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FARM TYPOLOGY INCORPORATING ACTUAL LAND USE

A Low-Data Input Approach For The Guanacaste Province, Costa Rica

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CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA (CATIE)

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The Research Program on Sustainability in Agriculture (REPOSA) is a cooperation between Wageningen Agricultural University (WAU), the Center for Research and Education in Tropical Agriculture (CATIE), and the Costa Rican Ministry of Agriculture and Livestock (MAG). In addition, REPOSA has signed memoranda of understanding with numerous academic, governmental, international, and non-governmental organizations in Costa Rica.
The overall objective of REPOSA is the development of an interdisciplinary methodology for land use evaluation at various levels of aggregation. The methodology, based on a modular approach to the integration of different models and data bases, is denominated *USTED* (*Uso Sostenible de Tierras En el Desarrollo*; Sustainable Land Use in Development).
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REPOSA is financed entirely by WAU under its Sustainable Land Use in the Tropics program, sub-program Sustainable Land Use in Central America. It operates mainly out of Guápiles where it is located on the experimental station *Los Diamantes* of MAG.

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REPOSA es financiado por la UAW bajo su Programa del Uso Sostenible de la Tierra en los Areas Trópicos. La sede de REPOSA está ubicada en la Estación Experimental Los Diamantes del MAG en Guápiles.

PREFACE

In 1986 an agreement for co-operation was signed between the *Tropical Agricultural Research and Higher Education Center* (CATIE)[1], the *Costa Rican Ministry for Agriculture and Livestock* (MAG) and the Wageningen University (WAU), the Netherlands. The Atlantic Zone Program (AZP) has resulted out of this agreement.

From January 1995 till August 1995, I cooperated in the research of the AZP in Guápiles, Costa Rica. This period, which I really enjoyed, was a practical training period and included thesis research. One final report has been written dealing with both periods. In Costa Rica I was supervised by Jetse Stoorvogel. I want to thank him for his help and advice. Also thanks to Prof. Louise Fresco and Prof. Johan Bouma, my supervisors in Wageningen. I also want to thank Don Mario who helped me with the fieldwork.

[1] CATIE is an international agronomical institute which is based in Turialba, Costa Rica.

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SUMMARY

The USTED methodology is a linear programming model, which supports land use planning as regional planning of agricultural lands. Although it is focused at the regional level, it does include the farm level as well and it will mainly concentrate on the definition of farm types. These farm types are generalizations of the relatively large number of farms in the study area and are determined by farm size and soil type. Actual land use can not be used for the determination of these farm types, because the output of the methodology comprises land use. Still it might be important to relate farm sizes and soil types to actual land use, so that decisions of farmers are also included in the methodology. So this thesis tries to define farm size classes, related to actual land use, in order to determine farm types for the farm typology to be used for the USTED methodology. To get an overview of actual land use in relation to farm size and soil types, an inventory is carried out for a limited number of farms, on the basis of interviews. The investigated area is a part of the Guanacaste province, which is situated in the north-west of Costa Rica.

In the farm typology all the farms which are grouped together in farm types are included. Due to the impossibility to incorporate all the farms of the study area, a stratified sampling is used to define farm size classes. To get a sample of farms with the greatest variation as possible, the study area is divided into agro-ecological zones. In each zone, pilot areas are chosen, where interviews are held. To see if this sample is a representative sample of the study area, two distributions are compared, one from census and one from interviews. When it seems to be a representative sample, data from interviews can be used to obtain the following information:

- Types of soils and variances in soils within one farm.
- Relation between farm size and current land use.
- Relation between soil type and current land use.
- Relation between parcel sizes and farm sizes.
- In case of cattle breeding details can be mentioned about different pasture systems in relation with farm sizes.

To make farm size classes, seven soil clusters from the study area, are distinguished, which are associations of soil types between different soil groups or combinations within one soil group. Soil group characteristics, which determine land properties, are given together with land use requirements of the occurring crops and pasture types, in order to get information about soil suitabilities which finally can be used for a land evaluation. This land evaluation is used to compare the expected land use with actual land use. Beside using scientific names of soil types it also seems important to use local names (the way farmers call them), because the relation between soil type with local names and land use seems more clear than the relation with scientific names.

When looking at the relation between farm size and current land use, six land use classes are distinguished: homegardens, crops, pasture, forest, tree plantation and fallow. When farm size classes were related with actual land use there was a relation, but because these farm size classes are arbitrarily chosen, they did not coincide with actual land use. To rectify this fault, individual farms, instead of farm classes, were plotted per different soil cluster. Looking at the relation between soil type and current land use, it can be concluded that each soil type determines its own land use. Homegardens, forest and fallow occur on mostly all soil clusters, crops on fertile soils, and tree plantation is mainly present on soils with steep slopes. Pasture occurs on all soil clusters and is often the main land use cover. Because pasture is very important in the study area, differences are made as well in pasture systems, like; pasture without animals, beef cattle, breeding cattle, dairy cattle and double

purpose are investigated. It could be concluded that pasture systems were related to agro-ecological zones, which means that theses systems are more or less related to soil types. A relation between parcel size and farm size could not be made.

So each farmer determines his land use by the occurring soil types. For the farm typology it is recommendable to define farm size classes per soil type, for each soil type has its own land use. In this way farm size classes coincide with actual land use and farm types may be better classified than in the past.

1 INTRODUCTION

When population increases, which is a known process of developing countries, often demands for arable land, pasture and urban area are becoming greater. This is mostly attended with a decrease in nature areas, like forests. Even where land is still plentiful, many people may have an inadequate access to land or benefits from its use. Land use planning (LUP) is a systematic way to address these problems and to decide how land should be used.

In the present context, land use planning is considered as regional planning of agricultural lands. It is meant to indicate the possibilities of land use (potentials) in the future and what should be done to go from the present situation to the future situation, in other words, how to change land use (Fresco et al., 1990). Land use planning can be supported by scenarios, for which the following (hierarchical) levels must be taken into account.

1) *LUST level*: The fundamental interaction between soil, plant and man, the smallest unit of observation is called LUST (Land Use System under a certain Technology input). This encompasses a single soil unit, with a single specific form of land use (one crop, mixed cropping or a crop rotation), with specific land and crop management.
2) *Farm level*: A farm may contain several LUST's. At a farm level the economic and agronomic decisions of farm management are evaluated.
3) *Regional level*: Land use planning at regional level is not simply a sum of scenarios for small farms in the region. It extends to non-agricultural sectors. Regional planners are more concerned with longer term economic, and in some cases also ecological issues.
4) *National level*: At this level a government will decide on what to invest.

When agricultural planning will be carried out on regional level, national level can be included as a boundary condition. This is also done in the methodology of the AZP.

This thesis will be focused on the USTED (Uso Sostenible de Tierras En el Desarrollo; Sustainable Land Use in Development) Methodology (Stoorvogel et al., 1995). The methodology is based on a linear programming model in combination with a Geographical Information System (GIS), crop growth simulation models and expert systems. The USTED Methodology developed at the Atlantic Zone Programme is meant to be a useful tool to support land use planning. It is a geo-referenced procedure for the analysis of the effect of scenarios on agricultural land use. Land use scenarios in this context are defined as a hypothesized set of changes in the socio-economic and the bio-physical environment. The on-average net farm income for the different farm types is maximized, by selecting different land use systems for the different farm types. Basic data for the methodology comprise quantitative descriptions of land use systems, data on e.g. prices and chemical compositions of inputs and outputs, and geo-referenced information on farm types. Sustainability is incorporated in the methodology by a limited number of quantified sustainability parameters (Jansen et al., 1995).

After developing this model in the Atlantic zone it is now tested with low-data input. The selected test area is part of the Guanacaste province which is situated in the north-west of Costa Rica and which is much drier than the Atlantic Zone.

Although this thesis is focused at the regional level, it does include the farm level as well and it will mainly concentrate on the definition of farm types. By investigating the regional level, it is not possible to look at each individual farm, so a limited number of farm types, which are generalizations of the relatively large number of farms in the region,

are needed. The general methodology for the determination of these farm types is described in chapter 3.

The calculation of an "optimum" land use distribution for a certain scenario, results in a selection of LUST's for different farm types. The sound analysis, which analyses a scenario, can not include actual land use for the definition of farm types, because the output of the methodology comprises land use. Optimum land use would than be depended on actual land use. The farm types are therefore defined on the basis of their physical production potential in terms of farm sizes and soil distribution. Although statistical techniques like cluster analysis may be used to group farms into farm types, the definition of the farm types is often described without good basis, due to absence of enough data for a cluster analysis. When farm types are only defined on the basis of farm size and soil types, decisions of farmers are not included. These decisions can be very important for the determination of farm types and therefore actual land use have to be incorporated in the determination of farm types. So the main objective of this thesis is to define farm size classes related to actual land use to determine farm types. When these classes are defined by actual land use, farm types are more related to land use decisions (selection of LUST's) of farmers and maybe be a better "optimum" land use distribution for a certain scenario can be found.

To get an overview of actual land use in relation to farm size and soil types, an inventory is carried out for a limited number of farms, on the basis of interviews. After interviewing, there will be looked for relations between land use and soil type or between land use and farm size which are described in chapter 4, to define farm size classes. Chapter 5 includes discussion and conclusions.

2 DESCRIPTION OF THE STUDY AREA

2.1 Physical description

2.1.1 Costa Rica, Guanacaste, the study area

Costa Rica, the second smallest country of Central America, has an area of 51,000 km² and is bordered by Nicaragua, Panama, the Pacific Ocean and the Caribbean Sea (Herrera, 1985).

In the north-west of Costa Rica, the province Guanacaste is located. Guanacaste is bordered by Nicaragua in the north, the Cordillera de Guanacaste in the east, the Pacific ocean in the west and the Golf of Nicoya in the south. Geographic coordinates are 9°16' to 11°12' N latitude and 84°30 to 85°56 W longitude. Within this province the study area is located, which has an area of 7,649 km² (see also figure 2.1). It covers the central part of the Guanacaste province. The cantons Abangares, Nandayure and La Cruz are excluded in the study area.

In 1984 this region had 160.000 inhabitants (DGEC, 1987b) and the most important income sources are agriculture and tourism.

2.1.2 Climate, natural vegetation and soils in the study area

The majority of the weather systems advancing over the province of Guanacaste come from the east where they have deposited much of their moisture on eastern Costa Rica while passing the mountains. This results in a subhumid/semiarid climate with a mean annual precipitation, which ranges from 1200 to 2900 millimeters per year (Anon., 1988). It has a dry season for five to six months, from November to May/April and a second rainfall minimum in July/August (Herrera, 1985). Because of the dry season, Guanacaste has less rainfall than other parts of Costa Rica. The mean year temperature is 27°C (Herrera, 1985).

Guanacaste has as much as seven different life zones as described by Holdridge (1971) ranging from Tropical Dry forest to Lower montane forest. The Tropical Dry forest which occurred mostly is a low semideciduous forest has only two strata of trees. This forest which has been extensively cleared and recurrently burned for shifting cultivation and pastures has now resulted in large range lands in the greatest part of Guanacaste (Hartshorn et al., 1982).

Some soil types in Guanacaste are: Andosols, Inceptisols, Mollisols, Alfisols, Vertisols and Entisols (Nieuwenhuyse, pers. comment, 1995). Andosols, Inceptisols and Mollisols are the most occurring ones.

On the steep slopes which are mostly covered by pasture, soil degradation occurs phenomenon. Physical compaction, repeated burning, and inappropriate land use are the most occurring causers of soil degradation (Hartshorn et al., 1982).

Figure 2.1: The study area.

2.2 Land use

2.2.1 Land use history

In the thirties many people moved from Central Costa Rica to the Nicoya Complex to find new virgin forest to cut for pasture lands and cultivation of basic cereals. This caused, in the course of the years, soil degradation on the steep slopes, which forced people to move out the area, especially in the seventies when the area was hit by several dry spells. In these times Nicoya became an emigration area instead of an immigration area. After this period, others, however, especially in the Hojancha area, started reforestation programs partly with local species like Melina (*Gmelina arborea*) and Pochote (*Bombacopsis quinatum*).

In the seventies many farmers started to cultivate rice in the Tempisque lowlands, but because of low prices many were forced to sell their land, especially poorer farmers on difficult Vertisols. In the nineties an irrigation scheme has been developed by SENARA

(Servicio Nacional de Aguas Subterraneas Riego y Avenamiento) to limit dependence on rainfall fluctuations; irrigated parcels around 7 ha, irrespective of soil quality, are being handed out to small farmers by IDA (Institute for rural development), which is the main organization dealing with the reorganization and management of agricultural settlements.

Elsewhere in the lowlands and on the volcanic slopes extensive grazing lands with shallow stony soils prevail (Anon., 1994a).

All these changes in land use, caused deforestation. Table 2.1 shows that deforestation was rapid between 1950 and 1980. Almost half of the deforestation has occurred since 1950. Annual deforestation dropped from 40,000 and 60,000 hectares in the late 1970s and early 1980s to 18,000 hectares between 1987 and 1992 and more recently to only 8,500 hectares (Kaimowitz, 1994).

Table 2.1: Forest area for selected years in Costa Rica (millions of hectares).

	1950	1970/80s	1990
Costa Rica	2.7	1.6	1.4

(Source: Kaimowitz, 1994)

In the Tropical dry life zone, forest area decreased from 427 km² in 1940 to 0 km² in 1983 (Sader et al., 1988). The conversion from forest to pasture on low-fertility soils and especially on steep slopes caused serious soil erosion and decreasing productivity. In some parts, for example in the Nicoya Complex started reforestation projects. In Guanacaste the reforestated area increased from 1211 ha. in 1990 to 2204 ha. in 1993 (Anon., 1994b)

2.2.2 Agriculture

While Costa Rica produces basic grains as rice (*Oryza sativa*), corn and beans for local consumption, only rice is currently being exported (Meyer, et al., 1986). The most important agricultural products of Guanacaste are: rice, sugar cane (*Saccharum cvs.*) and (sweet) melon (*C. Melo, Citrullus lanatus*) (Hartshorn, 1982). Mango (*Magnifera indica*) and coffee (*Coffea arabica*) are also grown but on a relative small scale. Rice and sugar cane can be found on large farms (up to 7,000 ha) in the lowlands of the Tempisque river but also on small farms (<50 ha.) for local consumption and fodder. The coffee species, grown in Costa Rica, is a crop that prefers some altitude and mostly occurs on slopes of the mountains of the Nicoya complex and on higher situated slopes of the non-volcanic Cordillera de Tilarán. Table 2.2 shows the area and the production of some crops which are cultivated in Guanacaste in 1984.

Table 2.2: Area (ha) and production (tons) of different crops in Guanacaste.

	Ha	Production in tons
Rice	41,169.9	121,799
Sugar cane	18,828.6	1,209,694
Maize White	7,371.8	6,476
Maize Sweet	1,053.3	1,073
Beans	5,845.7	2,160
Coffee	1,791.0	7,700
Platano	410.4	1,033
Oranges	329.7	10,415
Banana	225.5	540
Yucca	216.0	1,316
Avocado	206.9	3,061
Cocos	55.8	271*
Pine apple	87.6	10*

*in 1000 pieces

(Source: DGEC, 1987a)

2.2.3 Livestock

Table 2.3: Cattle population (million head) and pasture (millions of hectares) in Costa Rica in 1950, 1970, 1978, 1983 and 1991.

	1950	1970	1978	1983	1991
Cattle population	0.6	1.5	2.0	-	1.9
Pasture	0.6	1.3	1.7	2.2	2.4

(Source: Kaimowitz, 1994)

Table 2.3 shows the evolution of the cattle population and the evolution of pasture in Costa Rica since 1950. The region's cattle herd more than tripled between 1950 and 1978. After that, however it stagnated, and in 1991 there were fewer cattle in Costa Rica than thirteen years earlier. The stagnation of the cattle herd in the region has been associated with slower growth in pasture area, but not to a corresponding degree. Between 1978 and 1991, the area in pasture increased in the country, and in 1991 there was 0.7 million more hectares in pasture than in 1978. Growth in pasture at the same time cattle population has declined, resulted in more extensive livestock systems. During the period 1950-1970, 60% of pasture expansion occurred in tropical dry areas in the Pacific and central regions, with less than 2,000 mm. of annual rainfall and/or more than three dry months (Toledo, 1992).

Guanacaste and Puntarenas were the centers of livestock expansion between 1950 and 1960 and were the areas where the cattle population decreased the most in the 1980s. 2/3 of the pastures is owned by large and medium farmers (over 100 cattle each) (Kaimowitz,

1994).

3 METHODOLOGY

3.1 Introduction

For a farm typology farms need to be grouped into farm types. Formerly farms were grouped together only on the basis of farm sizes. Nowadays farms can be grouped on the basis of different criteria ranging from socio-economic (e.g. farmer objectives) to bio-physical (e.g. soil types) criteria. Still farm size remains the main criteria, to determine farm types. Land use planning, in the USTED Methodology, is considered as planning of agricultural lands on a regional level and on this level socio-economic criteria are difficult to find, due to data availability. In the specific application of this methodology, also land use can not be included, because the output of the methodology comprises land use. So only the physical production possibilities, like farm size and soil type remain for the determination of farm types. Data are available from census data, aerial photographs and soil maps.

Farm size classes, which are groups of farms with a certain soil type and a certain farm size range and based on actual land use, will determine farm types. First a general description will be given of how farm types are determined. After that, the method of this thesis will be explained as well as how data from the field will be used to define farm size classes, based on actual land use. To explain a certain land use on a certain soil type, also attention will be given to soil suitabilities of different soil types and crop requirements which determine a certain land use.

Guanacaste, where farms are situated which are being used for the farm typology, is divided into eleven cantons. Each canton is subdivided into different districts. For the research only eight cantons will be used (Liberia, Nicoya, Santa Cruz, Bagaces, Carillo, Cañas, Tilarán and Hojancha). The total area of the investigated cantons is 764,000 hectares.

Till this moment, in the AZP, farm types were determined by a cluster analysis. In general farm classification constitutes a grouping of farms with the objective to obtain classes, on the basis of particular characteristics, like soil type, actual land use, the objective of a farmer etc. (Alfaro et al., 1994). One of the main problems is to define the number of classes and to restrict the number of farm types. An other problem is that the location of the individual farms, mostly is not known, only the number of farms per district is known. This means that also the soil types of the farms are not known. Because the USTED Methodology is based on geo-referenced scenario analysis, locations of farms are needed. When locations are not available, it is difficult to perform a farm typology, because the final farm typology is based on an overlay with an available soil map and farm map. So finally in each district the number of farms, their sizes and soil types are known. The calculated number of farms will be checked with a field survey on the basis of defined farm types and may then indicate the relevance of farm types in actual land use. A detailed description of how farm types are being estimated, is described by v/d Steeg (in prep., 1996).

3.2 The determination of farm types

Farm size classes, like are used by v/d Steeg are defined on the basis of expert knowledge. The definition remains relatively arbitrary due to the lack of "hard" criteria. They do not relate to actual land use, and do not coincide with farmer's decisions. But to see for farm size classes which are determined by decisions of farmers, actual land use have to be incorporated in the determination of farm types. This is because land use is determined by farmers actions. So farm sizes and soil types need to be related to actual land use.

