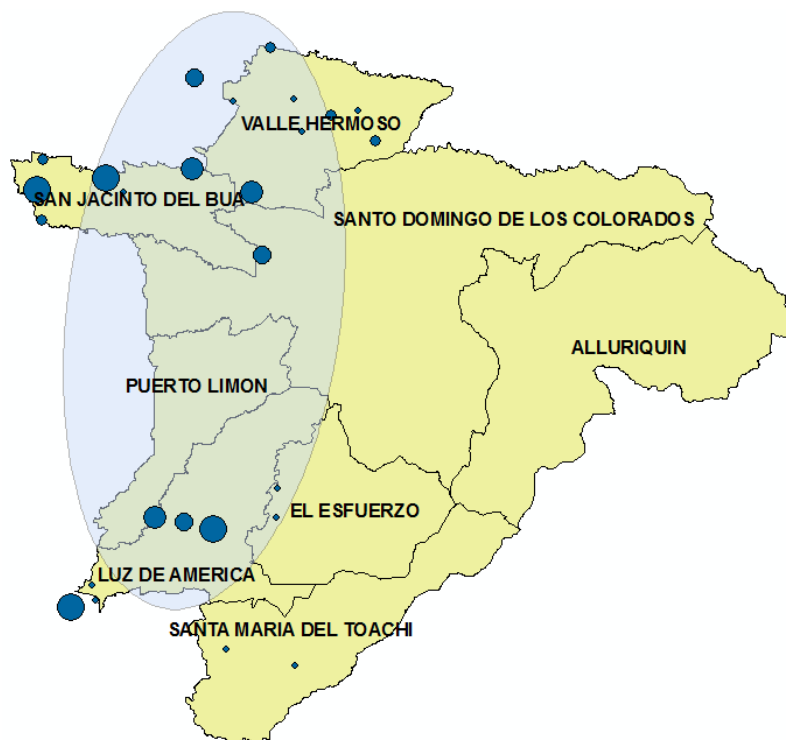


Figure32 - Ellipse of Distribution of points of oil Palm cultivation

### 2.4.3 PALMETTO

Santo Domingo offers an ideal climate for this type of crop, and as can be seen in Figure 33, is particularly focused on the northern part of the province, specifically in the Parish of Valle Hermoso, a reason for this may be that there is in the largest exporters of the product area, you buy total crop farmers because palmetto is not consumed domestically in the country and all production is for export, and added benefits of climate and soil, is that we can see agro-production that the alley is located mostly in the northwestern part of the province (see Figure 34).