In the farm typology all farms will be included which are grouped together in farm types. It is impossible to incorporate all farms of the study area, because of a great number of farms (± 12500). In the classification of farm sizes, a stratified sampling, instead of all farms, will be used to define farm size classes. This sampling has to be a sample with a variation in soils, land use, relief etc. as great as possible to get a real sight into the different farms with a certain land use. Therefore it is useful to divide the study area in agro-ecological zones and to select pilot areas in each of these zones. These agro-ecological zones and pilot areas, will be selected by aerial photointerpretation (scale 1: 80,000) and maps with contour lines (scale: 1:50,000). In each pilot area three till four interviews will be taken, to get a perception of farm size, soil type and land use. Also farms established by IDA will be considered, next to privately owned farms, to see differences between these farms.

Farm sizes classes, which will be used in this farm typology, will be found by looking at land use differences on different farm sizes per soil type. An hypothesis is that annual and perennial crops will be present on smaller farms with fertile soils and that extensive range lands will be found on large farms. After that, these farm size classes, which now are determined by actual land use, can be used to define farm types. These farm types are an input for the analysis from the USTED methodology.

3.3 Field survey

3.3.1 Introduction of the farm classification

In the Guanacaste province, farms with a wide range of sizes, soil types and land use are found. For the farm classification, only a sample of farms are being used. To see if the farms, which are being chosen and interviewed in the different pilot areas, are a representative sample of the presented farms in the study area, two kinds of distributions are being made.

First a distribution of farm sizes from census (DGEC, 1987a) is used. This distribution give an view about how many farms of a certain farm size are presented in 1984. The second distribution is derived from interviews and is a sample of farms in different pilot areas of different agro-ecological zones. These two distributions can be compared with each other to look if the sample from interviews is a representative sample of total presented farms in the study area.

When it seems to be a representative sample, the interviews can be used to analyse the data. All data which are collected with interviews (appendix 2) are introduced and processed in a spreadsheet. These data will be used to define farm size classes for the farm typology.

Figure 3.1, in which farms are plotted against the cumulative number of farms, shows the distribution from census.

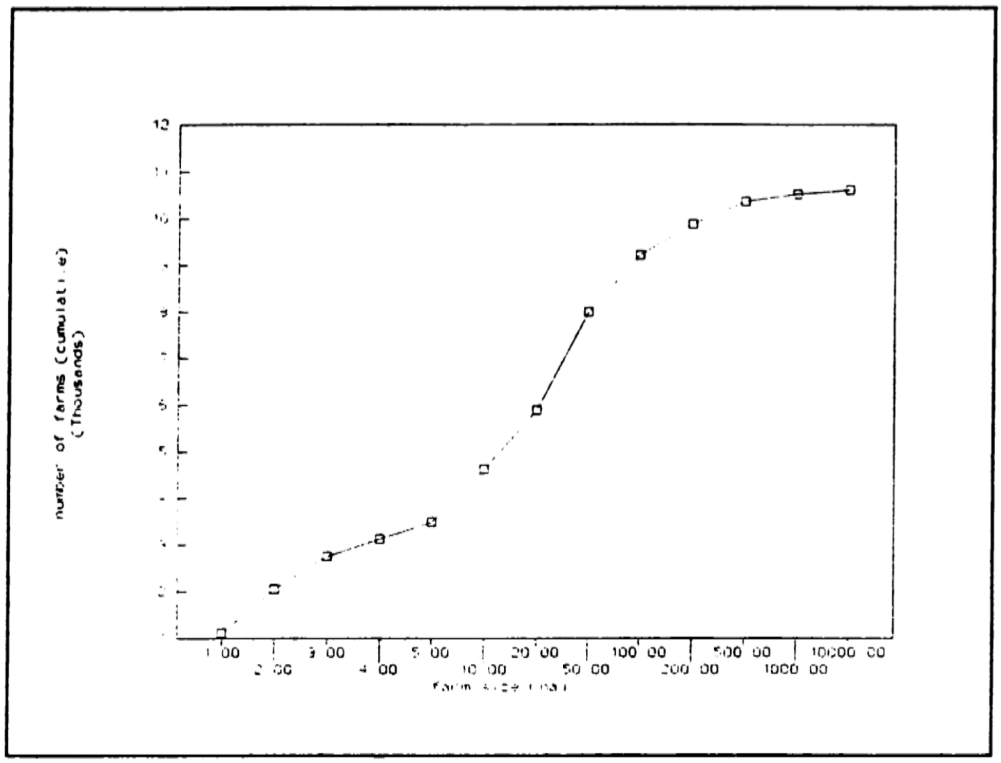

Figure 3.1: Size and number of farms in Guanacaste.

(Source: DGEC, 1987a)

Interviews (appendix 1) will be used for different purposes. For the farm typology, total area, number of parcels and soil types of farms will be needed. To say something about land use, also questions about agriculture, cattle breeding and natural landscapes (e.g. forest) are necessary.

From interviews with farmers, the following information can be concluded:

- Types of soils and variances in soils within one farm.
- Relation between farm size and current land use. E.g. it is likely that extensive cattle farms are larger than farms with annual cropping.
- Relation between soil type and current land use. As an example, Vertisols, which are very heavy clay soils and mostly situates in low flood plains, are not very suitable for some coffee varieties, because of coffee prefers a higher altitude.
- Relation between parcel sizes and farm sizes. Probably small farmers have smaller parcels than greater farms. When a relation is found between parcel size and farm size, aerial photographs, from where parcel sizes can be distinguished, can be used to estimate farm sizes, without field observations.
- In case of cattle breeding details can be mentioned about different pasture systems in relation with farm sizes.

For the definition of farm types, soil types are necessary. Farmers use other names for soil types than scientist, and that's why a comparison between different appellations is being made (van Uffelen, 1990).

3.3.2 The study area

The study area roughly encompasses the drainage basin of the Tempisque river. It consist of four major physiographic units. These physiographic units do not corresponded with agro-ecological zones and therefore the units are further subdivided on the basis of soil types, climate and relief. Figure 3.2 shows the agro-ecological zones in the study area.

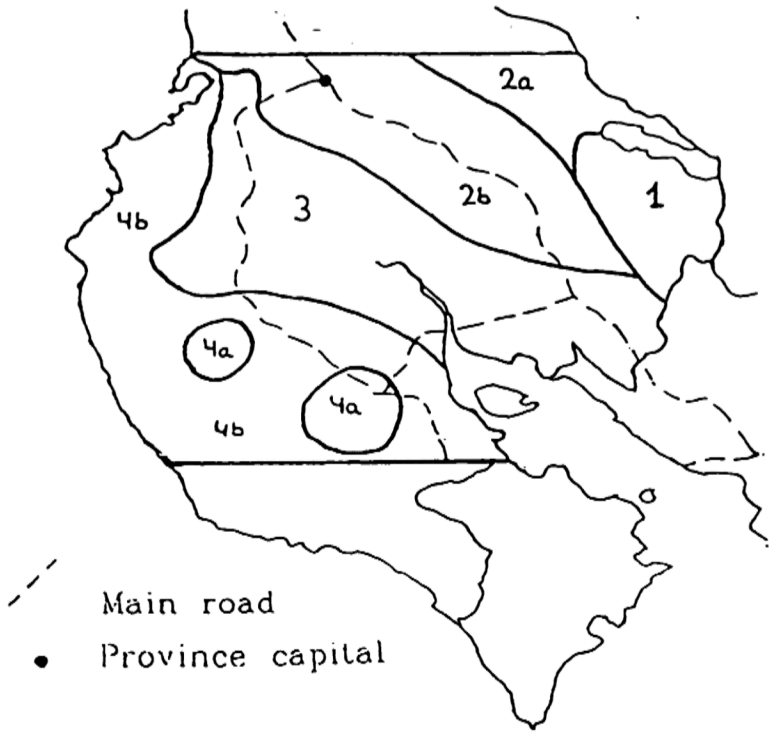

Figure 3.2: Agro-ecological zones in the study area.

1) The Cordillera the Tilarán, which is composed of volcanic and plutonic rocks. Sometimes also mineral resources, gold and silver are founded (Hartshorn, 1982). It is a mountainous non-volcanic area in the surroundings of the town Tilarán. Soils, classified as Andosols and Mollisols, which covers tertiary volcanic rocks, are mainly deep soils, consisting of a layer of volcanic ashes (50-100 cm.) and sometimes also of a layer of pumice. They are enriched with a lot of organic matter and have in general a good structure, well permeability and a good drainage. Structures are light to medium and the soils are very productive (Jeffery et al., 1989). When the rocks not are totally weathered they are called Mollisols. In this area, strong winds hardly permit any agriculture. Pasture is one of the suitable land use types.

2a) The Cordillera de Guanacaste, which is composed of four isolated volcanic massifs, with Volcán Miravalles the highest (2020m.) (Weyl, 1980). Quarternary vulcanism produced extensive depositions of pyroclastics (rhyolitic ash and tuff) around the Cordillera (Hartshorn, 1982). It is a mountainous volcanic area and soils, which covers quartiair volcanic rocks, also have layers of volcanic ashes. Besides Andosols also Inceptisols and Alfisols are found.

The difference with 1 is that influences of strong winds is less and that layers of volcanic ashes are thinner. When irrigation from rivers is possible, annual cropping is

found. But also in this area, pastures are frequently occurring.

2b) The Ignimbrite area is the footslope of the Cordillera and consists of two different landscapes: a strong eroded area close to the mountains and a flat to hilly landscape close to the lowlands. Soils are developed in ignimbrite and comprise, well drained red soils, well drained brown soils (Inceptisols), poorly drained black soils (Vertisols) and very strong eroded soils with a very thin layer (Entisols) which is hardly usable for agriculture. Ignimbrites consists for the greater part of volcanic glass that weathers rapidly (Driessen and Dudal, 1989). In general these soils are shallow with textures from light to medium, low fertility and with excessive drainage (Jeffery et al., 1989).

Very large pastures are typical of this area. On the Vertisols some rice and sugar cane can be found.

3) The Tempisque lowlands are situated between the Nicoya complex and the Ignimbrite area, which consists of thicker series of Upper Cretaceous-Tertiary sediments (Weyl, 1980). It is a flat area with some limestone outcrops. Within the Tempisque lowland, two major soil types can be distinguished, loamy alluvial soils called Inceptisols (or Mollisols when a thick dark surface layer is present) and heavy clay soils, called Vertisols. The alluvial soils on the river terraces are in general deep soils. They have good structures with medium textures, a good permeability and good drainage. Vertisols are heavy textured, black montmorillonite clay soils with a low permeability (Jeffery et al., 1989).

Sugar cane, melon and rice are the most important crops of this area.

4a) The Hojancha area is a hilly, mountainous area which consists of basalts alternated by hyaloclastic rocks (Weyl, 1980). The soils are not as eroded as the footslope of the Cordillera. It is situated in the southern part of the Nicoya complex, in the surroundings of the village Hojancha. South of Santa Cruz is also a little area which has the same characteristics. Red and Brown soils, (Alfisols and Inceptisols), alternate. They are mainly deep (depending of the position of the topography) well drained, permeable, good structured and moderately fertile soils (Jeffery et al., 1989).

In this area reforestation with Teca (*Tectona grandis*), Melina and Pochote is frequently occurring. Also coffee occurs frequently.

4b) The Nicoya complex contains the entire Nicoya complex, excluded from the areas mentioned by number 4a. It is a hilly area which also consists of basalts alternated by hyaloclastic rocks, but slopes are steeper than in the Hojancha area. It has well drained colluvial soils which are fertile, close to the Tempisque lowland and diverging brown and red soils, (Inceptisols and Alfisols), in the mountains on rather steep slopes.

Because of the steep slopes mainly pastures can be founded but also forest and reforestation.

Mangrove, swamps, limestone rocks, reserves, National Parks and pieces of land bought by the MIRENEM (Ministerio de Recursos Naturales Energia y Minas), are excluded from this study that is focused on agriculture and cattle breeding.

In general, land use in Guanacaste consists mainly of extensive grazing lands. Also agriculture occurs but only when enough rainfall or irrigation is available. Especially in the dry season irrigation is essential. Besides great plantations of rice, melon and sugar cane, small farms with coffee, banana, mango etc., can be found.

3.4 Soils in Guanacaste

3.4.1 The used classification

At this moment there are two soil maps of whole Costa Rica. One of them is the soil map at 1: 200,000 scale from Vásquez, 1979 (Pérez et al., 1987). The soil map of Vásquez is interpolated without field observations and therefore a new soil map, especially for Guanacaste, is necessary, to determine farm types. The preliminary legend of this soil map which is presently being made by Nieuwenhuyse will be used (Nieuwenhuyse pers. comment, 1995). There are eight soil groups and each soil group can be subdivided into one till four subgroups or soil types.

1) Soils of the Nicoya complex (Inceptisols, Alfisols).
   10) flat till light undulating
   11) hilly
   12) mountainous with soils greater than 60 cm.
   13) mountainous with soils smaller than 60 cm.

2) Colluvial- and Alluvial soils (Inceptisols, Mollisols).
   20) brown and red colluvial soils, Nicoya complex
   21) alluvial soils, Tempisque
   22) colluvial and alluvial soils with volcanic ashes
   23) coastal terraces

3) Swamps (Entisols).
   30) without specification

4) Vertisols.
   40) without specification

5) Soils on limestone or soils with calcareous sedimental rocks (Mollisols, Entisols,Inceptisols).
   50) undulating
   51) steep

6) Tertiary volcanic rocks (Andosols, Mollisols).
   60) with ash layers < 50 cm.
   61) with ash layers 30-60 cm.
   62) with ash layers 60-100 cm.
   63) with ash layers > 100 cm.

7) Ignimbrite (Inceptisols, Vertisols, Entisols).
   70) flat, poorly drained
   71) almost flat, well drained
   72) undulating
   73) dissected

8) Quartiary volcanic rocks (Andosols, Inceptisols, Alfisols).
   80) flat
   81) undulating
   82) undulating with soils between 30-60 cm.
   83) steep

Most farms in the study area have more than one soil type. A farm can have different soil types within one soil group (e.g. no. 71 and 70 of soil group 7) or different soil types within different soil groups (e.g. no. 23 and 11). Combinations of these soil types will be called soil associations and are grouped together into soil clusters. The soil clusters, which are used to find right farm size classes are:

Soil cluster 1: Association of soil types of the Nicoya complex.
Soil cluster 2: Colluvial and alluvial soil types or association of these soil types.
Soil cluster 6: Association of soil types with different ash layers, which cover tertiary volcanic rocks.
Soil cluster 7: Association of soil types on ignimbrite with different kind of relief.
Soil cluster 8: Association of soil types with different relief and different depth, which covers quartiary volcanic rocks.
Soil cluster 9: Combination of soil types of soil group 1 and soil types of soil group 2.
Soil cluster 10: Combination of soil types within different soil groups which also contains vertisols.

Soil group 3 and 4 are excluded from these soil clustering, because they only occur on farms in combination with other soil types. These soil types are included in soil cluster 10. Soil group 5 only occurred on one farm which means that this is not an important soil group for the determination of farm types and therefore excluded from the soil classification.

3.4.2 Soil group characteristics

For each soil group some characteristics will be given. These characteristics can be used for a land evaluation, to find which soils are suitable for which annual crops and pasture types. The used characteristics are described by Nieuwenhuyse (pers. comment, 1995) and are shown in table 3.1. These characteristics only give a qualitative survey and are applicable per volume unit, so thin soils in the field can have other characteristics than described in table 3.1. Abbreviations which are used in the table are:

cl= clay loam
c= clay
l= loam
sl= sandy loam
mod.= moderate
bas.= basic
ntr.= neutral
sl. acid= slightly acid
prism.= prismatic
ang.= angular
subang= subangular
bl.= blocky

Table 3.1: Soil characteristics for eight different soil groups.

characteristics	soil groups 1	2	3	4	5	6	7	8
texture	cl-c	variable	variable	c	l-cl	cl-c	sl-cl	sl-l
pH	sl. acid	ntr. acid	ntr.	bas. ntr.	bas. ntr	sl. acid	sl. acid	sl. acid
water availability	high-mod.	high	high	high	high-mod.	high-mod.	mod.	high-mod.
drainage	well-mod.	well-mod.	poor	poor	well	well-mod.	well	well
permeability	mod.	high-mod.	very slow	very slow	high	mod.	high	high
org. matter	mod.	mod. high	high	low	high	mod.	low mod.	high
fertility.	mod.	high	high	high	high	mod.	mod.	high
salinity	none	none	sl. acid mangrove	sl. acid sometimes	none	none	none	none
structure	subang.bl-ang.bl.	subang.bl-crumb	absent	prism.-ang.bl.	subang.bl-crumb	ang.bl-subang.bl	sub-ang.bl.	crumb-subang.bl

(Source: Nieuwenhuyse, 1995)

Table 3.2 shows some ratings of soil characteristics which are used in table 3.1. These ratings can be used to determine soil suitabilities per crop or pasture type. These soil suitabilities defined by literature can be compared with what is found in the field.

Table 3.2: Ratings of some soil characteristics.

characteristics	rating
water availability	
- moderate	120-180 mm/m
- high	>180 mm/m
permeability	<0.8 cm/h
- very slow	2-6 cm/h
- moderate	8-12.5 cm/h
- high	
organic matter	
- low	2-4% (% of soil weight)
- moderate	4-10%
- high	10-20%
salinity	
- slightly	4-8 millimhos/cm^2

(Source: Landon, 1991 and Anon., 1977)

3.5 Land evaluation

3.5.1 Introduction

Farm types are being determined by soil type and farm size. This means that certain farm types also have a certain land use, because of each soil type has his own land use. To explain why a certain land use will be found on a certain soil type, a land evaluation will be carried out.

When land is evaluated, land suitability will be analysed. There are a lot of different ways to define land suitability. Driessen and Konijn (1992) define land suitability as: "The combination of land (properties) with land-use to determine whether the compound requirements of land-use are adequately met by the compound properties of the land". Land suitability refers to the capacity of a defined land unit to support sustained application of a defined type of land utilization. The concept of "land" should not be confused with " soil" because soil is but one aspect of land, alongside vegetation, physiography, hydrology, climate/weather, infrastructure, etc.. Management, conservation and improvement requirements are all include in this suitability analysis.

So land properties (the supply side) have to be compared with land use requirements (the demand side). These land properties will be described by soil characteristics of different soil groups, which are described before. Each land use poses specific requirements to the land. These land use requirements consist largely of crop requirements. From soil groups, limitations, physical and chemical properties as described in table 3.1 are used. Crop requirements include: ranges of temperature, rainfall and altitude and soil related crop or pasture requirements. Not all crops will be included but only the most important ones: rice, sugar cane and coffee. From the pasture types, only the most occurring ones will be used and that are: Jaragua (Hyparrhenia rufa) and Estrella (Cynodon nlemfuensis).

When land properties and land use requirements are compared with each other, something can be said about soil suitabilities. This would be done per soil group and later on they can be used to declare land use on certain soil types.

3.5.2 Land use requirements

Rice

Rice tolerates a very wide range of climatic conditions and can be grown in temperate or hot tropical climates. The average temperature should lie between 20 and 38°C during the growing season. Because rice, as annual swamp plant which is used in the Tempisque lowlands, it needs during the growing season sufficient rain or irrigation water.

Rice grows on a wide range of soils, there is no optimal soil type. The optimum pH is 5.5 to 6.5 when dry and rises to 7.0 to 7.2 when flooded but rice will survive pH of 8 to 9. Rice can not be grown on soils with a pH lower than 3.4. Heavy alluvial soils of river valleys and deltas are usually better suited to rice than higher lighter soils. Although rice can grown on many soils from sandy loams and shallow lathyritic soils to heavy clays, it should be possible to puddle the soil to maintain a high water-table during growth, and to drain the soil for ripening and harvesting (Landon, 1991).

Sugar cane

Sugar cane is successfully grown both in the tropics and sub-tropics. The minimum mean air temperature for active growth is 20°C. Ideally the climate in the growing season should be warm (mean day temp. around 30°C). It needs 1500 mm. rainfall per year on a long growing season (Cobley, 1976).

Ideally cane land should have long, smooth slopes of up to 1 to 3°, the higher values in combination with heavier soils. Completely flat land produces problems of low surface runoff and, under surface irrigation, of water distribution, unless artificial slopes are constructed. Water needs to be freely available during growth periods. Sugar cane can grown on soils with a Ph between 5.0 and 8.0; a Ph between 6.3 and 6.7 is required for optimum performance (Driessen and Konijn, 1992). Ideal soils are well-drained, well-structured loams to clayloams > 1m. deep, and with a free draining (Landon, 1991).

Coffee

Best temperature for cultivating coffee is between 15°C and 25°C and best rainfall ranges between 1750 and 2000 millimeter. It needs a drier period of 2 to 3 months for the initiation of the flower buds.

Deep, slightly acid (pH 6.0 to 6.5), friable, permeable, well drained, eg. fertile loams of lathyritic or volcanic origin with "reasonable" humus content. Coffee have a high oxygen requirement, therefor well drained and heavy clay soils are unsuitable. Sandy soils are satisfactory if underlain by a subsoil with a higher clay content (Landon, 1991).

Jaragua (pasture)

Productivity of Jaragua is possible where temperatures do not drop under -8°C, and when rainfall ranges are between 800 and 4000 millimeter (Montiel, 1983).

It prefers sandy clay soils, which has a good permeability (Harvard-Duclos, 1979).

Estrella (pasture)

Productivity and persistence of Estrella are possible where temperatures do not fall -4°C. In its area of origin if occurs up to 2300 m. altitude.

It grows on many soil types but does best on moist, well drained soils. It will tolerate a broad soil pH range but best growth is made on soils with a pH above 5.5. It does not tolerate long periods of flooding ('t Mannetje and Jones, 1992).

3.5.3 Soil suitabilities for crops and pasture types

For soil suitabilities per crop or pasture type, crop requirements or land use requirements (paragraph 3.5.2) and soil characteristics (table 3.1) have to be combined. Per soil characteristic will be looked for which crops are suitable to grow within the ratings which are given. After that all soil characteristics will be compared to look which crop is most suitable on which soil cluster.

Soil cluster 1 occurs in the Nicoya complex and situates at higher altitudes. This causes of lower temperatures in this region than will be found in the lowland. Coffee, Jaragua and Estrella prefer some lower temperatures, so these crops are suitable for this region. If soil characteristics are being observed, coffee is the most suitable crop, but also sugar

cane can grow on this soil.

Soil cluster 2 which is situated at higher and lower altitudes, includes alluvial and colluvial soils. More fertile colluvial soils are suitable for coffee and the lower situated alluvials are suitable for sugar cane and rice when it has a more compacted structure. Jaragua and Estrella are also suitable to grow on this soil group.

Soil cluster 6 situates in the Tilarán area and lies at higher altitude. Temperature and soil characteristics are most suitable for coffee and Estrella.

Soil cluster 7 which consists of ignimbrites are not very fertile because of low to moderate organic matter content. Therefore not many crops are suitable to grow on this soil group. Pasture types, Jaragua and Estrella and sugar cane can occur but it is not the best opportunity.

Soil cluster 8 is situated at higher altitudes in the Cordillera de Guanacaste and is very fertile, because of the presence of volcanic material. Crops which don't need very high temperatures, like coffee, are very suitable to grow. Estrella and Jaragua are also suitable to grow on this soil group.

Soil cluster 9 is a combination of lower situated soils (soil group 2) and higher situated soils (soil group 1) in an hilly landscape. Most of these soils are lying under steep slopes. Because of this steepness, sugar cane which prefers smooth slopes and also other crops, will hardly occur on this soil group. A lot of organic matter will be washed away with water erosion.

Soil cluster 10 includes the Vertisols and is situated in the lowlands with very high temperatures. Rice is the most suitable crop because of its preference for heavy, compacted clay soils and high temperatures. Sugar cane can also grown because of the high temperatures, but only at some lighter Vertisols where drainage is a little bit better than on the heavy clay soils.

4 RESULTS AND ANALYSIS

4.1 Introduction

A total of 153 farms were interviewed. Some agro-ecological zones have more interviews than other one's because of the occurrency of big farms (distances between farms are bigger) or bad roads which made it difficult to get at farms which are situated at larger distances. To look if the 153 farms are a representative sampling from the presented farms in the study area, two lines with farm size distributions, one from census in 1984 (DGEC, 1987a) and one from interviews, will be compared with each other. Figure 4.1 shows the comparison between the two different derivations of farm size distributions.

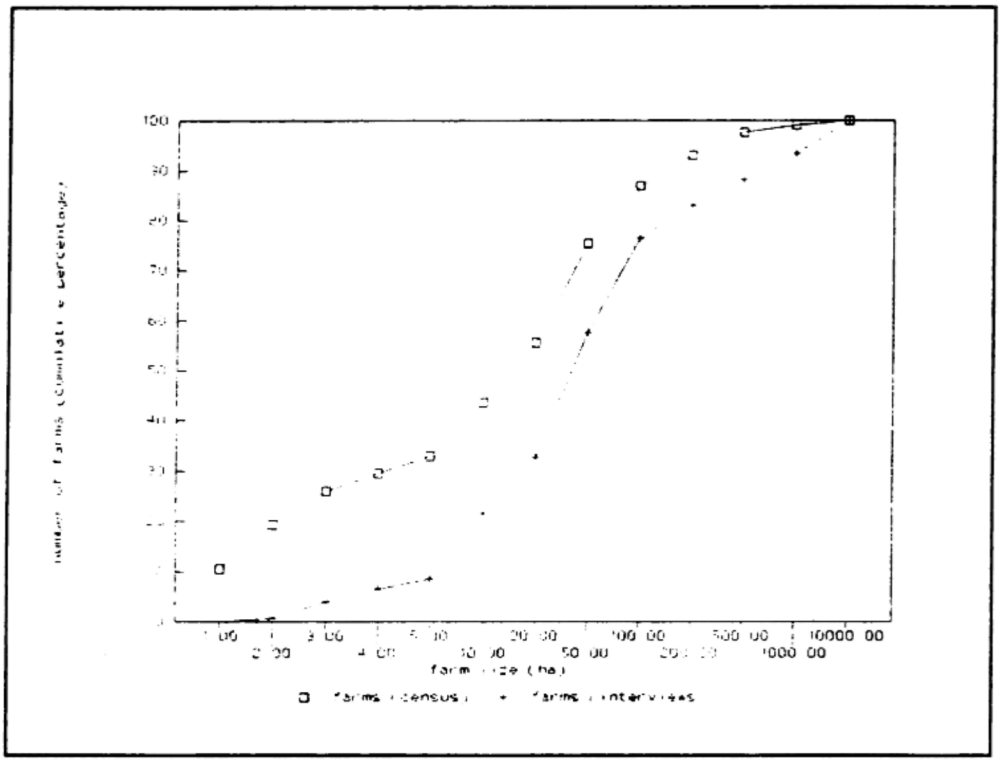

Figure 4.1: Size and number of farms from census and interviews.

When the two distributions in figure 4.1 are being compared with each other, can be concluded that: 1) The interviewer had observed relatively few small farms and more big farms compared with census. 2) Difference in the two lines are the effect of changed farm size distributions between 1984 and 1995. Although this, farm size distribution of the interviewed farms, turns out to be a good representative sampling of census.

Chapter 4.2 says something about the farmer names of different soil types and what this mean for the determination of farm types. From data of the interviews, relations between agricultural land use, farm size and dominant soil type are derived (chapter 4.3). Farm size classes, to determine farm types, will be distinguished by each other to look at differences in land use on different farm sizes and per soil group. Chapter 4.4 will look at differences in pasture systems because of the importance of this land use in the study area.

4.2 Farmers perception of soils

For the determination of farm types, soil groups were used like as scientists them are using. The farmers, classify their soils (local names) mostly in an other way than scientist will do. From the findings of van Uffelen (1990), the farmers of Neguev settlement, which is situated in the Atlantic Zone of Costa Rica, associate observable characteristics of their soils with the behavior of their crops. Color is an important criteria to distinguish soil types as indicated by their local names. To look if this also happens in the study area, farmers were interviewed about local names of occurring soil types. Local names of the different soil types, which farmers use in Guanacaste are: Tierra Negra, Tierra Colorada, Tierra Roja, Tierra Solsonquite, Tierra Iguanera, Tierra Cascaja and Tierra Loma.

Other criteria according to farmers are: altitude or location (Tierra Loma), humidity (i.e., sec or dry, like Tierra Solsonquite), texture (i.e., sandy or clayey, like Tierra Cascaja and Tierra Solsonquite) structure (i.e., soft or hard), and other present features (i.e., animals, like Tierra Iguanera) (Gonzalez, 1994). Most criterias are also related with color, that in high places, there are generally red-colored soils which are dry and clayey, and that black soils which are more fertile, soft and humid are generally found in lower areas and near the river banks. Farmers also prefer some soils to other soils for different land use purposes. Brown soils are generally more suitable for agriculture than red soils.

For the farm typology is it important to know, which farm size ranges define farm size classes. When farmers determine their land use by soil types, it is very important to know which local names refers with which scientific names. Tierra negra is mostly used for crops and Tierra Roja, which is less fertile, for forest and fallow. The local names, which seems to be more detailed in combination with land use, are defined on a greater scale than scientific names. When local names are being used for the farm typology they have to be integrated with scientific names. Table 4.1 shows the comparison between the different names of different soil types.

Table 4.1: Comparison between the farmers and the scientific names of different soil types in Guanacaste.

farmers names	scientific names	short description
Tierra Negra	Inceptisols, Mollisols, Entisols, Andosols	brown/black soils
Tierra Colorada	Alfisols, Inceptisols	red soils
Tierra Roja	Alfisols	very red soils
Tierra Solsonquite	Vertisols	swampy or poorly drained soils
Tierra Iguanera	Inceptisols, Entisols	shallow soils which covers ignimbrites
Tierra Cascaja	Entisols	ignimbrites with a little soil formation and a lot of stones
Tierra Loma	Mollisols, Inceptisols, Entisols	soils situated on a hill

4.3 Land use in relation with farm size classes and different soil types

4.3.1 Land use in relation to farm sizes

To get a general view of land use in relation with farm size, 10 arbitrarily chosen farm size classes will be distinguished. This relation between land use and the distribution of farm size classes is presented in figure 4.2. Percentages, which are used, are being calculated per farm size and per land use. It contains 6 main land use classes: homegarden (where mainly beans, rice and maize are cultivated for home consumption), crops (which are annual or perennial crops, mainly rice, sugar cane, and coffee, that are cultivated next to the crops for home consumption), pasture, forest, tree plantation (which are areas where trees are planted for reforestation), and fallow. The term fallow stretches from fallow to secondary vegetation. In this study it is seen as land use without direct production.

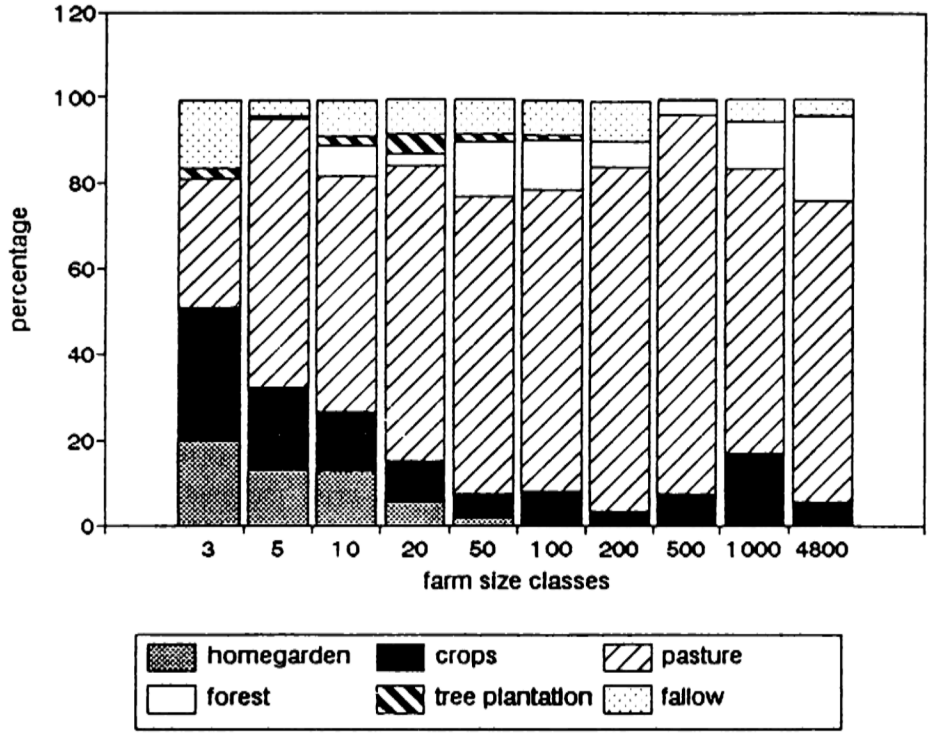

Figure 4.2: Land use in different farm size classes.

A clear relation between land use and farm size can be observed: The percentual importance of homegardens and annual crops decreases with increasing farm size. Only in the classes of 200-500 ha. and 500-1000 ha. crops are increasing, due to the cultivating of sugar cane and rice as plantation crops. The percentual area of homegardens always decreases with increasing farm size, because homegardens are small parcels (up to ± 2 hectare), close to houses, where crops are being cultivated for home consumption. The percentual area under homegarden becomes therefore smaller at bigger farms. Pasture dominates most classes and increases with increasing farm size (r^2= 0.917). Fallow decreases with increasing farm size and occurs in all farm size classes. Tree plantations can be found on the smaller farms. This can be explained by the existence of reforestation projects in the Nicoya complex where generally only farms smaller than 100 ha. are found.

Forest is present in all the different farm size classes, except for farms smaller than 10 ha. The percentual importance of forest increases with increasing farm size. Forest occurs in the Nicoya complex, mostly on the steep slopes which was to be seen when I did interviews.

There are some different farm size classes, but not very clear. The presence of homegardens and forest can determine some classes. But land use is still dominated by pasture. The farm size classes which can be derived from figure 4.2 are:

<5 ha., percentage pasture is less than 55% and forest not occurs.

5-50 ha., percentage pasture lies between 55% and 70% and after 50 ha., hardly any homegarden occurs.

>50 ha., no homegardens are occurring.

Because pasture dominates land use, it is important to look at differences within pasture, for example, cattle density.

In this way, where farm size classes are arbitrarily chosen, they will not coincide with land use. Therefore it is important to look at individual farms on different soil clusters. It can be expected that fertile soils have other farm size classes than unfertile soils. This will be checked in the following paragraph.

4.3.2 Land use on different soil clusters

For each of the soil clusters, mentioned in paragraph 3.4.1, specific land use can be related to farm size. This will be done with the same procedure which is used to explain land use in different farm size classes (paragraph 4.3.1). The farm size classes are now related with individual farms and not with arbitrarily chosen farm size classes. The real areas of the farms can be seen in appendix 2. The figures 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, and 4.9 show land use per farm and per soil cluster. Each figure has different number of farms because of differences of occurrency per soil cluster. First land use on farms with specific soil distribution will be described and afterwards land use on these different soil clusters will be compared with each other.

soil cluster 1

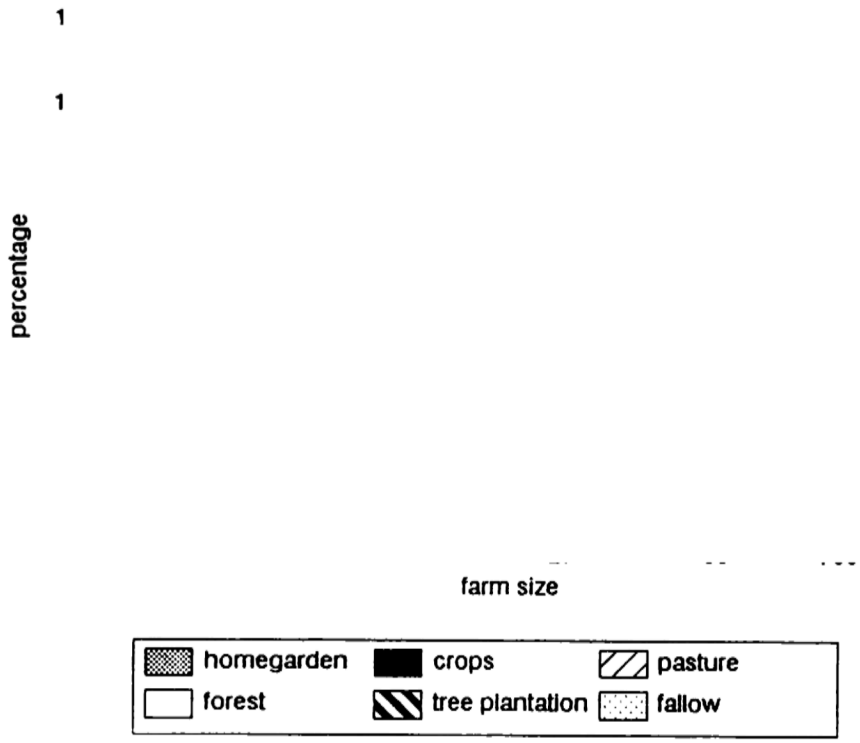

Figure 4.3: Land use on farms for soil cluster 1.

On the soils of the Nicoya complex, homegardens exist on farms smaller than 55 hectare (figure 4.3). The area under homegarden is decreasing with increasing farm size and a clear difference in land use can be found at 17 hectare. Tree plantation does not occur on farms greater than 55 ha. and is spread out over these different farm sizes. Crops like rice, sugar cane and coffee, which are the most occurring ones in the study area, do not have a clear relation with farm size. They only occur on farms smaller than 100 hectare and mainly exists of coffee. This was to be expected because coffee prefers some altitude, which was concluded from the land evaluation and soil group 1 has well soil suitabilities for coffee. Forest exists in all farm sizes except for farms smaller than 10 hectare. Pasture can be found on hardly all farm sizes, and do not have a clear relation with farm size. Sometimes farmers have their farm under fallow, but because this is a land use without direct production it will be excluded from the determination of the farm size classes.