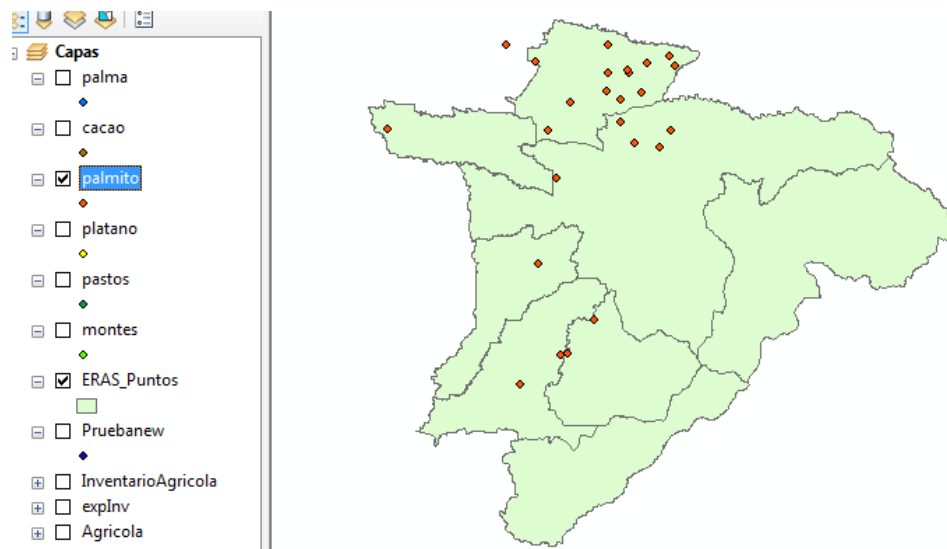


Figure33 - Distribution of points of Palmetto

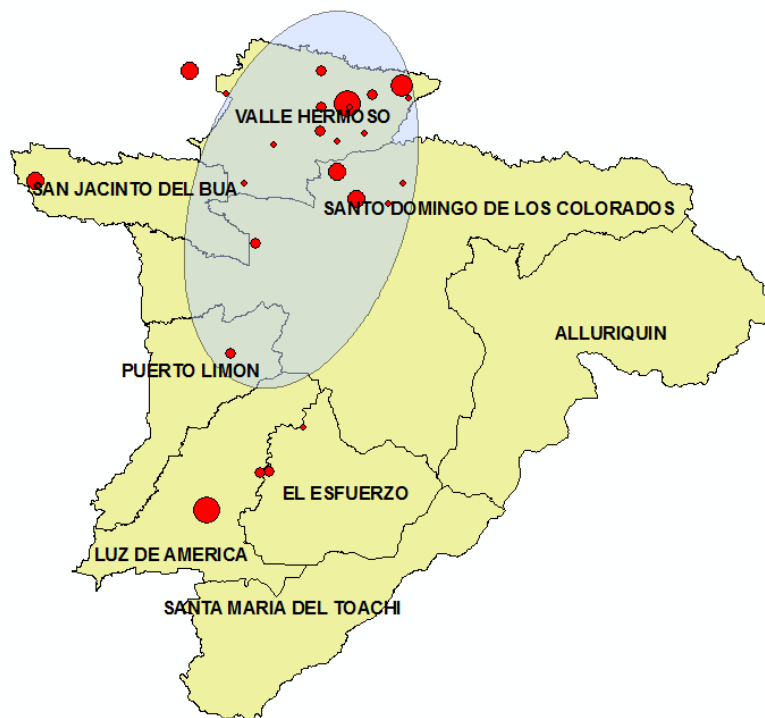


Figure34 - Ellipse of Distribution of points of oil Palmetto cultivation

By Figure 35 and 36, we can see a number of large enclosures there Palmetto productions, denoting that it is one of the most important crops in the province.

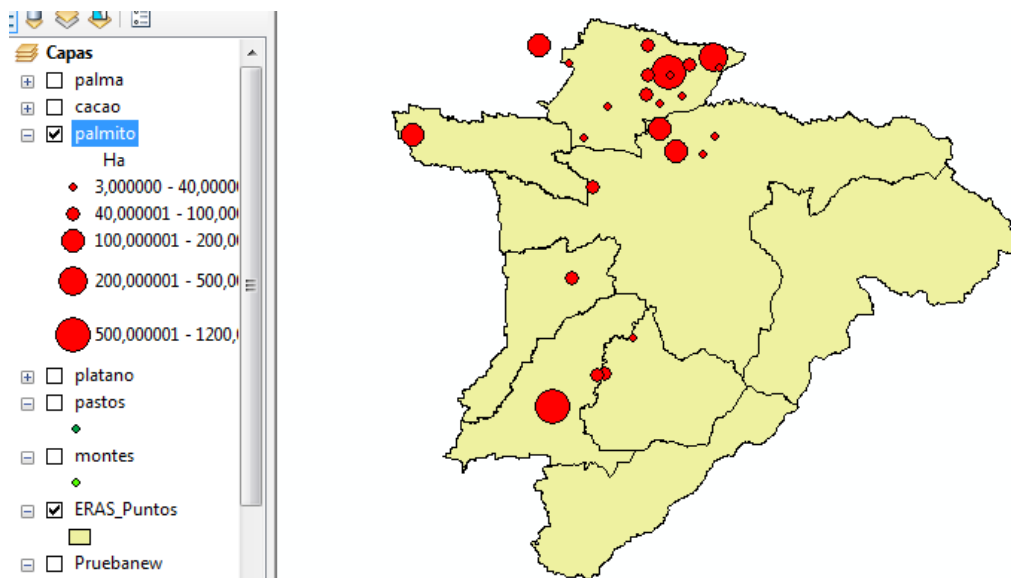


Figure35 - Sizes Palmetto crops by enclosures

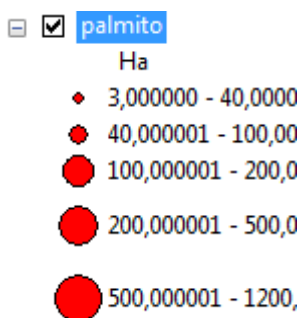


Figure36 - Class distribution of the planting of Palmetto

### 2.4.4 BANANA

For the excellent performance of soil and climate, the western center of the province is one of the largest producers of bananas, and still be very influential on the canton bordering El Carmen, one of the major producers of this crop (Barraganete variety), we can see the distribution of points (Figure 37) and agro-production alley (Figure 38) focuses precisely on that area (Parish of Puerto Limon mainly followed by San Jacinto del Búa and the western part of the cantonal Santo Domingo), in which the variety is grown for export (Barraganete), on the other parishes, the variety is grown mainly Dominican who is for domestic consumption.

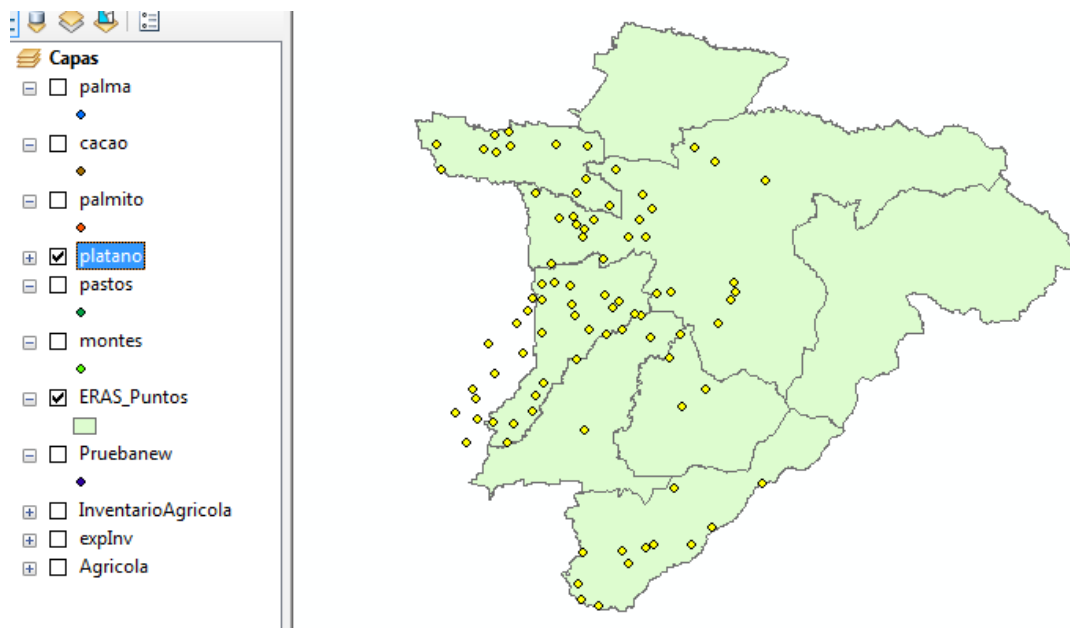


Figure37 - Distribution of points of Banana

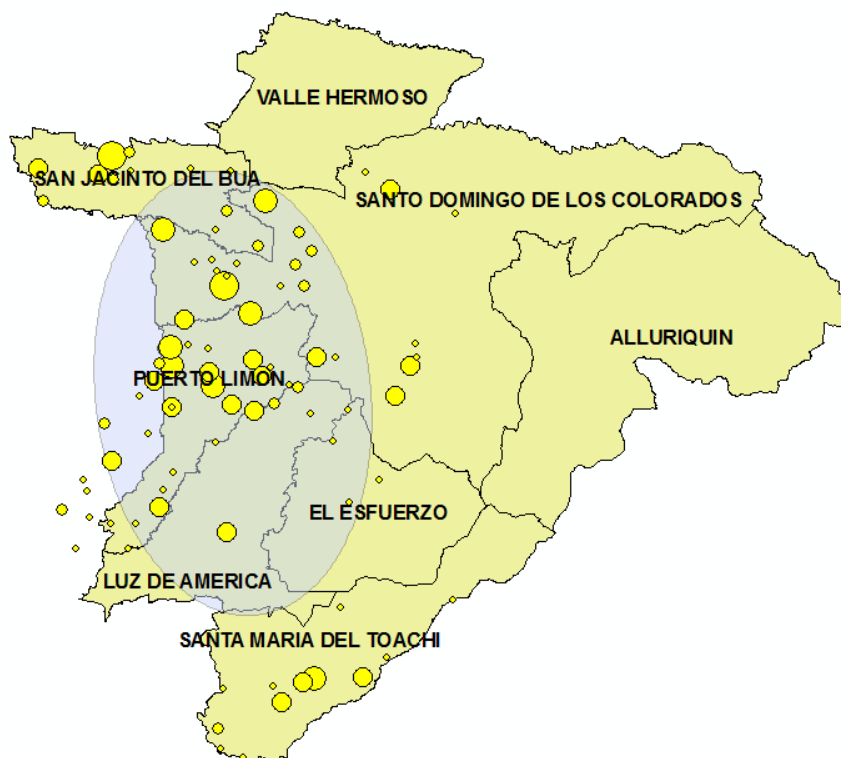


Figure38 - Ellipse of Distribution of points of oil Banana cultivation

There is a very varied size farmer as you can see in the figures 39 and 40, but basically the big farmers engaged in the planting of export variety with small contrasting devoted mostly to dominico cultivation.



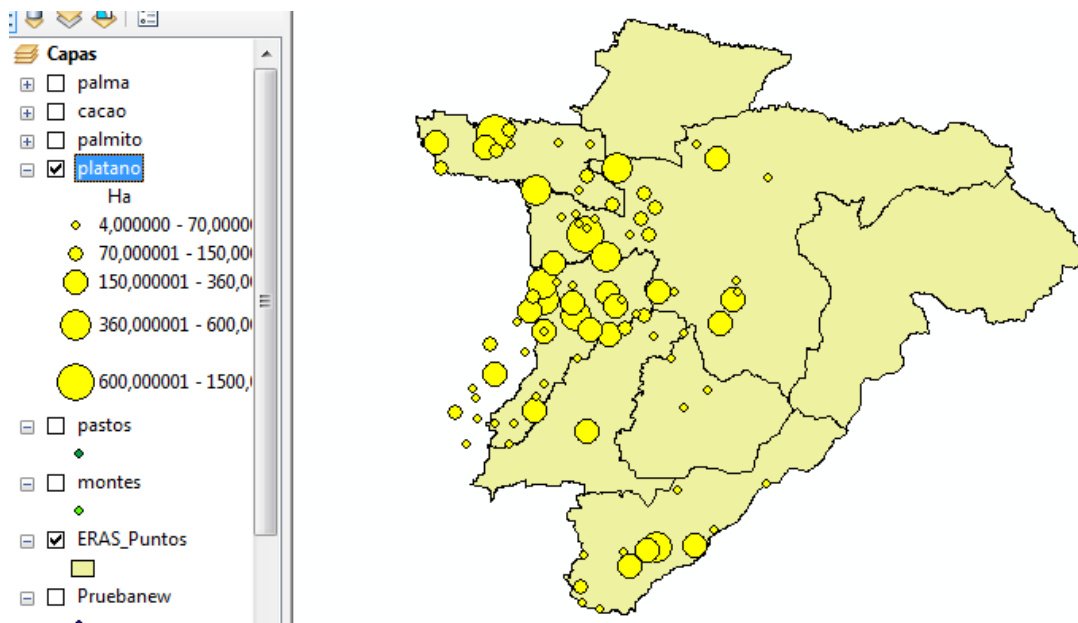


Figure39 - Sizes Banana crops by enclosures

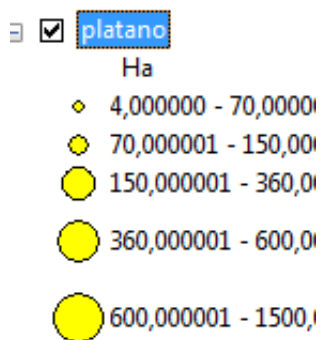


Figure40- Class distribution of the planting of Banana

### 2.4.5 YUCCA

Santo Domingo is known for being a major cassava producing provinces (now mostly planted the bitter variety) in Ecuador, for its climate and soil, providing the optimum performance for this crop, mainly in the cantonal and in the center of the province (Figure 42).