Three farm size classes can be observed for the soils of the Nicoya complex: The first one ranges from 0 till 15 hectare in which homegardens are decreasing and pasture is less than 50 %. The second farm size class lays between 15 and 48 hectares. Percentage of pasture is more than 50 %. The farms greater than 48 hectare are a mixture of different land use covers.

soil cluster 2

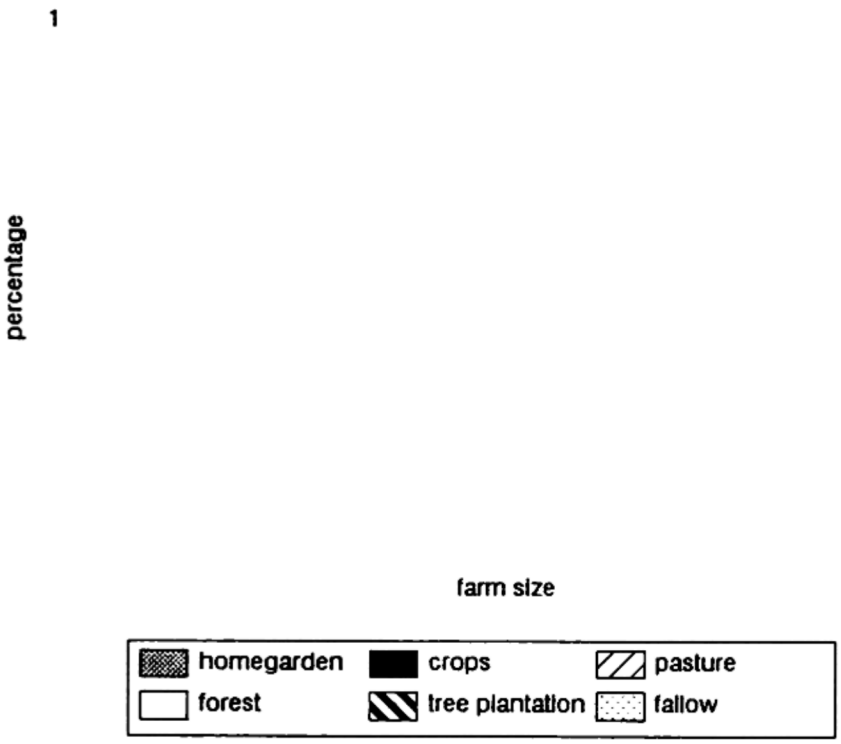

Figure 4.4: Land use on farms for soil cluster 2.

On the colluvial and alluvial soils homegardens decreases with increasing farm size and generally do not occur on farms greater than 23 hectare (figure 4.4). Crops are only divided over the farms smaller than 46 hectare and mainly exist of rice and sugar cane, which is to be expected when looking at the soil suitabilities of this soil cluster. Sometimes tree plantation, forest or fallow can be found. Pasture is the mainly type of land use and occurs on all farms except from farms smaller than 6.5 hectare.

Farm size classes on colluvial and alluvial soils ranges from 0 till 23 hectare, after which hardly any homegarden occurs and from 23 till 46 hectare, after which hardly any crops occur. Under farms greater than 46 ha., pasture is the occurring land use, and there can not be found an other division in farm size classes. Soil cluster 2 is situated in a hilly area. Although good soil suitabilities for crops, like coffee, is pasture an occurring land use, because of steep slopes.

soil cluster 6

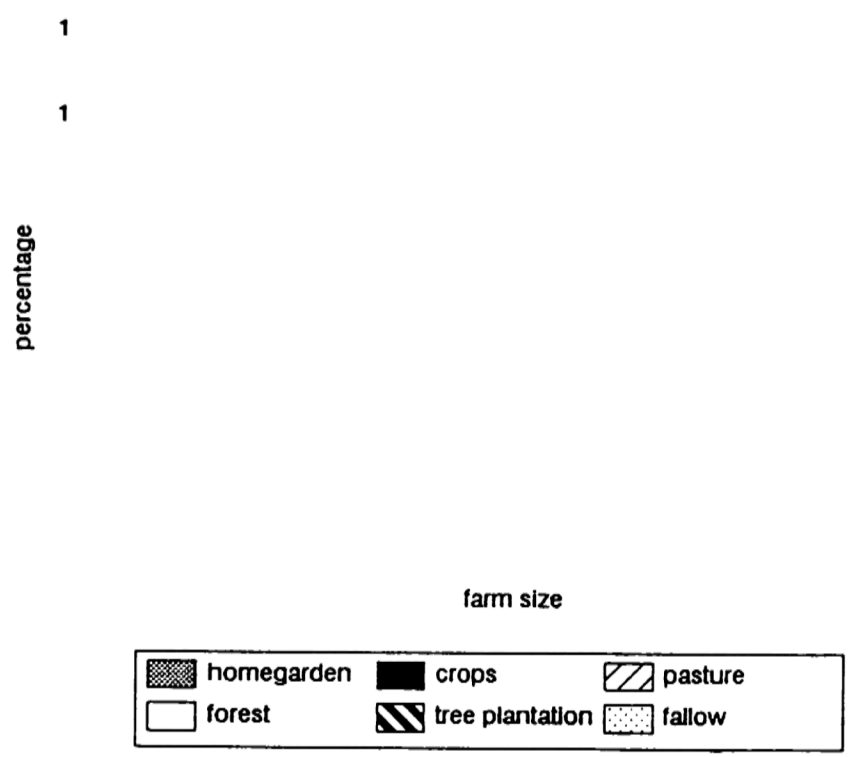

Figure 4.5: Land use on farms for soil cluster 6.

On soils which cover tertiar volcanic rocks (figure 4.5), pasture is the main land use cover. Almost all farms have more than 70 % pasture. Due to very strong winds, pasture is one of the suitable land use possibilities. Only some farmers which use dense wind hedges can cultivate crops, like coffee, which can be seen in the figure (peaks of crops). Again the occurring coffee can be explained by the crop requirements and soil suitabilities of this soil cluster. Forest occurs on almost all farms greater than 10 ha. Homegardens have a clear occurrence on farms smaller than 8 hectare. Tree plantation exists, but only on some farms. There are a few farms, which have their farm, or a part of it, under fallow.

For the soils in the Cordillera the Tilarán three farm size classes can be found. The first farm size class ranges from 0 till 8 hectare, which have still some hectares of homegardens. The second farm size class ranges from 8 till 70 hectare. After 70 ha., where almost all farms can be completely dedicated to pasture, the third farm size class can be found.

soil cluster 7

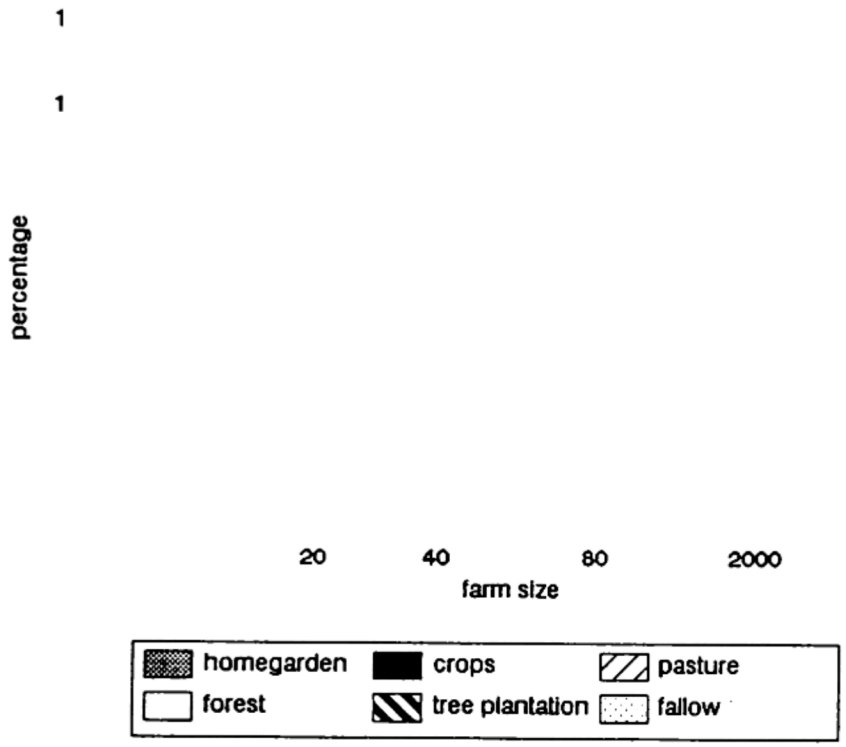

Figure 4.6: Land use on farms for soil cluster 7.

In the soil cluster of igimbrites (figure 4.6), also pasture dominates. Some farms, however, are dedicated to the cultivation of crops. Rice and sugar cane are the occurring crops on the farm with 364 ha. and the farm with 3300 hectares. Ignimbrites are not very fertile and when they are shallow too, it is hardly possible to cultivate crops. Deeper soils or soils close to rivers can be used for agriculture, because of more fertility. That is why sometimes sugar cane and rice can be found. Tree plantation only occurs on one farm. Homegardens occur on farms smaller than 35 ha., but compared with the preceding soil clusters, homegardens are less important. Forest and fallow exist on some farms and have not a relation with farm size.

In this soil cluster only two farm size classes can be found. The boundary between the two classes lays at 35 hectare. After this boundary homegardens do not exist.

soil cluster 8

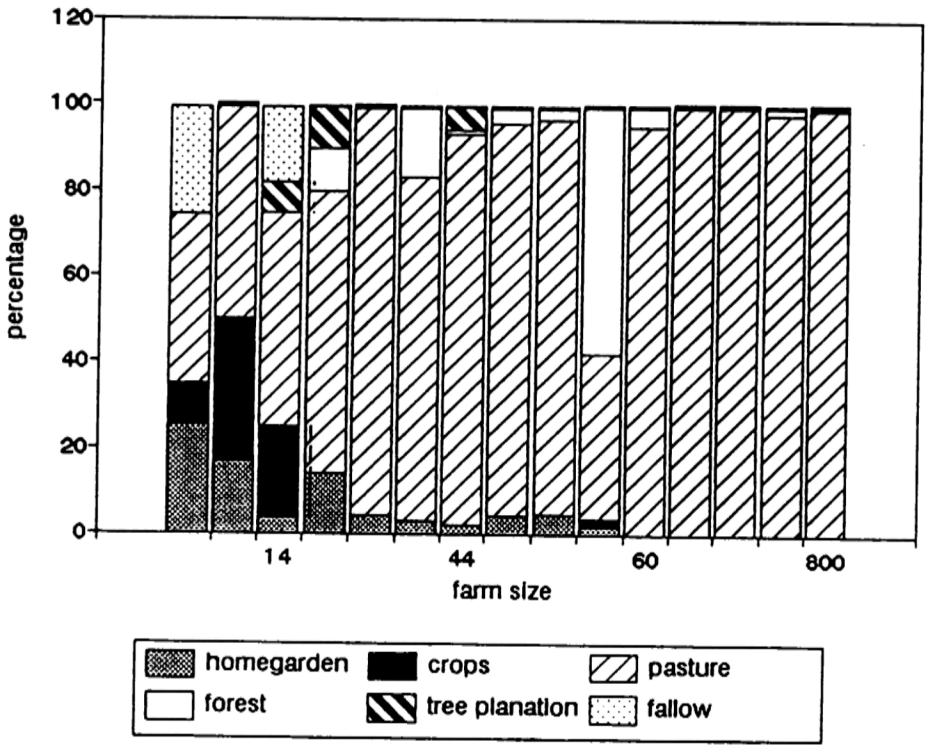

Figure 4.7: Land use on farms for soil cluster 8.

On soils which cover tertiar volcanic rocks and which are found on the higher situated slopes of the Cordillera de Guanacaste (figure 4.7), occur on the smaller farms (<14 ha.) some crops like tomatoes, sweet chili and other vegetables. This can also be explained by the soil suitabilities of this soil cluster, which are in general good fertile soils. On farms smaller than 57 ha., homegardens occur. Pasture can be found in every farm and increases with increasing farm size, except from one farm which has more than 50% forest. Fallow, tree plantation and forest occur on some farms but relatively seen, they have a small percentage of the total farm area.

The first farm size class ranges from 0 till 23 hectare. In this farm size class pasture is less than 65% and also homegardens, crops, fallow, forest and tree plantation are occurring. Between 23 and 57 hectare, pasture has a percentage of more than 80%. The third farm size class ranges from 57 till 800 hectare. Farms greater than 57 ha. do not have any crops or homegardens and have more than 95% pasture.

soil cluster 9

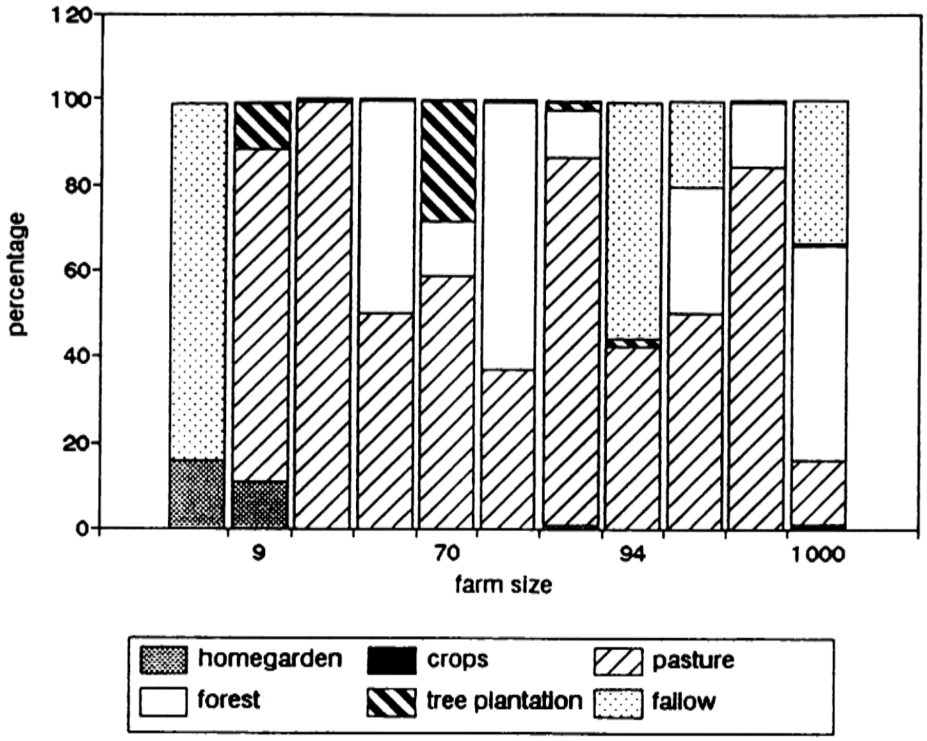

Figure 4.8: Land use on farms for soil cluster 9.

Soil cluster 9 is a combination of soil types of soil group 1 and soil group 2 (figure 4.8). This means that the higher situated soil types alternates with the lower situated soil types and that this area is characterized by a varying relief. The slopes in this hilly, mountainous area, which are very steep, hardly have crops, but have a lot of forest and fallow. This is to be expected because of high erosion risks when crops are being cultivated on these slopes. Part of the farms have some tree plantation. On the slopes which are a little less steep, pasture occurs and is again the main land use. Homegardens are only found on two farms which are smaller than 9 hectare.

A boundary between two farm size classes, can be laid after 27 ha., because of the absence of forest before this farm size. Each farm after this size has forest except from the farm with 94 ha., but this farm is determined by fallow and in the beginning was said that fallow will not be included in the determination of farm size classes.

soil cluster 10

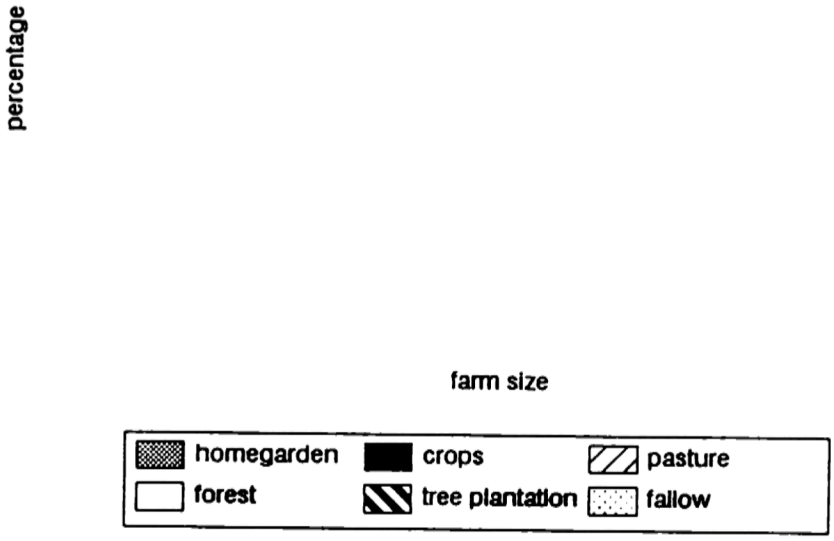

Figure 4.9: Land use on farms for soils with vertisols.

Farms on soil cluster 10 (figure 4.9) have a lot more crops. This can be explained by the presence of Vertisols, which has good soil suitabilities for rice and sugar cane. Homegardens only exist on farms smaller than 16 hectare except for the smallest farm, which is totally covered by pasture. Pasture occurs on every farm and when there are no crops, pasture is almost the only occurring land use. Sometimes tree plantation, forest and fallow are found, but compared with crops and pasture it is a very low percentage. They also have, just like the other two land uses, no clear relation with farm sizes.

The first farm size class ranges from 0 till 16 hectare, and do not have any crops. The boundary between the second and the third farm size class lays at 76 hectare. In the third farm size class are crops the determining land use. The fourth farm size class ranges from 2000 till 4800 hectare., in which pasture is again the determining land use.

In general can be concluded that homegardens occur mostly on all soil clusters, close to farmers houses. Crops do not occur on all soil clusters and only occur on fertile soil types without steep slopes. Tree plantation exists mainly on farms situated in the Nicoya complex because of the occurrency of steep slopes in this area. Fallow and forest are presented on nearly every soil group.

When a farm has different soil types forest or fallow can be found on the worst soil types and homegardens and crops on the best soil types. Pasture occurs on all soil clusters and is on each soil cluster the main land use cover. This is also to be seen in table 4.2, which shows percentage of different land uses per soil cluster.