Figure41 - Distribution of points of Yucca

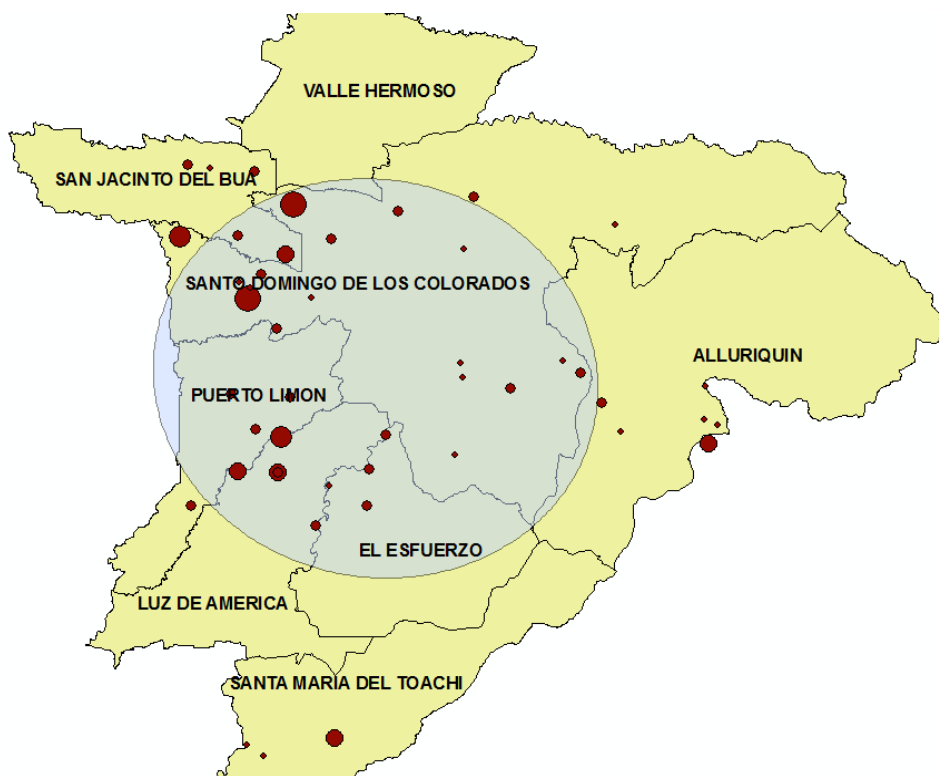


Figure42 - Ellipse of Distribution of points of Yucca cultivation

The western part of the province is characterized by the farm houses with the largest producers of cassava (Figure 43).