Table 4.2: Percentages of different land use classes per soil cluster.

soil cluster	ha. total	home-garden	culti-vars	pas-ture	forest	tree plan-tation	fallow
1	695	2.54	14.69	48.44	16.04	4.29	14.00
2	1106	1.26	6.15	78.06	7.15	0.45	6.92
6	4281	0.46	1.41	91.20	6.19	0.11	0.63
7	9553	0.05	5.49	67.49	26.45	0.02	0.50
8	2320	0.61	0.28	95.60	3.11	0.24	0.16
9	1915	0.13	0.52	39.37	35.98	1.57	22.42
10	17219	0.05	12.19	68.82	12.48	0.75	5.70
	37089						

There can be concluded that there is a relation between land use and soil clusters. Rice is cultivated on Vertisols. Because of the heavy clay structure, which is very useful to puddle, enough water is available in the growing season. Sugar cane is founded next to vertisols also on alluvial soils. Alluvial soils seemed to be more suitable than vertisols when looking at the soil suitabilities, but vertisols turned out to be also useful for the cultivation of sugar cane. Soil cluster 1 and 6 are cultivated with coffee as the most occurring crop. This was also concluded from the land evaluation where soil characteristics and temperature are being compared with crop requirements. On some fertile volcanic soils (soil cluster 8) annual crops, like coffee and vegetables are founded which was also the result of the land evaluation. Pasture occurs on all soil clusters but it seemed to be that Estrella prefers more altitude and volcanic soils than Jaragua (soil cluster 6 and parts of soil cluster 8). All these findings from the field can be explained by crop requirements and soil suitabilities of chapter 3.5.

If all figures (4.2-4.9) are compared with each other, there can be concluded that each figure has other farm size classes. That means that each soil cluster has his own farm size ranges which are related to actual land use or that each farmer determines his land use by the present soil types. This means that for the determination of farm types first a division into soils have to be made, so that for each soil cluster right farm size classes can be used.

From the relation of land use with different soil clusters (figure 4.3 to 4.9) next farm size classes per soil cluster can be derived:

Soil cluster 1: 0-15 ha.
15-48 ha.
>48 ha.

Soil cluster 2: 0-23 ha.
23-46 ha.
>46 ha.

Soil cluster 6: 0-8 ha.
8-70 ha.
>70 ha.

Soil cluster 7: 0-35 ha.
>35 ha.

Soil cluster 8:	0-23 ha. 23-57 ha. >57 ha.	Soil cluster 9:	0-27 ha. >27 ha.
Soil cluster 10:	0-16 ha. 16-76 ha. 76-2000 ha. >2000 ha.		

These farm size classes are mainly determined by homegardens, crops and percentage of pasture of a certain farm. Farmers do not always know exactly how big their farms are, so boundaries can give a wrong indication. Also the small sampling of farms (153 of ± 12500 farms) can not rectify this fault. It is therefore useful to say that boundaries of these farm size classes are laying in a certain range around the given boundaries. The range includes varying farm sizes from -20% till +20% of the given farm size boundary. For a farm of 100 ha. ranges from 80-120 hectares can be used. A Farm of 1000 ha. have ranges between 900-1100. Maybe it is useful to use a sensitivity analysis when these boundaries of farm size classes are being used to determine farm types.

Because pasture is the main land use on each soil cluster, it is useful to look more to this land use. After investigating of differences between pasture it is maybe possible to support or shift the current farm size classes.

4.4 Differences between pasture systems

4.4.1 Introduction

Because pasture is the dominating land use cover in the study area on all soil clusters (table 4.2) and increases with increasing farm size (r^2= 0.917) it is useful to look more at differences between pasture systems. Pasture percentages differ between the different soil clusters, because of differences in soil characteristics. Fertile soils have a lower percentage of pasture than unfertile soils. It would be useful to look at differences between pasture systems per soil cluster, but because of lack of time this will not be done. Without the division among the soil cluster still something can be said about differences between the pasture systems. In the study area five pasture systems can be distinguished. The different systems are:

-pasture without animals
-beef cattle
-breeding cattle
-dairy cattle
-double purpose

Differences in farm sizes related to pasture systems, cattle density and average farm sizes are the most important factors to find farm size classes determined by pasture. These farm size classes can be used to say more about land use differences. The pasture systems will not be related to a certain soil clusters because of the most important pasture types, Jaragua and Estrella can almost grow on all soil clusters. See also paragraph 3.5.2 where

soil suitabilities for pasture types are being described.

4.4.2 farm size classes determined by pasture

To look at differences between pasture systems the same farm size classes as used in paragraph 4.2.1 are used. Figure 4.10 shows percentages of different pasture systems and other land use per certain farm size class. Other land use covers like, homegardens, crops, tree plantation, forest and fallow will be joined together in one group and are called "other land use".

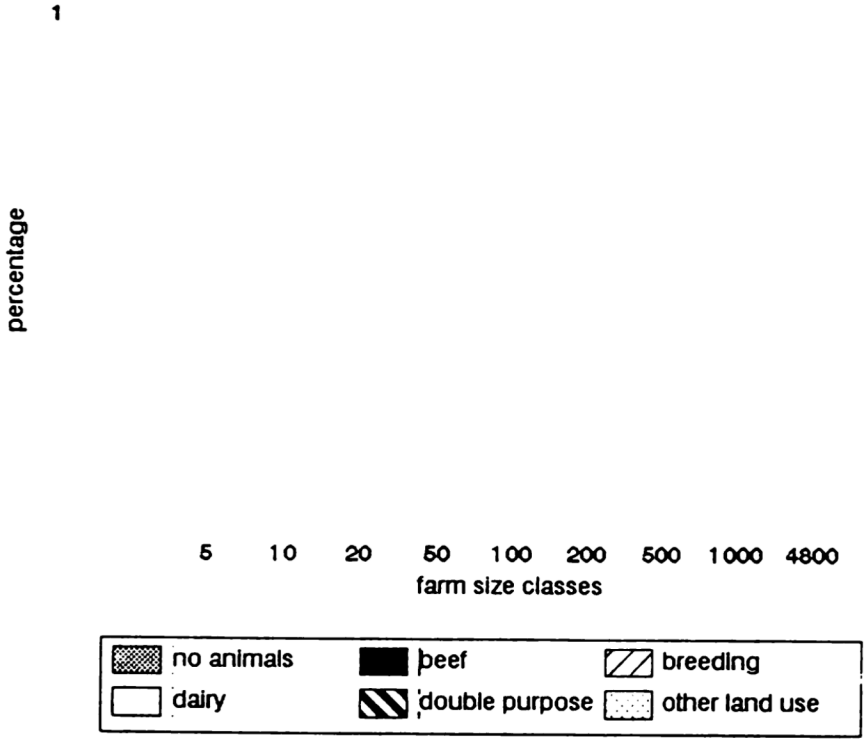

Figure 4.10: Percentages of pasture systems on different farm size classes.

Dairy cattle systems do not occur on farms greater than 500 hectare and the importance of beef cattle systems increase with increasing farm size, except for the last two classes and not occur on farms smaller than 10 hectare (figure 4.10). Breeding cattle occurs mostly on farms between 20 and 200 hectares. Double purpose systems can be found in all farm size classes. Other land use decreases with increasing farm size and become less important on bigger farms except for farms greater than 500 hectare. This can be explained by the existence of farms with a great area for the cultivation of sugar cane and rice.

To find farm size classes it is necessary to look at real farm sizes of the different systems. Table 4.3 shows some differences between pasture systems, like ranges between farm sizes, average farm sizes and cattle densities.

Table 4.3: Farm sizes (in hectares) and cattle densities (in animals per hectare) of the different pasture systems.

	no animals	beef cattle	breeding cattle	dairy cattle	double purpose
farm size ranges	3-2000	10-3300	2.5-4800	3-430	4-4600
average	185	468	217	81	373
cattle density (summer)	0	0.97	1.04	1.62	1.40
cattle density (winter)	0	1.12	1.23	1.76	1.41

Farm size classes determined by pasture can be found from figure 4.10 and table 4.3. The first farm size class ranges from 0 till 10 hectare. In this class no beef cattle occurs. The second farm size class ranges from 10 till 430 ha. After 430 ha. no farms with dairy cattle is occurring.

Further can be concluded from table 4.3 that farms with dairy cattle have a smaller average size than the other ones and that beef cattle farms have the greatest average size. Cattle densities are highest for dairy cattle and smallest for beef cattle. Differences in cattle density in summer and winter can be explained by differences in precipitation which is a very important feature in the study area, because of a dry season in summer with little rainfall. This causes for a lower cattle density in summer in all different pasture systems. Also can be concluded from table 4.3 that beef cattle and breeding cattle are more extensive than the other one's. One point to remark is that cattle density is only determined by quantity of animals per hectare and not by quantity of livestock units (LU) per hectare. One LU is 400 kg. life weight (Argel, et al., 1993).

Some cattle systems are situated in a certain agro-ecological zone. Dairy cattle occurs most in the Tilarán area and in the Cordillera de Guanacaste, near lake Arenal (see appendix 2). In these agro-ecological zones (referring with soil cluster 6 and 8), pasture type Estrella, occurs most. Breeding cattle is more situated in the lowlands, the ignimbrite area and the Hojancha area (soil cluster 1, 2, 7 and 10). There can't be found clear areas for the other two pasture systems. But to say more about which pasture system occurs most in which agro-ecological zone, equal amounts of farms in each zone are needed. With this data can be concluded that land use on the different soil clusters is also determined by pasture systems. Because each pasture system has his own farm size ranges and is more or less related with a certain soil type, this is an extra foundation to determine farm types per soil cluster.

4.5 One Last remark

When looking at the points mentioned in chapter 3.3.1, one aspect, the relation between parcel size and farm size, is not discussed. This is because of very unreliable data from

farmers. Many farmers do not know exactly how many parcels they have and how big they are. So a relation between parcel size and farm size can not be made. Also from aerial photographs, parcel sizes can not be distinguished, because of unclear photographs.

5 DISCUSSION AND CONCLUSIONS

In this thesis a new approach is used to determine farm types. Farm size classes, which determine farm types, were defined on the basis of land use per soil group. To make these farm size classes, individual farm sizes were used and not arbitrarily chosen farm sizes. Land use of some classes were then determined through only one farm, which would give a wrong idea of land use per farm size class. Farm size classes which were found to determine farm types can be used in the methodology.

Guanacaste can be considered a cattle breeding area (almost 70% of the investigated area). Pasture is the main land use on each soil cluster. Crops like rice, coffee and sugar cane are present but relatively seen this is only a low percentage of the investigated area (6%). Annual and perennial crops are present on smaller farms (except from rice and sugar cane) and extensive range lands can mainly be found on large farms. This agrees with the hypothesis, which was posed before.

Soil types, with certain soil characteristics, determine land use in the study area (e.g. Vertisols seems to be very useful for rice). For the farm typology this means that it is useful to define farm size classes per soil type for each soil type has his own land use. Fertile soils (e.g. Vertisols) have more possibilities for using land than unfertile soils (e.g. Ignimbrites), which means that fertile soils also have more farm size classes than unfertile soils because farm size classes were determined by land use. Especially homegardens and pasture percentages determine the boundaries between the farm size classes on the different soil clusters. Soil types also determine differences within one land use class, like pasture. Pasture systems differ within different agro-ecological zones which means that these systems are more or less related to soil types. Next to soil types relief also determines land use. Steep slopes hardly can be used for the cultivation of crops or pasture. Often forest or tree plantation are the best solution as land use. Therefore it is useful that relief is taken into account in the determination of farm types.

In this way farm size classes coincide with actual land use and selection of LUST's per farm type will be better tuned on farmers decision which causes a better "optimum" land use distribution for a certain scenario of the USTED methodology. This means that farm types are better classified and by using them for the farm typology we will be moving in the right direction.

Next to my main conclusions, I would also like to make some last recommendations. Before using the farm size classes, I think it is better to use a sensitivity analysis, because boundaries of the farm size classes are determined through one farm and the size of this farm is not always exact. Firstly farmers did not always say the truth about their farm size (taxes were introduced when I did my field work or farmers did not know exactly how big their farms were). Secondly, it was difficult to reach small farmers, due to a bad road condition in the mountains in the beginning of the raining season. Thirdly it was difficult to get the right data from big farms because owners of these farms were mostly living in the capital of the country and not in the country side. Despite these shortcomings, it can be said that even by using a small number of farms with data which were not always correct, still a clear vision can be found in differences of land use on farms and with these data conclusions can be made.

Cattle breeding is a very important land use. I mentioned some differences between pasture systems, but because these systems are also determined by soil types, I would suggest to give more attention to this type of land use in further research. Maybe it is still

useful to look at pasture systems per soil cluster. One other point is that when farm types will be related to actual land use, soil types will become an important issue in the distinction of these farm types. It still remains essential to restrict the amount of farm types for the farm typology, which can become very difficult when each soil type determines his own land use. Local names of soils seemed to be more related to actual land use than scientific names and therefore it is maybe useful to make the relation between the two different names more clear. As a final recommendation I would like to advice to do field work in the beginning of the dry season. Roads are better passable and farmers have more knowledge regarding different crop areas, because at the end of the dry season hardly any crop is cultivated.

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ANNEX1: ENCUESTA PARA UN ESTUDIO REGIONAL DEL USO DE LA TIERRA EN GUANACASTE

Número de encuesta:
Fecha:
Nombre de agricultor:
Nombre de finca:
Cantón:
Distrito:
Zona:
IDA asentamiento: no.. si..
Nombre de IDA asentamiento:

Tierra

1. Cuántas hectáreas, manzanas tiene Usted en total?
   .....Ha. (manzana = ± 0.8 Ha.)

2. Número de parcelas (apartos) y más o menos cuántas hectáreas miden esas parcelas?
   no.... .....Ha.
   no.... .....Ha.
   no.... .....Ha.
   no.... .....Ha.

3. Qué tipos de suelos tiene Usted? (negra, suamposa, roja, sosonquite, toba)
   A tierra.... .....Ha.....%
   B tierra.... .....Ha.....%
   C tierra.... .....Ha.....%
   D tierra.... .....Ha.....%

Uso de la tierra
-Cultivos

4. Tiene Usted cultivos? si.... no....

5. Cuáles cultivos tiene Usted en la finca y cuántas hectáreas?

cultivo	ha.	suelo A B C D	cultivo	ha.	suelo A B C D
a.frijoles	....	....	l.café	....	....
b.caña de azúcar	....	....	m.banana	....	....
c.papaya	....	....	n.mango	....	....
d.maíz	....	....	o.piña	....	....
e.melón	....	....	p.pimienta	....	....
f.plátano	....	....	q.coco	....	....

cultivo	ha.	suelo A B C D	cultivo	ha.	suelo A B C D
g.sandía	....	....	r.yuca	....	....
h.papa	....	....	s.aguacate	....	....
i.arroz	....	....	t.naranja	....	....
j.limón	....	....	u.madera	....	....
k.tomate	....	....	v.ajo	....	....

otros verduras:

.....	....	....
.....	....	....
.....	....	....

-agricultura

*cultivos permanentes ....Ha tipo de suelo: A B C D

*cultivos anuales ....Ha tipo de suelo: A B C D

-Ganado

6. Tiene Usted ganado? si.... no....

7. En cuántas hectáreas (pasto)?
.....Ha tipo de suelo: A B C D

8. Qué tipo de pasto tiene Usted?
-jaragua
-estrella (africana)
-brachiaria
-veranero
-guinea
-natural

9. Qué sistema de ganado tiene Usted en su finca?
-engordo
-ganado lechero
-mixto ...% de carne ...% lechero
-ganado de cria

10. Cuántos animales tiene Usted en inviérno y en verano?
-engordo ....inviérno
....verano
-ganado lechero ....inviérno
....verano
-ganado de cria ....inviérno
....verano

11. Otras usos de la tierra:

-bosque .....Ha tipo de suelo: A B C D

-reforestación .....Ha tipo de suelo: A B C D

* Teca
* Melina
* Pochote
* Otros: .....

Mano de Obra

12. Cuántas personas de su familia trabajan en la finca? .....

13. Quiénes son estas personas? (edad)

personas: edad:	1.....	2.....	3.....	4..... ....
14. Ellos trabajan: a)perm.tiempo completo b)perm.tiempo parcial c)ocasional	A B C	A B C	A B C	A B C
15. Cuántas horas por -día -semana -mes				

Titulación de la tierra

16. Usted tiene algún documento de propiedad de la finca?
si... no...

-carta de venta, IDA
-carta de venta, abogado
-título de propiedad
-título de adjudicación
-plano

ANNEX 2: SPREADSHEET AND USED ABBREVATIONS (QPRO)

encno: number of the interview.
IDAnbr: name of the IDA settlement.
hatot: total area.
no.par: number of parcels.
greatest: greatest parcel.
smallest: smallest parcel.
avpar1: total area devided by number of parcels.
avpar2: greatest plus smallest parcel devided by two.
hahomeg: total area of homegarden.
hacrop: total area of crops.
hapast: total area of pasture.
hafor: total area of forest.
hartreepl: total area of tree plantation.
hataco: total fallow area.
title: land title.
value: value of the interview.

CANTON (abbreviation)		**DISTRICT** (abbreviation)	
Liberia	lib	Liberia	lib
		Nacasido	nac
		Mayorga	may
		Cañas Dulces	cdul
		Curubande	cur
Nicoya	nic	Nicoya	nic
		San Antonio	san
		Mansion	man
		Quebrada Honda	qhon
		Samara	sam
Santa Cruz	scr	Santa Cruz	scr
		Tempate	tem
		Cartagena	cart
		veintisiete de abril	vda
		cuajiniquil	cua
		Diria	dir
		Bolson	bol
Bagaces	bag	Bagaces	bag
		Fortuna	for
		Mogote	mog
Carillo	car	Sardinal	sar
		Belen	bel
		Filadelfia	fil
Cañas	can	Cañas	can

CANTON (abbreviation)		DISTRICT (abbreviation)	
Tilarán	til	Tilarán	til
		Tierras Morenas	tmor
		Santa Rosa	sros
		Libano	liba
		Quebrada Grande	qgr
		Tronadora	tro
		Arenal	are
Hojancha	hoj	Hojancha	hoj

ZONE:

1: 1a, The Cordillera de Tilerán.
2: 1b, The Cordillera.
3: 1c, The Ignimbrite area.
4: 2, The Tempisque lowlands.
5: 3a, The Hojancha area.
6: 3b, The Nicoya complex.

SOIL TYPE:

SOILT1: negra
SOILT2: colorado
SOILT3: roja
SOILT4: solsonquite
SOILT5: iguanera
SOILT6: cascaja
SOILT7: loma
SOILTA: soiltypes as described in paragraph 3.4.1
SOILTB: soil associations as described in paragraph 3.4.1

-999=present,but area is not known.

CROPS:

CROP1: maize
CROP2: beans
CROP3: beans-maize-rice
CROP4: rice
CROP5: coffee
CROP6: sugarcane
CROP7: platano
CROP8: cotton
CROP9: sorghum
CROP10: onions
CROP11: marañon (cashew)
CROP12: asparagus
CROP13: lemon
CROP14: watermelon
CROP15: tomatoes
CROP16: sweet chili
CROP17: macadamia
CROP18: coffee-banana

CROP19: palmito (palmheart)
CROP20: fruit trees
CROP21: orange
CROP22: avocado(peer)
CROP23: mango
CROP24: pipa
CROP25: banana

PASTURE TYPE:
PASTO1: Jaragua
PASTO2: Estrella (africana)
PASTO3: Brachiaria
PASTO4: Natural
PASTO5: Trasballa
PASTO6: Grama
PASTO7: Anglinton
PASTO8: Guinea
PASTO9: resto

1=present 2=not present

LIVESTOCK
ANSUM1: amount of animals in summer (meat)
ANWIN2: " " " in winter (meat)
ANSUM2: " " " in summer (breeding)
ANWIN2: " " " in winter (bredding)
ANSUM3: " " " in summer (milk)
ANWIN3: " " " in winter (milk)
ANSUM4: " " " in summer (double purpose)
ANWIN4: " " " in winter (double purpose)

TREE PLANTATION/REFORESTATION:
HATRPL1: Teca
HATRPL2: Melina
HATRPL3: Pochote
HATRPL4: other

FAMILY LABOUR
PERSCOM: amount of persons which work the entire day.
PERSPAR: " " " " " a part of the day.
PERSOCA: " " " " " occasional.

LAND TITLE (TITEL)
1: escritura
2: plano
3: carta de venta, abogado
4: carta de venta IDA
5: título de propiedad
6: escritura + plano

VALUE
1: bad
2: medium
3: good

encno	canton	district	zone	IDA	IDAnbr	hatot	no.par	greatest	smallest	avpar1	avpar2
1	hoj	hoj	6	0	0	15.2	4	5.6	1.6	3.8	3.6
2	hoj	hoj	6	0	0	1.5	1	1.5	1.5	1.5	1.5
3	hoj	hoj	6	0	0	20	3	10	3	6.66667	6.5
4	hoj	hoj	6	0	0	100	8	12.5	12.5	12.5	12.5
5	hoj	hoj	6	0	0	50	5	12	2	10	7
6	hoj	hoj	6	0	0	21.6	3	8	5.6	7.2	6.8
7	hoj	hoj	6	0	0	15	3	5	5	5	5
8	hoj	hoj	6	0	0	2.8	2	2.4	0.4	1.4	1.4
9	hoj	hoj	6	0	0	48	4	14.4	11.2	12	12.8
10	nic	sam	5	0	0	60	1	60	60	60	60
11	nic	sam	5	0	0	16.8	2	8.8	8	8.4	8.4
12	nic	sam	5	0	0	40	3	13.3	13.3	13.3333	13.3
13	nic	nic	5	0	0	100	2	70	30	50	50
14	scr	cua	5	0	0	70	6	20	6	11.6667	13
15	nic	nic	5	1	nosara	7	2	4.5	2.5	3.5	3.5
16	nic	nic	5	1	nosara	6	3	2.5	1.5	2	2
17	nic	nic	5	1	nosara	6	2	4.5	1.5	3	3
18	nic	nic	5	0	0	36	4	16	10	9	13
19	scr	cua	5	1	pital	6.5	2	4.5	2	3.25	3.25
20	scr	cua	5	0	0	6.5	2	5	1.5	3.25	3.25
21	scr	cua	5	0	0	70	6	27	2	11.6667	14.5
22	scr	cua	5	1	?	94	4	2.35	2.35	23.5	2.35
23	scr	vda	5	0	0	2.5	1	2.5	2.5	2.5	2.5
24	scr	vda	5	0	0	10	5	2	2	2	2
25	scr	vda	5	0	0	15	4	6	2	3.75	4
26	scr	scr	6	0	0	3	1	3	3	3	3
27	scr	scr	6	0	0	32	3	12	8	10.6667	10
28	scr	scr	6	0	0	90	3	71	4	30	37.5
29	nic	nic	6	0	0	50	2	30	20	25	25
30	nic	nic	6	0	0	50	3	20	15	16.6667	17.5
31	nic	nic	6	0	0	27	2	14	13	13.5	13.5
32	nic	qhon	4	0	0	42	2	30	12	21	21
33	nic	qhon	4	0	0	10	4	2.5	2.5	2.5	2.5
34	nic	qhon	4	0	0	2000	10	200	200	200	200
35	nic	san	4	0	0	180	10	40	2	18	21
36	nic	san	4	0	0	25	6	4.6	4.6	4.16667	4.6
37	nic	san	4	0	0	27	4	6.75	6.75	6.75	6.75
38	nic	san	4	0	0	48	4	12	12	12	12
39	car	sar	4	0	0	6.4	1	6.4	6.4	6.4	6.4
40	car	sar	4	0	0	11	5	3	1	2.2	2
41	car	sar	4	0	0	25	3	20	2	8.33333	11
42	car	sar	4	0	0	50	4	35	5	12.5	20
43	car	sar	4	0	0	141	2	116	25	70.5	70.5
44	lib	may	2	1	consuelo	6	3	3	1	2	2
45	lib	may	2	1	consuelo	5	2	3	2	2.5	2.5
46	lib	may	2	0	0	800	15	53.3	53.3	53.3333	53.3
47	lib	may	2	0	0	60	7	10	6	8.57143	8
48	lib	cdul	3	0	0	700	20	30	25	35	27.5
49	lib	cdul	3	0	0	40	10	4	4	4	4
50	lib	cdul	3	0	0	37	3	20	5	12.3333	12.5
51	lib	cdul	3	0	0	20	4	5	5	5	5

encno	canton	district	zone	IDA	IDAnbr	hatot	no.par	greatest	smallest	avpar1	avpar2
52	lib	cdul	3	0	0	44.8	2	22.4	22.4	22.4	22.4
53	lib	lib	3	0	0	6	1	6	6	6	6
54	lib	lib	3	0	0	11	3	4	3	3.66667	3.5
55	lib	lib	3	0	0	4800	48	-999	-999	100	-999
56	scr	cart	5	0	0	1000	20	100	5	50	52.5
57	scr	tem	5	0	0	150	7	27.75	13	21.4286	20.375
58	scr	tem	5	0	0	320	4	109	56.6	80	82.8
59	scr	tem	5	0	0	13	5	5	2	2.6	3.5
60	scr	cart	5	0	0	200	6	125	12	33.3333	68.5
61	scr	dir	4	0	0	22	4	11	3	5.5	7
62	nic	san	4	0	0	22	3	7.3	7.3	7.33333	7.3
63	nic	san	4	0	0	430	5	300	130	86	215
64	nic	san	4	0	0	4	1	4	4	4	4
65	nic	san	4	0	0	34	6	15	2	5.66667	8.5
66	bag	bag	3	0	0	2000	1	2000	2000	2000	2000
67	bag	bag	3	0	0	70	6	11.7	11.7	11.6667	11.7
68	bag	bag	3	0	0	2000	5	400	400	400	400
69	bag	bag	4	0	0	3300	1	3300	3300	3300	3300
70	bag	bag	4	1	sanramor	15	4	8	2	3.75	5
71	bag	bag	4	1	sanramor	7	1	7	7	7	7
72	bag	bag	4	1	sanramor	16	2	8	8	8	8
73	bag	bag	4	1	sanramor	15	2	8	7	7.5	7.5
74	bag	mog	2	0	0	79	5	15.8	15.8	15.8	15.8
75	bag	mog	2	0	0	240	4	80	53.3	60	66.65
76	bag	mog	2	0	0	110	4	35	15	27.5	25
77	bag	mog	2	0	0	60	20	3	3	3	3
78	bag	mog	2	0	0	160	3	53.3	53.3	53.3333	53.3
79	bag	mog	2	0	0	58	15	-999	-999	3.86667	-999
80	bag	mog	2	0	0	22.5	7	5	2.9	3.21429	3.95
81	bag	mog	2	0	0	240	15	24	0.8	16	12.4
82	bag	for	2	0	0	23	8	8	0.8	2.875	4.4
83	bag	for	2	0	0	68	7	28	5.8	9.71429	16.9
84	bag	bag	3	0	0	80	5	16	16	16	16
85	bag	bag	3	0	0	3.5	1	3.5	3.5	3.5	3.5
86	bag	bag	3	0	0	35	9	10	1	3.88889	5.5
87	bag	bag	3	0	0	900	20	80	6	45	43
88	bag	bag	3	0	0	80	5	16.25	15	16	15.625
89	bag	bag	3	0	0	561.6	17	95	2	33.0353	48.5
90	bag	bag	3	0	0	364	20	50	4	18.2	27
91	can	can	3	0	0	2000	35	40	4	57.1429	22
92	can	can	4	1	san luis	46	3	22	5	15.3333	13.5
93	can	can	4	0	0	41	3	14	13	13.6667	13.5
94	can	can	4	0	0	76	2	66	10	38	38
95	can	can	4	0	0	850	40	600	2	21.25	301
96	can	can	4	1	san luis	10	1	10	10	10	10
97	can	can	4	1	san luis	3	1	3	3	3	3
98	can	can	4	0	0	60	4	30	10	15	20
99	can	can	4	0	0	7	2	4	3	3.5	3.5
100	can	can	4	0	0	32	4	15	3	8	9
101	can	can	4	0	0	128	7	32	5	18.2857	18.5
102	can	can	4	0	0	1200	7	-999	-999	171.429	-999

encno	canton	district	zone	IDA	IDAnbr	hatot	no.par	greatest	smallest	avpar1	avpar2
103	can	can	4	0	0	800	26	56	4	30.7692	30
104	bag	for	2	0	0	50	30	20	1	1.66667	10.5
105	bag	for	2	0	0	224	8	20	8	28	14
106	bag	for	2	0	0	57	6	28	2	9.5	15
107	bag	for	2	0	0	48	5	12	4.8	9.6	8.4
108	bag	for	2	0	0	30	8	3.75	3.75	3.75	3.75
109	can	can	2	0	0	4600	87	-999	-999	52.8736	-999
110	can	can	2	1	corobici	19.8	6	7.2	1.85	3.3	4.525
111	can	can	2	1	corobici	14	4	7	2	3.5	4.5
112	til	tmor	2	0	0	44	5	20	5	8.8	12.5
113	til	tmor	1	0	0	5.6	3	5	0.2	1.86667	2.6
114	til	tmor	1	0	0	40	5	12	6.4	8	9.2
115	til	tmor	1	0	0	30	4	7.5	7.5	7.5	7.5
116	til	tmor	1	0	0	29.6	2	20	9.6	14.8	14.8
117	til	tmor	1	0	0	53	4	35	4	13.25	19.5
118	til	tmor	1	0	0	10	1	10	10	10	10
119	til	are	2	0	0	14	5	2.8	2.8	2.8	2.8
120	til	tmor	2	0	0	160	6	80	-999	26.6667	-459.5
121	til	tmor	2	0	0	32	6	16	4.4	5.33333	10.2
122	til	tmor	2	0	0	10	1	10	10	10	10
123	til	qgr	1	0	0	49.6	19	16	0.4	2.61053	8.2
124	til	qgr	1	0	0	13.6	8	1.7	1.7	1.7	1.7
125	til	qgr	1	0	0	3.2	3	1.25	0.95	1.06667	1.1
126	til	qgr	1	0	0	56	66	0.85	0.85	0.84848	0.85
127	til	qgr	1	0	0	8	18	0.55	0.55	0.44444	0.55
128	til	til	1	0	0	4.4	7	0.63	0.63	0.62857	0.63
129	til	til	1	0	0	64	30	2.13	2.13	2.13333	2.13
130	til	til	1	0	0	15	8	1.875	1.875	1.875	1.875
131	til	tro	1	0	0	88	18	5.6	0.48	4.88889	3.04
132	til	tro	1	0	0	60.8	40	6.4	0.5	1.52	3.45
133	til	tro	1	0	0	200	16	12.5	12.5	12.5	12.5
134	til	tro	1	0	0	52.8	6	8	1.6	8.8	4.8
135	til	tro	1	0	0	136	130	-999	-999	1.04615	-999
136	til	til	1	0	0	687	50	13.74	13.74	13.74	13.74
137	til	til	1	1	m.morera	4	12	1	0.25	0.33333	0.625
138	til	til	1	1	m.morera	4.7	22	0.21	0.21	0.21364	0.21
139	til	til	1	1	m.morera	4.5	12	0.375	0.375	0.375	0.375
140	til	til	1	0	0	84	11	6.4	2.4	7.63636	4.4
141	til	til	1	0	0	120	30	4	4	4	4
142	til	are	2	0	0	17	35	0.49	0.49	0.48571	0.49
143	til	are	2	0	0	3	8	0.375	0.375	0.375	0.375
144	til	are	2	0	0	9	18	2	0.25	0.5	1.125
145	til	are	2	0	0	8	8	2.4	0.4	1	1.4
146	til	liba	1	0	0	72	12	8	4	6	6
147	til	liba	1	0	0	24	1	24	24	24	24
148	til	liba	1	0	0	48	3	24	22.8	16	23.4
149	til	liba	1	0	0	50	5	20	6	10	13
150	til	sros	1	0	0	346	15	23.1	23.1	23.0667	23.1
151	til	sros	1	0	0	64	4	16	16	16	16
152	til	sros	1	0	0	500	6	83.3	83.3	83.3333	83.3
153	til	sros	1	0	0	1040	30	80	20	34.6667	50

encno	soilt1	soilt2	soilt3	soilt4	soilt5	soilt6	soilt7	soiltA	soiltB	hahomeg
1	15.2	0	0	0	0	0	0	1	1	0.3
2	1.5	0	0	0	0	0	0	1	1	1.5
3	0	20	0	0	0	0	0	1	1	0
4	50	0	50	0	0	0	0	1	1	0
5	45	0	5	0	0	0	0	1	1	2
6	21.6	0	0	0	0	0	0	1	1	0
7	15	0	0	0	0	0	0	1	1	1
8	2.8	0	0	0	0	0	0	1	1	0.4
9	24	0	24	0	0	0	0	1	1	0.4
10	50	0	10	0	0	0	0	1	1	0
11	16.8	0	0	0	0	0	0	1	1	0.8
12	20	0	20	0	0	0	0	1	1	0
13	70	0	30	0	0	0	0	1	1	0
14	66.5	0	3.5	0	0	0	0	1.6	9	0
15	7	0	0	0	0	0	0	1	1	2.25
16	6	0	0	0	0	0	0	1	1	2.5
17	6	0	0	0	0	0	0	1	1	1
18	36	0	0	0	0	0	0	1	1	0
19	6.5	0	0	0	0	0	0	6	2	3
20	6.5	0	0	0	0	0	0	6	2	2
21	70	0	0	0	0	0	0	1.3	9	0
22	54	40	0	0	0	0	0	1.3	9	0
23	0	2.5	0	0	0	0	0	1	1	0.5
24	2	0	8	0	0	0	0	1.3	9	1
25	0	15	0	0	0	0	0	1	1	0
26	1.5	1.5	0	0	0	0	0	1.3	9	0.5
27	16	16	0	0	0	0	0	1.3	9	0
28	30	60	0	0	0	0	0	1.3	9	1
29	50	0	0	0	0	0	0	2	1	2
30	50	0	0	0	0	0	0	2	1	0.5
31	27	0	0	0	0	0	0	2	1	2.5
32	-999	0	-999	0	0	0	-999	4.9	10	0.25
33	10	0	0	0	0	0	0	4	2	0
34	2000	0	0	0	0	0	0	478	11	0
35	179	0	1	0	0	0	0	4	2	1
36	0	0	0	23	0	0	2	148	12	0
37	19	0	0	0	0	4	4	134	9	0
38	48	0	0	0	0	0	0	4	2	0
39	6.4	0	0	0	0	0	0	4.8	13	0.8
40	11	0	0	0	0	0	0	4.8	13	2
41	19	6	0	0	0	0	0	3.4	2	0
42	50	0	0	0	0	0	0	3.4	2	0
43	66	0	0	75	0	0	0	4.8	13	0
44	6	0	0	0	0	0	0	21	8	1
45	5	0	0	0	0	0	0	21	8	1.25
46	800	0	0	0	0	0	0	21	8	0
47	60	0	0	0	0	0	0	21	8	0
48	700	0	0	0	0	0	0	21	8	0
49	40	0	0	0	0	0	0	15	7	0
50	37	0	0	0	0	0	0	15	7	0
51	19	0	0	1	0	0	0	15	7	1

encno	soilt1	soilt2	soilt3	soilt4	soilt5	soilt6	soilt7	soiltA	soiltB	hahomeg
52	44.8	0	0	0	0	0	0	15	7	0
53	0	0	0	0	6	0	0	15	7	1
54	0	6	0	0	5	0	0	19.17	7	1
55	3710	0	0	300	790	0	0	4.81517	14	0
56	-999	-999	-999	0	0	0	0	1.3	9	0
57	150	0	0	0	0	0	0	3	2	0
58	-999	-999	-999	0	0	0	0	1.3	9	0
59	13	0	0	0	0	0	0	3	2	1
60	-999	-999	-999	0	0	0	0	1.3	9	0
61	22	0	0	0	0	0	0	4	2	0.5
62	0	22	0	0	0	0	0	3.4	2	0.5
63	0	0	0	430	0	0	0	4.8	13	0
64	0	0	0	4	0	0	0	4.8	13	0
65	34	0	0	0	0	0	0	4.8	13	0
66	800	0	0	0	0	1200	0	15.17	7	0
67	0	0	0	0	62	8	0	16.17	7	0
68	0	0	0	100	1400	500	0	16.17	7	0
69	800	0	0	0	0	2500	0	14.16	7	0
70	7	0	0	8	0	0	0	4.8	13	3
71	7	0	0	0	0	0	0	4	2	0
72	8	0	0	8	0	0	0	4.8	13	1
73	7	0	0	8	0	0	0	4.8	13	0
74	79	0	0	0	0	0	0	5.18	15	1
75	240	0	0	0	0	0	0	5	2	0
76	110	0	0	0	0	0	0	5	2	4
77	50	10	0	0	0	0	0	5.18	15	0
78	104	56	0	0	0	0	0	20.5	15	1.6
79	58	0	0	0	0	0	0	5	2	0
80	22.5	0	0	0	0	0	0	20	8	1
81	240	0	0	0	0	0	0	20	8	0
82	23	0	0	0	0	0	0	5	2	2
83	4	0	0	64	0	0	0	5.8	13	0
84	40	0	0	40	0	0	0	14.15	7	0
85	0	0	0	0	3.5	0	0	15	7	0
86	0	0	0	20	15	0	0	14.15	7	1.5
87	540	0	0	360	0	0	0	14.15	7	0
88	0	0	0	15	65	0	0	14.15	7	0
89	561.6	0	0	0	0	0	0	14.15	7	0
90	364	0	0	0	0	0	0	14.15	7	0
91	1725	0	0	275	0	0	0	4.815	14	0
92	46	0	0	0	0	0	0	4	2	0
93	41	0	0	0	0	0	0	4	2	0
94	22.8	0	0	53.2	0	0	0	4.8	13	0
95	0	450	0	400	0	0	0	4.8	13	0
96	10	0	0	0	0	0	0	4	2	0
97	3	0	0	0	0	0	0	4	2	0
98	60	0	0	0	0	0	0	10	6	0
99	7	0	0	0	0	0	0	4	2	0
100	32	0	0	0	0	0	0	4	2	0
101	123	0	0	5	0	0	0	4.8	13	1.5
102	835	0	0	360	0	0	5	10.48	16	0