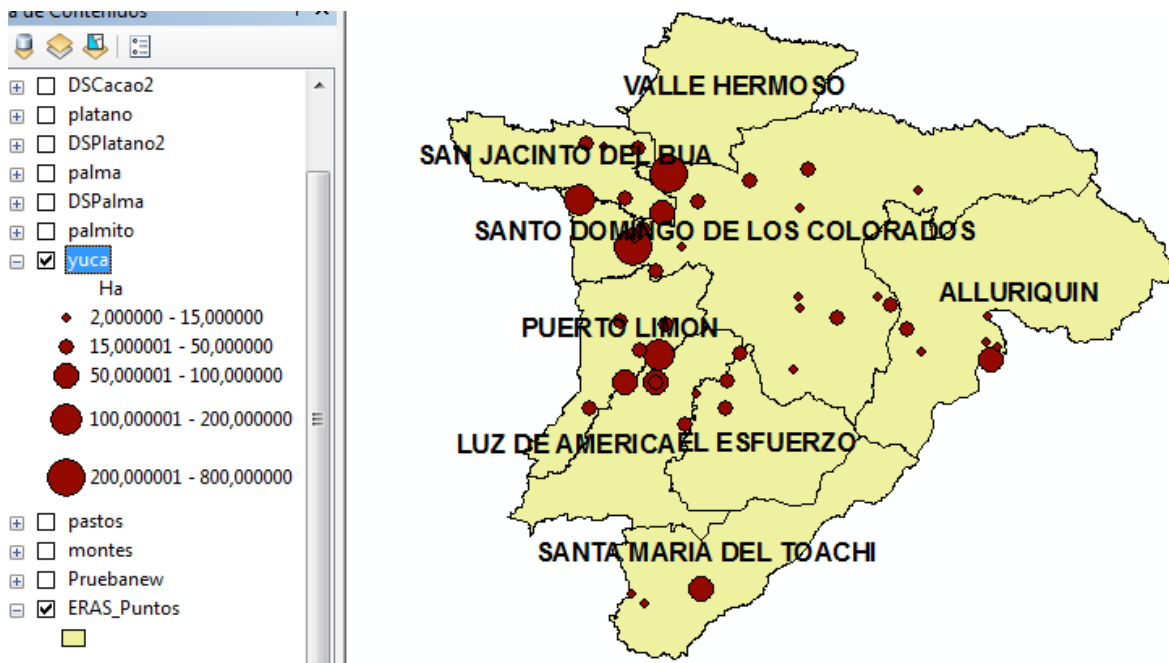


Figure43 - Sizes Yucca crops by enclosures

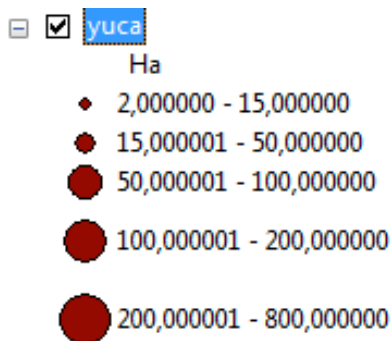


Figure44 - Class distribution of the planting of Yucca

### 2.4.6 GRASSES GROWN

Although grasses grown is the main crop in the area, covering 125,095 hectares, it is not considered part of the agro, being directly related to the livestock, being the staple food of cattle, but this crop brings consideration to indicate that Santo Domingo is highly livestock area, as we can infer from the distribution of points (Figure 45) where there are province-wide enclosures having sown pasture for their cattle and their main trend is the eastern part

of the province, closest to the mountains of Ecuador (Figure 46) where the higher seeded range grasses (Figure 47).