encno	soilt1	soilt2	soilt3	soilt4	soilt5	soilt6	soilt7	soiltA	soiltB	hahomeg
103	0	0	0	710	0	0	90	4.8	13	0
104	50	0	0	0	0	0	0	20	8	2.4
105	224	0	0	0	0	0	0	20	8	0
106	57	0	0	0	0	0	0	20	8	1
107	48	0	0	0	0	0	0	20	8	2.2
108	30	0	0	0	0	0	0	20	8	1
109	1840	1380	0	1380	0	0	0	8.2021	17	0
110	19.8	0	0	0	0	0	0	20	8	2.8
111	14	0	0	0	0	0	0	20	8	0.5
112	44	0	0	0	0	0	0	20	8	1
113	5.6	0	0	0	0	0	0	11	6	1.5
114	40	0	0	0	0	0	0	11	6	0
115	30	0	0	0	0	0	0	11	6	1.6
116	29.6	0	0	0	0	0	0	11	6	0.8
117	53	0	0	0	0	0	0	12	6	2
118	10	0	0	0	0	0	0	12	6	0
119	14	0	0	0	0	0	0	12	6	0
120	160	0	0	0	0	0	0	12	6	0
121	32	0	0	0	0	0	0	12	6	0
122	10	0	0	0	0	0	0	12	6	0
123	49.6	0	0	0	0	0	0	12	6	0.8
124	13.6	0	0	0	0	0	0	12	6	0
125	3.2	0	0	0	0	0	0	12	6	0.8
126	56	0	0	0	0	0	0	12	6	0
127	8	0	0	0	0	0	0	12	6	0
128	4.4	0	0	0	0	0	0	13	6	0.4
129	64	0	0	0	0	0	0	13	6	0
130	15	0	0	0	0	0	0	13	6	1
131	88	0	0	0	0	0	0	13	6	0.8
132	60.8	0	0	0	0	0	0	13	6	0
133	200	0	0	0	0	0	0	13	6	0
134	52.8	0	0	0	0	0	0	13	6	0
135	136	0	0	0	0	0	0	13	6	0
136	687	0	0	0	0	0	0	12	6	0
137	4	0	0	0	0	0	0	12	6	0
138	4.7	0	0	0	0	0	0	12	6	1
139	4.5	0	0	0	0	0	0	12	6	0.8
140	84	0	0	0	0	0	0	12	6	0.8
141	120	0	0	0	0	0	0	12	6	0
142	17	0	0	0	0	0	0	13	6	0
143	3	0	0	0	0	0	0	13	6	0.25
144	9	0	0	0	0	0	0	13	6	0
145	8	0	0	0	0	0	0	13	6	2
146	64.8	7.2	0	0	0	0	0	11	6	1.8
147	12	12	0	0	0	0	0	11	6	0
148	43.2	4.8	0	0	0	0	0	11	6	2.4
149	44	6	0	0	0	0	0	11	6	0.8
150	346	0	0	0	0	0	0	10	6	0
151	64	0	0	0	0	0	0	10	6	0
152	500	0	0	0	0	0	0	10	6	0
153	1040	0	0	0	0	0	0	10	6	0

encno	hacrop	crop1	crop2	crop3	crop4	crop5	crop6	crop7	crop8	crop9	crop10	crop11
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	3	0	0	0	0	3	0	0	0	0	0	0
6	0.8	0	0	0	0	0	0.8	0	0	0	0	0
7	2	0	0	0	0	2	0	0	0	0	0	0
8	2.4	0	0	0	0	2.4	0	0	0	0	0	0
9	0.4	0	0	0	0	0	0.4	0	0	0	0	0
10	4	4	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	84	7	7	0	70	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	3.5	3.5	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0
30	0.5	0	0	0	0	0.5	0	0	0	0	0	0
31	1.5	0	0	0	0	1.5	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0	0	0
43	50	5	5	0	5	0	35	0	0	0	0	0
44	2	0	0	0	0	0	0	0	0	0	0	0
45	0.5	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0
49	15	0	0	15	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0	0

encno	hacrop	crop1	crop2	crop3	crop4	crop5	crop6	crop7	crop8	crop9	crop10	crop11
52	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0	0
55	400	0	0	0	300	0	0	0	0	100	0	0
56	10	5	0	0	0	0	5	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0	0
59	1	0	0	0	0	0	1	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
61	7	3	0	0	4	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0
63	40	0	0	0	0	0	40	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0
69	350	0	0	0	330	0	0	0	0	20	0	0
70	1	0	0	0	0	0	0	0	0	0	0	0
71	2	0	0	0	0	0	0	0	0	0	0	0
72	8	0	0	0	8	0	0	0	0	0	0	0
73	8	0	0	0	8	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0
76	2	0	0	0	0	0	0	1	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0	0	0	0	0	0
82	2	0	0	0	0	0	0.5	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0	0	0
85	3.5	0	0	0	0	0	0	0	0	0	0	0
86	2	0	0	0	0	0	0	0	0	0	0	0
87	0	0	0	0	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0	0	0	0	0	0
90	154	0	0	0	0	0	0	0	114	40	0	0
91	106	8	0	0	40	0	8	0	0	8	4	10
92	14.5	5	3	0	3.5	0	0	0	0	0	0	0
93	28	0	0	0	14	0	14	0	0	0	0	0
94	31	0	0	0	31	0	0	0	0	0	0	0
95	600	0	0	0	350	0	250	0	0	0	0	0
96	9	0	0	0	0	0	9	0	0	0	0	0
97	2.5	0	0	0	0	0	0	0	0	0	0	0
98	30	0	0	0	0	0	30	0	0	0	0	0
99	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0
101	0	0	0	0	0	0	0	0	0	0	0	0
102	400	0	0	0	0	0	400	0	0	0	0	0

encno	hacrop	crop1	crop2	crop3	crop4	crop5	crop6	crop7	crop8	crop9	crop10	crop11
103	455	0	0	0	15	0	75	0	0	0	0	0
104	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0	0
106	1	0	0	0	0	1	0	0	0	0	0	0
107	0	0	0	0	0	0	0	0	0	0	0	0
108	0	0	0	0	0	0	0	0	0	0	0	0
109	0	0	0	0	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0	0	0
111	3	0	0	0	0	1.5	0	0	0	0	0	0
112	0	0	0	0	0	0	0	0	0	0	0	0
113	0	0	0	0	0	0	0	0	0	0	0	0
114	8	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0
116	1.6	0	0	0	0	1.6	0	0	0	0	0	0
117	0	0	0	0	0	0	0	0	0	0	0	0
118	0	0	0	0	0	0	0	0	0	0	0	0
119	0	0	0	0	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0	0	0	0	0
121	0	0	0	0	0	0	0	0	0	0	0	0
122	6	0	0	0	0	6	0	0	0	0	0	0
123	0	0	0	0	0	0	0	0	0	0	0	0
124	0	0	0	0	0	0	0	0	0	0	0	0
125	0	0	0	0	0	0	0	0	0	0	0	0
126	0.8	0	0	0	0	0.8	0	0	0	0	0	0
127	1.6	0	0	0	0	0	1.6	0	0	0	0	0
128	0	0	0	0	0	0	0	0	0	0	0	0
129	0	0	0	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0	0	0
131	0	0	0	0	0	0	0	0	0	0	0	0
132	2.4	0	0	0	0	0.8	0	0	0	0	0	0
133	0	0	0	0	0	0	0	0	0	0	0	0
134	0	0	0	0	0	0	0	0	0	0	0	0
135	0	0	0	0	0	0	0	0	0	0	0	0
136	6.7	0	0	0	0	6.7	0	0	0	0	0	0
137	1.5	0	0	0	0	1	0	0	0	0	0	0
138	0	0	0	0	0	0	0	0	0	0	0	0
139	1	0	0	0	0	0.5	0	0.5	0	0	0	0
140	0.8	0	0	0	0	0	0	0.8	0	0	0	0
141	0	0	0	0	0	0	0	0	0	0	0	0
142	0	0	0	0	0	0	0	0	0	0	0	0
143	0	0	0	0	0	0	0	0	0	0	0	0
144	0	0	0	0	0	0	0	0	0	0	0	0
145	0	0	0	0	0	0	0	0	0	0	0	0
146	0	0	0	0	0	0	0	0	0	0	0	0
147	0	0	0	0	0	0	0	0	0	0	0	0
148	0	0	0	0	0	0	0	0	0	0	0	0
149	0	0	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0	0	0
151	0	0	0	0	0	0	0	0	0	0	0	0
152	0	0	0	0	0	0	0	0	0	0	0	0
153	0	0	0	0	0	0	0	0	0	0	0	0

encno	crop12	crop13	crop14	crop15	crop16	crop17	crop18	crop19	crop20	crop21	crop22	crop23
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	1	1	0	0	0
45	0	0	0	0	0	0	0	0	0	0.5	0	0
46	0	0	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0	0

encno	crop12	crop13	crop14	crop15	crop16	crop17	crop18	crop19	crop20	crop21	crop22	crop23
52	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	1	0	0	0
71	0	0	0	0	0	0	0	0	0	1	1	0
72	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	1	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0	0	0	0	0	0
82	0	0	1	0.25	0.25	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	3.5	0
86	0	0	0	0	0	0	0	0	0	0	2	0
87	0	0	0	0	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
91	25	3	0	0	0	0	0	0	0	0	0	0
92	0	0	3	0	0	0	0	0	0	0	0	0
93	0	0	0	0	0	0	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0	0	0	0	0
97	0	0	1	0	0	0	0	0	0	0	0.5	0.5
98	0	0	0	0	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0
101	0	0	0	0	0	0	0	0	0	0	0	0
102	0	0	0	0	0	0	0	0	0	0	0	0

encno	crop12	crop13	crop14	crop15	crop16	crop17	crop18	crop19	crop20	crop21	crop22	crop23
103	0	0	0	0	0	0	0	0	0	0	0	0
104	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0	0
106	0	0	0	0	0	0	0	0	0	0	0	0
107	0	0	0	0	0	0	0	0	0	0	0	0
108	0	0	0	0	0	0	0	0	0	0	0	0
109	0	0	0	0	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0	0	0
111	0	0	0	0	0	1	0	0	0	0	0.5	0
112	0	0	0	0	0	0	0	0	0	0	0	0
113	0	0	0	0	0	0	0	0	0	0	0	0
114	0	0	0	0	0	0	8	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0
116	0	0	0	0	0	0	0	0	0	0	0	0
117	0	0	0	0	0	0	0	0	0	0	0	0
118	0	0	0	0	0	0	0	0	0	0	0	0
119	0	0	0	0	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0	0	0	0	0
121	0	0	0	0	0	0	0	0	0	0	0	0
122	0	0	0	0	0	0	0	0	0	0	0	0
123	0	0	0	0	0	0	0	0	0	0	0	0
124	0	0	0	0	0	0	0	0	0	0	0	0
125	0	0	0	0	0	0	0	0	0	0	0	0
126	0	0	0	0	0	0	0	0	0	0	0	0
127	0	0	0	0	0	0	0	0	0	0	0	0
128	0	0	0	0	0	0	0	0	0	0	0	0
129	0	0	0	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0	0	0
131	0	0	0	0	0	0	0	0	0	0	0	0
132	0	0	0	0.8	0.8	0	0	0	0	0	0	0
133	0	0	0	0	0	0	0	0	0	0	0	0
134	0	0	0	0	0	0	0	0	0	0	0	0
135	0	0	0	0	0	0	0	0	0	0	0	0
136	0	0	0	0	0	0	0	0	0	0	0	0
137	0	0	0	0	0	0	0	0	0	0	0	0
138	0	0	0	0	0	0	0	0	0	0	0	0
139	0	0	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0	0	0
141	0	0	0	0	0	0	0	0	0	0	0	0
142	0	0	0	0	0	0	0	0	0	0	0	0
143	0	0	0	0	0	0	0	0	0	0	0	0
144	0	0	0	0	0	0	0	0	0	0	0	0
145	0	0	0	0	0	0	0	0	0	0	0	0
146	0	0	0	0	0	0	0	0	0	0	0	0
147	0	0	0	0	0	0	0	0	0	0	0	0
148	0	0	0	0	0	0	0	0	0	0	0	0
149	0	0	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0	0	0
151	0	0	0	0	0	0	0	0	0	0	0	0
152	0	0	0	0	0	0	0	0	0	0	0	0
153	0	0	0	0	0	0	0	0	0	0	0	0

encno	crop24	crop25	hapast	pasto1	pasto2	pasto3	pasto4	pasto5	pasto6	pasto7	pasto8	pasto9
1	0	0	14.9	1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	17	1	1	0	0	0	0	0	0	0
4	0	0	90	1	1	0	0	0	0	0	0	0
5	0	0	43	1	0	0	0	1	0	0	0	0
6	0	0	20.8	1	0	0	0	0	1	0	0	0
7	0	0	10	1	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	32.8	1	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	1.2	1	0	0	0	0	0	0	0	0
12	0	0	40	1	0	0	0	0	0	0	0	0
13	0	0	70	1	0	0	0	0	0	0	0	0
14	0	0	26	1	0	0	0	0	0	0	0	0
15	0	0	3	1	0	0	0	0	0	0	0	0
16	0	0	2	1	1	0	0	0	0	0	0	0
17	0	0	1	1	0	0	0	0	0	0	0	0
18	0	0	20	1	0	0	0	0	0	0	0	0
19	0	0	2	1	0	0	0	0	0	0	0	0
20	0	0	2	1	0	0	0	0	0	0	0	0
21	0	0	41	1	0	0	0	0	0	0	0	0
22	0	0	40	1	0	0	0	0	0	0	0	0
23	0	0	2	1	0	0	0	0	0	0	0	0
24	0	0	7	1	0	0	0	0	0	0	0	0
25	0	0	8	1	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	16	1	0	0	0	0	0	0	0	0
28	0	0	77	1	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	10	1	0	0	0	0	0	0	0	0
31	0	0	21	1	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	10	1	0	0	0	0	0	0	0	0
34	0	0	800	1	0	0	0	0	0	1	0	1
35	0	0	177	1	0	0	0	0	0	0	0	1
36	0	0	20	1	0	0	0	0	0	0	0	0
37	0	0	27	1	0	0	0	0	1	0	0	1
38	0	0	43	1	0	0	0	0	0	0	0	1
39	0	0	5.6	1	0	0	0	0	0	0	0	0
40	0	0	6	1	0	0	0	0	0	0	0	0
41	0	0	10	1	0	0	0	0	0	0	0	0
42	0	0	50	1	0	0	0	0	0	0	0	0
43	0	0	5	1	0	0	0	0	0	0	0	0
44	0	0	3	1	0	0	1	0	0	0	0	0
45	0	0	2	1	0	0	0	0	0	0	1	0
46	0	0	790	1	1	0	0	0	1	0	1	1
47	0	0	57	1	0	0	0	0	0	0	1	0
48	0	0	685	1	0	1	0	0	1	0	1	0
49	0	0	20	1	0	0	0	0	0	0	0	0
50	0	0	34	1	0	1	0	0	0	0	1	0
51	0	0	17	1	0	0	0	0	0	0	0	0

encno	crop24	crop25	hapast	pasto1	pasto2	pasto3	pasto4	pasto5	pasto6	pasto7	pasto8	pasto9
52	0	0	24	1	0	0	0	0	0	0	0	0
53	0	0	5	1	0	0	0	0	0	0	0	0
54	0	0	8	0	0	0	0	1	0	0	0	0
55	0	0	4200	1	0	1	0	0	0	1	0	1
56	0	0	150	1	1	0	0	0	0	0	0	1
57	0	0	138	1	0	1	0	0	0	0	0	1
58	0	0	270	1	0	0	0	0	0	0	0	0
59	0	0	10	1	0	0	0	0	0	0	0	0
60	0	0	100	1	0	0	0	0	0	1	0	0
61	0	0	11	1	0	0	0	0	0	0	0	0
62	0	0	5	1	0	0	1	0	0	0	0	0
63	0	0	390	1	0	0	1	0	0	0	0	0
64	0	0	4	1	0	0	0	0	0	0	0	0
65	0	0	34	1	1	0	0	0	0	0	0	0
66	0	0	1980	1	0	0	0	0	0	0	0	0
67	0	0	66	1	0	1	0	0	0	0	0	0
68	0	0	1000	1	0	0	1	0	0	0	0	0
69	0	0	1500	1	1	0	1	0	0	0	0	0
70	0	0	11	0	0	0	1	0	0	0	0	0
71	0	0	5	0	0	0	0	0	0	1	0	1
72	0	0	6	1	0	0	0	0	0	1	0	1
73	0	0	7	1	0	0	0	0	0	1	0	0
74	0	0	74	0	1	0	0	0	0	0	0	1
75	0	0	240	0	1	0	1	0	0	0	0	0
76	0	0	60	0	1	1	0	0	0	0	0	1
77	0	0	30	0	1	0	0	0	0	0	0	0
78	0	0	158.4	0	1	1	0	0	1	0	0	0
79	0	0	50	1	1	0	1	0	0	0	0	1
80	0	0	21.5	1	1	0	0	0	0	0	0	0
81	0	0	240	1	1	0	0	0	0	0	0	0
82	0	0	17	1	1	1	0	0	0	0	0	1
83	0	0	68	1	0	0	0	1	0	1	0	0
84	0	0	80	1	0	0	1	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0
86	0	0	31.5	1	0	0	0	0	0	0	0	0
87	0	0	900	1	0	0	0	0	0	1	0	1
88	0	0	25	1	0	0	0	0	0	0	0	0
89	0	0	556.6	1	0	0	0	1	0	0	0	0
90	0	0	200	1	0	0	0	1	0	0	0	0
91	0	0	1169	1	0	1	0	0	0	0	0	1
92	0	0	19	1	0	0	0	0	0	0	0	0
93	0	0	10	1	0	0	0	0	1	0	0	0
94	0	0	45	1	0	0	0	1	0	0	0	0
95	0	0	250	1	1	1	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0	0	0	0	0
97	0.5	0	0	0	0	0	0	0	0	0	0	0
98	0	0	30	1	0	0	0	0	0	0	0	0
99	0	0	7	0	0	0	1	0	0	0	0	0
100	0	0	32	1	0	1	0	1	1	0	0	0
101	0	0	126.5	1	0	0	0	1	0	0	0	0
102	0	0	800	0	1	0	0	1	0	1	0	0

encno	crop24	crop25	hapast	pasto1	pasto2	pasto3	pasto4	pasto5	pasto6	pasto7	pasto8	pasto9
103	0	0	205	1	1	0	0	1	0	0	0	1
104	0	0	46	0	1	0	1	0	0	0	0	0
105	0	0	224	1	1	0	0	0	0	0	0	0
106	0	0	22	0	1	0	1	0	0	0	0	0
107	0	0	43.8	1	1	0	0	0	0	0	0	0
108	0	0	24	1	1	0	0	0	0	0	1	0
109	0	0	4000	1	1	0	0	0	0	0	0	1
110	0	0	13	1	1	0	0	0	0	0	0	0
111	0	0	7	1	0	0	1	0	0	0	0	0
112	0	0	40	0	0	0	1	0	0	0	0	0
113	0	0	4.1	1	0	1	0	0	0	0	0	1
114	0	0	27.2	1	0	1	0	0	0	0	0	0
115	0	0	28.4	1	0	0	1	0	1	0	0	0
116	0	0	27.2	1	0	0	0	0	0	0	0	0
117	0	0	35	1	1	0	0	0	0	0	0	0
118	0	0	0	0	0	0	0	0	0	0	0	0
119	0	0	14	0	1	1	0	0	0	0	0	0
120	0	0	160	0	0	1	0	0	0	0	0	0
121	0	0	25	0	0	0	1	0	0	0	0	0
122	0	0	1	0	0	0	0	0	0	0	0	1
123	0	0	39.2	1	1	0	0	0	0	0	0	0
124	0	0	11.2	0	1	0	0	0	0	0	0	0
125	0	0	2.4	0	1	0	0	0	0	0	0	0
126	0	0	55.2	0	1	0	0	0	0	0	0	0
127	0	0	6.4	0	1	0	0	0	0	0	0	0
128	0	0	3.6	0	1	0	0	0	0	0	0	0
129	0	0	60	0	1	0	0	0	0	0	0	0
130	0	0	14	0	1	0	0	0	0	0	0	0
131	0	0	79.2	0	1	0	0	0	0	0	0	0
132	0	0	46.4	0	1	0	0	0	0	0	0	0
133	0	0	182.4	0	1	0	0	0	0	0	0	0
134	0	0	52.8	0	1	0	0	0	0	0	0	0
135	0	0	129.6	0	1	0	0	0	0	0	0	0
136	0	0	645.3	1	1	1	1	0	0	0	1	0
137	0	0.5	2.5	0	1	0	0	0	0	0	0	0
138	0	0	3.7	0	1	0	0	0	0	0	0	0
139	0	0	2.7	0	1	0	0	0	0	0	0	0
140	0	0	74.4	0	1	0	0	0	0	0	0	0
141	0	0	120	0	1	0	0	0	0	0	0	0
142	0	0	15	0	1	0	0	0	0	0	0	1
143	0	0	2.75	0	1	1	0	0	0	0	0	1
144	0	0	9	0	1	1	0	0	0	0	0	0
145	0	0	5	0	0	1	1	0	0	0	0	1
146	0	0	68.4	1	1	0	0	0	0	0	1	0
147	0	0	22	1	0	0	0	0	0	0	0	0
148	0	0	44	1	1	0	0	0	0	0	0	0
149	0	0	49.2	1	0	0	0	0	1	0	0	0
150	0	0	338	1	1	0	0	0	0	0	0	0
151	0	0	48	1	0	0	1	0	0	0	0	0
152	0	0	460	1	0	0	0	0	0	0	0	0
153	0	0	960	1	1	0	0	0	0	0	0	0

encno	ansum1	anwin1	ansum2	anwin2	ansum3	anwin3	ansum4	anwin4	hafor	hatreepl	hatrpl1	hatrpl2
1	9	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	10	10	0	0	0	0	0	3	0	3
4	60	100	0	0	0	0	0	0	10	0	0	0
5	0	0	0	0	0	0	25	40	2	5	0	5
6	0	0	0	0	10	10	0	0	0	0	0	0
7	0	0	0	0	15	15	0	0	1	1	0	0
8	0	0	0	0	0	0	0	0	0	0.4	0	0.2
9	25	25	0	0	0	0	0	0	0	14.4	2.4	10.4
10	0	0	0	0	0	0	0	0	4	0	0	0
11	0	0	0	0	6	6	0	0	0	0	0	0
12	0	0	18	18	0	0	0	0	0	0	0	0
13	5	5	0	0	5	5	0	0	16	0	0	0
14	0	0	60	100	0	0	0	0	44	0	0	0
15	0	0	0	0	0	0	0	0	0	1.75	0.5	0.25
16	0	0	0	0	0	0	0	0	1.5	0	0	0
17	0	0	2	2	0	0	0	0	3	1	0	0
18	0	0	10	25	0	0	0	0	15	0.25	0	0
19	0	0	0	0	3	5	0	0	1.5	0	0	0
20	0	0	6	6	0	0	0	0	2.5	0	0	0
21	0	0	40	40	0	0	0	0	9	20	0	10
22	0	0	0	50	0	0	0	0	0	2	0	0
23	0	0	3	3	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	1	0	1
25	0	0	4	4	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	14	14	0	0	0	0	16	0	0	0
28	0	0	0	0	0	0	0	0	10	2	0	0
29	0	0	0	0	0	0	0	0	47	1	0	1
30	0	0	0	0	0	0	0	0	10	2	0	0
31	0	0	0	0	10	10	0	0	2	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	15	15	0	0	0	0	0	0	0	0
34	400	400	0	0	0	0	0	0	300	0	0	0
35	0	0	180	180	0	0	0	0	2	0	0	0
36	40	40	0	0	0	0	0	0	5	0	0	0
37	20	20	10	10	20	20	0	0	0	0	0	0
38	0	0	40	40	0	0	0	0	2	3	0	0
39	0	0	0	0	17	17	0	0	0	0	0	0
40	9	9	0	0	6	6	0	0	0	3	1.5	0
41	0	0	15	15	0	0	0	0	15	0	0	0
42	15	0	0	0	15	15	0	0	35	0	0	0
43	0	0	0	0	0	0	0	0	3	2	1	1
44	0	0	0	0	4	4	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0
46	350	350	0	0	20	20	0	0	10	0	0	0
47	0	0	0	0	30	30	0	0	3	0	0	0
48	800	800	0	0	0	0	0	0	15	0	0	0
49	0	0	23	23	0	0	0	0	5	0	0	0
50	0	0	20	20	0	0	0	0	3	0	0	0
51	9	9	0	0	8	8	0	0	0	0	0	0

encno	ansum1	anwin1	ansum2	anwin2	ansum3	anwin3	ansum4	anwin4	hafor	hatreepl	hatrpl1	hatrpl2
51	9	9	0	0	8	8	0	0	0	0	0	0
52	0	0	50	50	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0
54	10	10	0	0	10	10	0	0	0	2	0	0
55	0	0	5200	5200	0	0	0	0	500	0	0	0
56	125	150	0	0	125	150	0	0	500	5	0	2
57	100	100	50	50	0	0	0	0	12	0	0	0
58	0	0	30	30	0	0	0	0	50	0	0	0
59	0	0	0	0	15	15	0	0	0	1	0	0
60	0	0	100	100	0	0	0	0	60	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	20	20	0	0	0	0	0	0
63	0	0	0	0	50	50	0	0	0	0	0	0
64	0	0	0	0	4	4	0	0	0	0	0	0
65	0	0	60	60	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	20	0	0	0
67	0	0	40	65	0	0	0	0	4	0	0	0
68	0	0	500	500	0	0	0	0	1000	0	0	0
69	1500	2500	0	0	0	0	0	0	1450	0	0	0
70	0	0	10	15	0	0	0	0	0	0	0	0
71	6	6	0	0	20	20	0	0	0	0	0	0
72	2	2	0	0	2	2	0	0	1	0	0	0
73	0	0	8	8	0	0	0	0	0	0	0	0
74	0	0	113	113	0	0	0	0	4	0	0	0
75	0	0	0	0	100	100	0	0	0	0	0	0
76	60	60	0	0	0	0	0	0	0	0	0	0
77	30	50	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	50	50	0	0	0	0	0	0
79	0	0	0	0	0	0	80	80	8	0	0	0
80	0	0	0	0	0	0	20	20	0	0	0	0
81	0	0	0	0	0	0	250	250	0	0	0	0
82	0	0	0	0	0	0	15	15	1	1	0	0
83	0	0	60	80	0	0	0	0	0	0	0	0
84	0	0	100	100	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0
86	4	20	0	0	0	0	0	0	0	0	0	0
87	0	0	0	0	0	0	462	462	0	0	0	0
88	0	0	45	100	0	0	0	0	40	0	0	0
89	262	300	0	0	0	0	0	0	5	0	0	0
90	200	300	0	0	0	0	0	0	0	0	0	0
91	0	0	0	0	0	0	1200	1200	700	25	0	0
92	0	0	0	0	0	0	0	0	0	0	0	0
93	25	25	0	0	7	7	0	0	0	0	0	0
94	0	0	36	36	0	0	0	0	0	0	0	0
95	0	0	0	0	250	250	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0	0	0	0	0
97	0	0	0	0	0	0	0	0	0	0	0	0
98	0	0	50	30	0	0	0	0	0	0	0	0
99	0	0	0	0	31	31	0	0	0	0	0	0
100	0	0	0	0	15	30	0	0	0	0	0	0
101	0	0	30	30	0	0	0	0	0	0	0	0
102	800	800	0	0	0	0	0	0	0	0	0	0

encno	ansum1	anwin1	ansum2	anwin2	ansum3	anwin3	ansum4	anwin4	hafor	hatreepl	hatrpl1	hatrpl2
103	190	190	0	0	0	0	0	0	140	0	0	0
104	0	0	0	0	140	140	0	0	1.6	0	0	0
105	200	200	0	0	0	0	0	0	0	0	0	0
106	0	0	0	0	15	15	0	0	33	0	0	0
107	60	60	0	0	0	0	0	0	2	0	0	0
108	0	0	15	15	0	0	0	0	5	0	0	0
109	0	0	0	0	0	0	2500	2500	500	100	100	0
110	0	0	0	0	0	0	0	0	2	2	0	0
111	0	0	8	8	0	0	0	0	0	1	0	0
112	0	0	0	0	0	0	45	45	0.5	2.5	0	0
113	0	0	0	0	0	0	0	0	0	0	0	0
114	0	0	0	0	0	0	20	20	4	0.8	0	0
115	0	0	10	30	0	0	0	0	0	0	0	0
116	0	0	25	25	0	0	0	0	0	0	0	0
117	0	0	0	0	0	0	50	50	0	1	0	0
118	0	0	0	0	0	0	0	0	0	0	0	0
119	15	15	0	0	0	0	0	0	0	0	0	0
120	0	0	0	0	140	140	0	0	0	0	0	0
121	0	0	30	30	0	0	0	0	6	1	0	0
122	3	3	0	0	0	0	0	0	1	0	0	0
123	0	0	0	0	14	14	0	0	9.6	0	0	0
124	0	0	0	0	0	0	12	12	2.4	0	0	0
125	0	0	0	0	2	2	0	0	0	0	0	0
126	0	0	0	0	27	27	0	0	0	0	0	0
127	0	0	0	0	20	20	0	0	0	0	0	0
128	0	0	0	0	7	7	0	0	0.4	0	0	0
129	0	0	0	0	22	22	0	0	4	0	0	0
130	0	0	10	10	0	0	0	0	0	0	0	0
131	0	0	0	0	0	0	130	130	8	0	0	0
132	0	0	0	0	0	0	100	100	12	0	0	0
133	150	200	0	0	0	0	0	0	16	1.6	0	0
134	40	60	0	0	0	0	0	0	0	0	0	0
135	0	0	0	0	110	110	0	0	6.4	0	0	0
136	800	800	0	0	0	0	0	0	35	0	0	0
137	0	0	0	0	0	0	4	4	0	0	0	0
138	0	0	0	0	7	7	0	0	0	0	0	0
139	0	0	0	0	13	13	0	0	0	0	0	0
140	78	78	0	0	0	0	0	0	8	0	0	0
141	0	0	0	0	200	200	0	0	0	0	0	0
142	0	0	0	0	43	43	0	0	2	0	0	0
143	0	0	0	0	5	5	0	0	0	0	0	0
144	0	0	0	0	0	0	12	12	0	0	0	0
145	0	0	0	0	3	19	0	0	1	0	0	0
146	0	0	40	40	0	0	0	0	1.6	0.2	0	0
147	0	0	15	15	0	0	0	0	2	0	0	0
148	20	30	0	0	0	0	0	0	1.6	0	0	0
149	60	70	0	0	0	0	0	0	0	0	0	0
150	200	280	0	0	0	0	0	0	8	0	0	0
151	0	0	25	70	0	0	0	0	16	0	0	0
152	400	400	0	0	0	0	0	0	40	0	0	0
153	600	1000	0	0	0	0	0	0	80	0	0	0

encno	hatrpl3	hatrpl4	hataco	perscorr	perspar	persoca	title	value
1	0	0	0	2	0	6	5	1
2	0	0	0	2	5	0	5	0
3	0	0	0	3	0	0	5	2
4	0	0	0	2	0	3	5	2
5	0	0	0	3	0	3	5	2
6	0	0	0	1	0	2	5	2
7	0	1	0	1	0	4	5	2
8	0.2	0	0	1	0	0	5	1
9	1.6	0	0	3	0	2	5	0
10	0	0	52	0	2	0	5	1
11	0	0	14.8	3	0	0	0	2
12	0	0	0	2	0	0	5	2
13	0	0	0	6	0	0	5	1
14	0	0	0	2	0	0	5	0
15	1	0	0	1	1	0	6	2
16	0	0	0	1	0	0	6	2
17	1	0	0	2	0	0	6	2
18	0.25	0	0	0	3	0	5	2
19	0	0	0	0	2	0	2	1
20	0	0	0	0	3	0	2	2
21	10	0	0	0	0	1	2	2
22	2	0	52	1	0	0	6	2
23	0	0	0	0	1	0	5	2
24	0	0	0	0	2	0	5	2
25	0	0	3.5	0	0	0	3	1
26	0	0	2.5	0	1	0	5	0
27	0	0	0	0	2	0	5	1
28	2	0	0	0	2	0	5	2
29	0	0	0	0	3	0	6	2
30	0	2	27	0	2	0	6	2
31	0	0	0	0	4	0	3	1
32	0	0	41.75	0	1	0	6	0
33	0	0	0	1	0	0	0	2
34	0	0	900	0	2	0	6	2
35	0	0	0	0	5	0	6	1
36	0	0	0	0	3	0	6	2
37	0	0	0	0	3	0	6	2
38	3	0	0	4	0	0	6	2
39	0	0	0	2	0	0	2	2
40	1.5	0	0	3	2	0	2	1
41	0	0	0	4	0	0	2	1
42	0	0	0	0	1	0	2	1
43	0	0	81	*	*	*	6	2
44	0	0	0	0	3	0	0	2
45	0	0	1.25	2	0	3	0	2
46	0	0	0	0	6	0	6	2
47	0	0	0	1	0	0	6	2
48	0	0	0	5	0	0	6	2
49	0	0	0	0	5	0	6	2
50	0	0	0	0	1	0	6	2
51	0	0	2	0	1	0	0	1

encno	hatrpl3	hatrpl4	hataco	perscorr	perspar	persoca	title	value
52	0	0	20.8	0	3	0	1	2
53	0	0	0	1	4	0	0	2
54	0	2	0	0	0	5	1	2
55	0	0	0	1	0	0	1	2
56	3	0	335	2	3	0	1	1
57	0	0	0	1	0	0	1	2
58	0	0	0	0	2	0	6	0
59	1	0	0	0	0	5	1	2
60	0	0	40	5	0	0	1	2
61	0	0	3.5	0	9	0	2	2
62	0	0	16.5	0	2	0	6	0
63	0	0	0	2	0	0	2	2
64	0	0	0	0	2	0	1	2
65	0	0	0	0	3	0	1	2
66	0	0	0	0	0	0	6	1
67	0	0	0	0	4	0	6	2
68	0	0	0	1	0	0	6	2
69	0	0	0	1	0	0	6	2
70	0	0	0	3	0	0	4	2
71	0	0	0	0	3	0	4	2
72	0	0	0	1	0	0	1	2
73	0	0	0	4	0	0	1	2
74	0	0	0	1	0	0	1	1
75	0	0	0	5	0	0	6	2
76	0	0	44	0	4	0	6	1
77	0	0	30	0	2	0	1	0
78	0	0	0	3	0	0	6	1
79	0	0	0	3	0	0	6	0
80	0	0	0	2	0	4	1	1
81	0	0	0	0	3	0	1	2
82	1	0	0	1	0	0	1	2
83	0	0	0	1	0	0	1	2
84	0	0	0	2	0	0	6	2
85	0	0	0	0	0	1	6	1
86	0	0	0	1	0	0	1	2
87	0	0	0	0	3	0	1	2
88	0	0	15	0	1	0	1	2
89	0	0	0	3	0	0	6	2
90	0	0	10	0	0	0	6	2
91	25	0	0	0	0	0	6	2
92	0	0	12.5	0	2	0	0	2
93	0	0	0	1	0	0	1	2
94	0	0	0	1	0	0	1	2
95	0	0	0	0	2	0	6	0
96	0	0	0	0	2	0	1	2
97	0	0	0	0	2	0	1	2
98	0	0	0	0	2	0	6	2
99	0	0	0	0	2	0	1	2
100	0	0	0	1	0	0	0	2
101	0	0	0	0	4	0	1	1
102	0	0	0	1	3	0	6	2

encno	hatrpl3	hatrpl4	hataco	perscorr	perspar	persoca	title	value
103	0	0	0	0	0	0	1	0
104	0	0	0	1	0	0	1	2
105	0	0	0	2	0	0	0	2
106	0	0	0	2	0	0	1	1
107	0	0	0	1	0	0	6	2
108	0	0	0	1	0	0	6	2
109	0	0	0	0	0	0	6	2
110	1	1	0	2	0	1	1	0
111	0	1	2.5	4	0	0	1	2
112	0	2.5	0	0	4	0	1	2
113	0	0	0	0	1	0	3	0
114	0.8	0	0	1	0	0	1	2
115	0	0	0	1	0	0	3	2
116	0	0	0	3	0	0	1	2
117	1	0	15	2	0	0	1	0
118	0	0	10	0	0	0	1	2
119	0	0	0	0	1	0	1	2
120	0	0	0	1	0	0	1	0
121	0	1	0	2	0	0	2	1
122	0	0	2	2	0	0	1	2
123	0	0	0	1	0	0	3	2
124	0	0	0	0	3	0	3	2
125	0	0	0	0	2	0	3	2
126	0	0	0	3	0	1	2	2
127	0	0	0	1	0	3	1	2
128	0	0	0	1	0	0	1	2
129	0	0	0	1	0	0	1	1
130	0	0	0	3	0	0	3	1
131	0	0	0	2	0	0	1	2
132	0	0	0	1	3	0	6	2
133	0	1.6	0	1	0	0	1	1
134	0	0	0	0	0	0	1	2
135	0	0	0	3	0	0	6	2
136	0	0	0	0	0	0	6	2
137	0	0	0	1	0	4	1	2
138	0	0	0	0	2	0	1	2
139	0	0	0	2	0	0	1	2
140	0	0	0	1	0	0	1	2
141	0	0	0	2	0	0	1	1
142	0	0	0	3	0	0	1	2
143	0	0	0	0	2	0	3	2
144	0	0	0	2	0	0	3	2
145	0	0	0	0	1	0	1	2
146	0.2	0	0	3	0	0	3	2
147	0	0	0	0	3	0	1	2
148	0	0	0	0	3	0	1	2
149	0	0	0	0	1	0	1	2
150	0	0	0	0	2	0	1	2
151	0	0	0	0	1	0	1	1
152	0	0	0	0	4	0	1	2
153	0	0	0	1	0	0	1	1