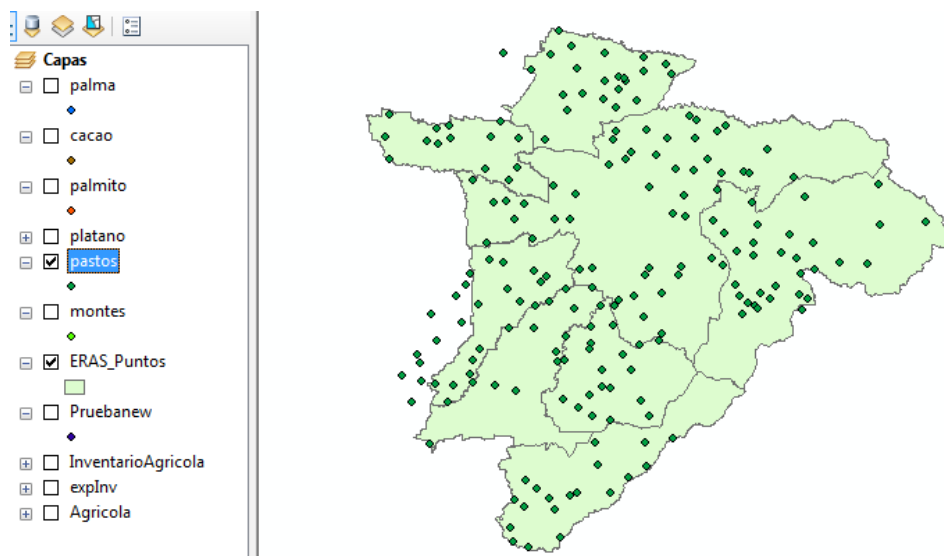


Figure45 - Distribution of points of Yucca

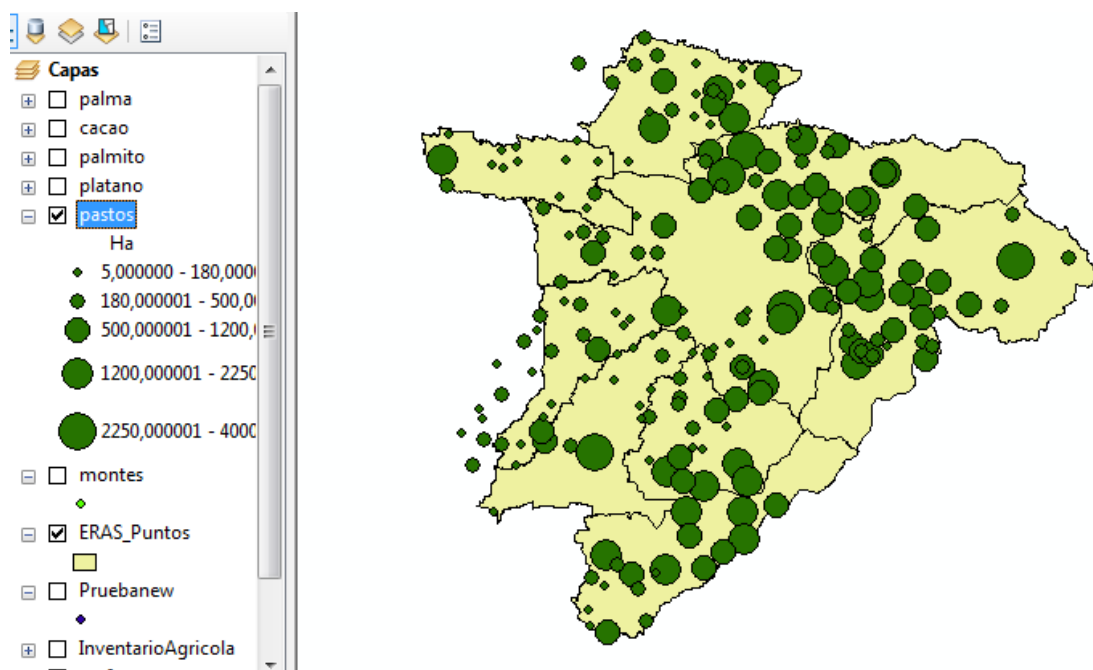


Figure46 - Sizes grasses grown crops by enclosures



Figure47 - Class distribution of the planting of grasses grown

## 2.5 FILE SYNCHRONIZATION WITH GIS CLOUD

In order to share information generated, and keep updated, you need a public and collaborative interface to use this GIS CLOUD (Figure 48), a web-based software, free for non-commercial purposes, with an extension that is installed in Arc Map for synchronization of all files of our project, and to manage the use of users and their permissions issue (Figure 49), and thereby to keep the information current. For all the above dimensioned just to create the accounts so necessary for technical staff will work with the project, and set its permissions to share the link where published our GIS project.

<http://www.giscloud.com/map/89745/Inventario%20Agro%20Santo%20Domingo#>

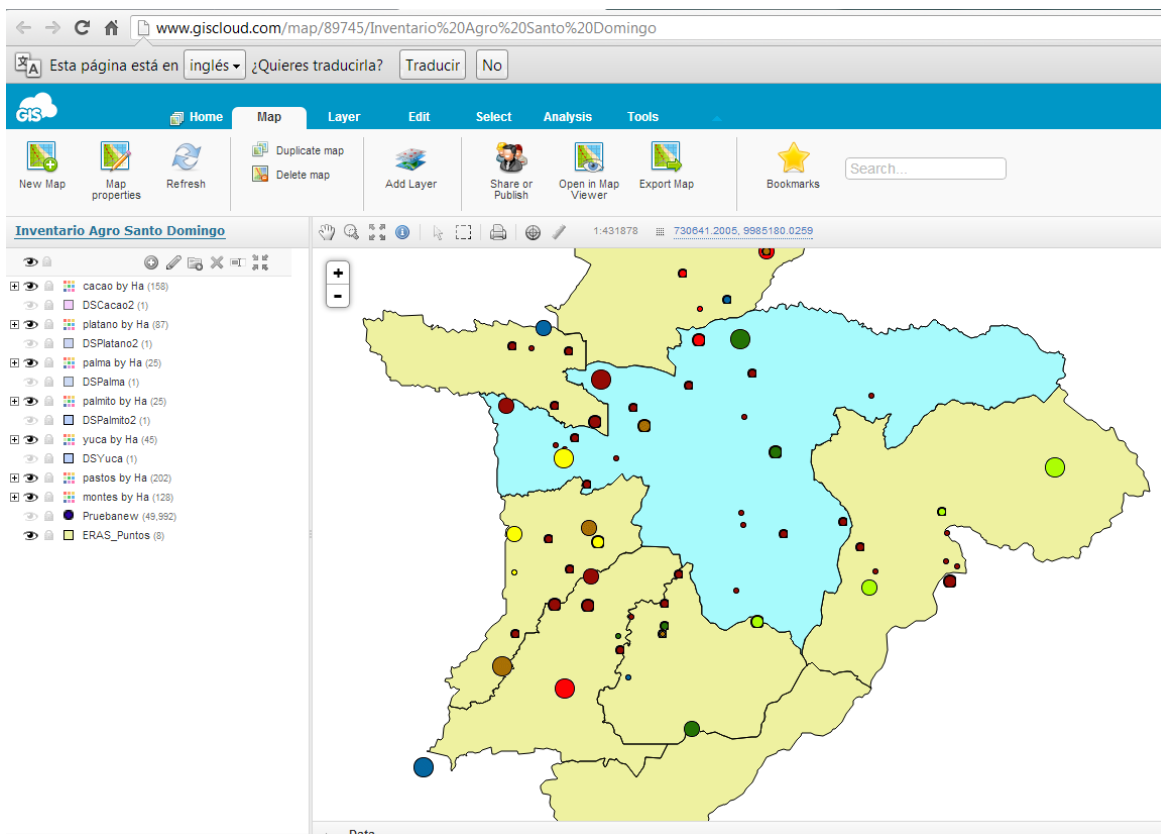


Figure48 - GISCLOUD Map Editor Interface

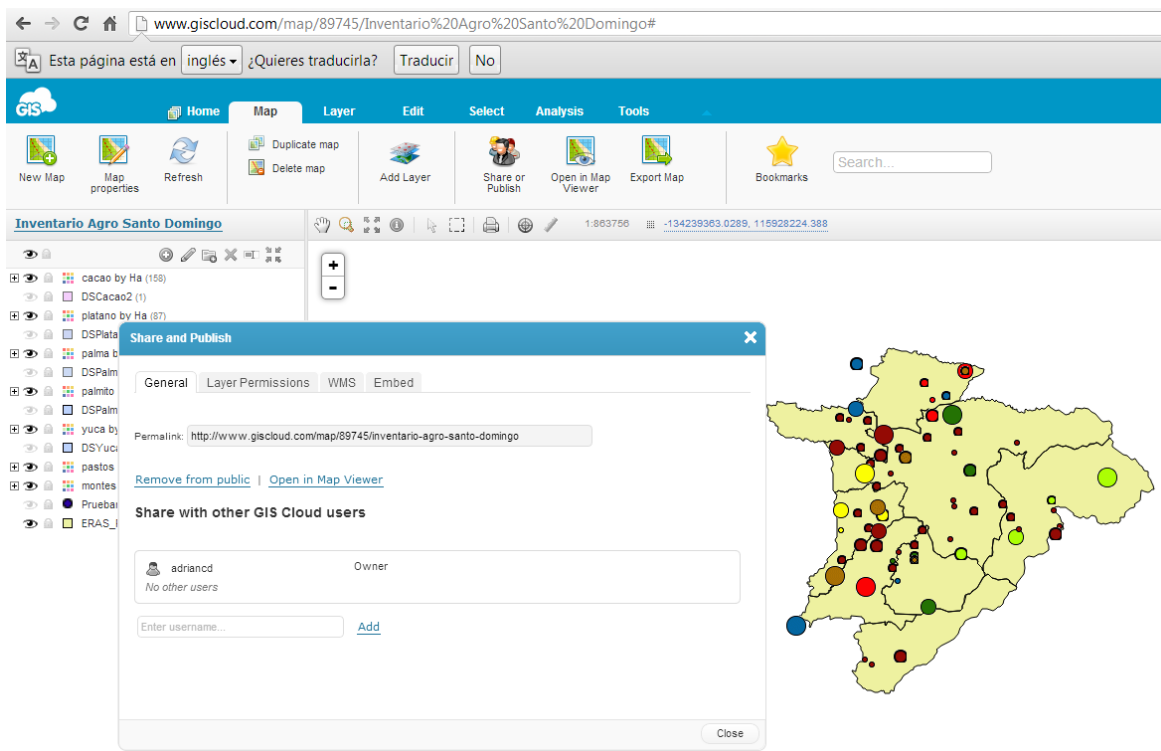


Figure49 - Interface to share and edit permissions

## **CHAPTER III**

# **CONCLUSIONS AND RECOMMENDATIONS**

## **CHAPTER III**

### **3. CONCLUSIONS AND RECOMMENDATIONS**

#### **3.1 CONCLUSIONS**

- In this research could be reached actually identify the main crops in the province, to determine what is the real potential of the province on its land.
- It could bring out the alleys of agro-production of major crops in the province.
- The information generated about the alleys of agro-production, will greatly assist the trader wishing to identify where to buy the product as there is a significant concentration of producers.
- It can locate where the production areas and specialized producers in each crop are.
- It could collect important input for making better decisions by authorities, according to the reality of the province.
- GIS is an exceptional tool for the handling and processing of spatial information, with which you can benefit extensively to agricultural management policies on the part of the authorities and producers.



### **3.2 RECOMMENDATIONS**

- The Provincial MAGAP should appoint technical staff in charge to continue updating the information in GIS.
- Implement livestock's study to GIS.
- Continue to increase the sample (surveys and interviews) to be possible to reach 100%.
- Disseminate information from our research to the agricultural community and seek the most efficient mechanism to advise the producer.
- Add to GIS an optimum climate database for the province so we can provide more accurate advice to the producer.

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