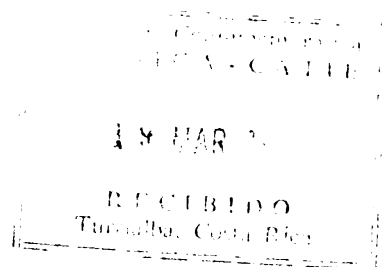
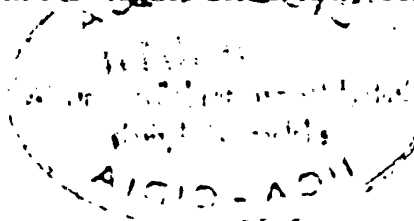


**RESEARCH PROGRAM ON SUSTAINABILITY
IN AGRICULTURE (REPOSA)**



**Report No. 112
Field Report No. 155**

THE NEGUEV REVISITED
***A study of the agricultural changes between
1987 and 1996 in the Neguev settlement, Costa Rica***



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**CENTRO AGRONÓMICO 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)*. REPOSA provides research and practical training facilities for students from WAU as well as from other Dutch and regional educational institutions. REPOSA's research results are actively disseminated through scientific publications, internal reports, students' thesis, and presentations at national and international conferences and symposia. Demonstrations are conducted regularly to familiarize interested researchers and organizations from both within and outside Costa Rica with the *USTED* methodology. 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.

REPOSA (*Research Program on Sustainability in Agriculture*, o sea Programa de Investigación sobre la Sostenibilidad en la Agricultura) es una cooperación entre la Universidad Agrícola de Wageningen, Holanda (UAW), el Centro Agronómico Trópico de Investigación y Enseñanza (CATIE) y el Ministerio de Agricultura y Ganadería de Costa Rica (MAG). Además REPOSA ha firmado cartas de entendimiento con organizaciones académicas, gubernamentales, internacionales y non-gubernamentales en Costa Rica.

REPOSA ha desarrollado una metodología cuantitativa para el análisis del uso sostenible de la tierra para apoyar la toma de decisiones a nivel regional. Esta metodología, llamada USTED (Uso Sostenible de Tierras En el Desarrollo) involucra dimensiones económicas y ecológicas, incluyendo aspectos edafológicos y agronómicos.

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

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Chapter I

INTRODUCTION

1.1 Context of the study

In 1987 a *Research Program on Sustainability in Agriculture (REPOSA)*¹ was initiated, in which the *Centro Agronómico Tropical de Investigación y Enseñanza (CATIE)*, the *Wageningen Agricultural University (WAU)*, and the *Ministerio de Agricultura y Ganadería (MAG)* cooperate. The main focus of REPOSA is "development of an interdisciplinary methodology for the analysis and evaluation of ecologically and economically sustainable land use" (Jansen et al., 1996:1). The research is based on a combination of modeling, experimentation and multiple goal planning, resulting in alternative scenarios and thematic maps. In accordance with a micro-level, as well as regional focus of the program, target groups can be found at either level. At the small scale, beneficiaries are individual farmers, specialized entrepreneurs, extension services and farmer groups. At the (sub) regional level the target group consists of organizations involved in agricultural development. (Atlantic Zone Program, 1992)

The present report is the result of a five month practical period for the Department of Development Economics (WAU), conducted within the scope of REPOSA. The study consists of a general analysis of the agriculture in the Neguev settlement and a comparison with the situation in 1987.

1.2 Objectives

After an exploratory survey in the Atlantic Zone three areas were selected for a general farm-survey, conducted in February 1987: the Neguev settlement, a western part of Río Jiménez and Las Lomas de Cocorí. Objectives of the survey were to obtain a general notion about the agricultural situation, problems and opinions of the producers; providing a way for comparing different regions; classifying farms, to enable selections for more specific studies; and finally providing a broad framework for more detailed studies. (Brink and Waaijbergen, 1990:1) Considering that almost a decade of intensive studies of the Neguev settlement has passed since, this framework might need to be revised to take into account changes which have occurred. Therefore, the primary objective of the study is obtaining a systematic insight into the present agricultural situation as well as the changes which have occurred during the 1987-1995 period in the Neguev settlement.

A secondary objective of the study is obtaining additional data for my thesis directed at inclusion of land degradation in a multi-period linear programming model. General data on the presence and causes of

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REPOSA is the continuation of the Atlantic Zone Program.

land degradation and on the time-horizon of the farmers are gathered. Finally data regarding yield and input use per crop are gathered; two important items missing in the original 1987 survey. //

1.3 Hypotheses

Several hypotheses regarding changes in the Neguev have been formulated, mostly based on trends indicated in the analysis of the 1987 survey data. The original survey showed a strong tendency towards deforestation in the Neguev. In 1979 forest was the principal use of the land, whereas in 1987 it comprised only 15 percent of the area. (Oñoro, 1990:40) This development corresponds with the high rate of deforestation recorded at the national level. From 1970 to 1989 the rate of deforestation in Costa Rica has been extremely high, varying between 1.2 and 1.8 percent of existing area annually, whereas the average for the tropical areas is 0.5 percent. (WRI, 1991:17) Based on these two factors it is hypothesized that the present area under forest will be significantly lower than in 1987, i.e. basically no forest will be remaining in the settlement area.

The second hypothesis concerns the composition of the population. There has been a great deal of institutional attention for the settlement, consisting of technical assistance, infrastructural investments etc. (Oñoro, 1990:17) According to the 1987 survey the number of women in the area was relatively low, which was attributed to difficult living conditions resulting from the colonizing character of the settlement. (Oñoro, 1990:34) Assuming an improvement in living conditions, it is hypothesized that the relative number of women has increased in the last decade.

Several hypotheses related to landownership issues have been phrased. In 1987 already a considerable part of the producers did not belong to the original occupiers, (Oñoro, 1990:32) which indicates rather fast changes in land-ownership in the area. At the same time there has been a historical tendency towards land concentration in the Atlantic Zone of Costa Rica. (De Vries, 1986) It is therefore hypothesized that instead of the original 311, more or less uniform farms a more diverse pattern of landownership has emerged: larger and relatively extensive farms coexisting with smaller and relatively intensive farms. This trend is probably reinforced by the issuing of land titles (see below).

For relative small farms a hypothesis regarding land degradation has been formulated. The goal of the occupation and subsequent assignment of small parcels to family production units was intensification of land-use. However, more intensive use of land can lead to exhaustion of the soil, especially on poor soils, if no improvement measures are taken. It is hypothesized that smaller farms will more often indicate the occurrence of erosion on their farms as a result of their more intensive land use.

The last hypothesis related to landownership consists of two parts. As far as the legal ownership of the land is concerned, it is hypothesized that at present more farmers have a legal title to the land. In 1987 none of the respondents had such a title, due to policies of IDA (*Instituto de Desarrollo Agrario*) which required 10 years of consecutive working of the parcel in order to qualify for titling. This policy limited the possibilities to sell the farm, as well as possibilities to obtain (formal) credit. (Oñoro, 1990:38) It is therefore hypothesized that more farmers will indicate the use of credit in the past year, as a result of increased occurrence of legal ownership.

The last group of hypotheses relates to types of land use. Related to the assumption that larger, more extensive farms have arisen, it is expected that the area devoted to pasture has increased.

Maize was the most important crop in 1987, based on the number of producers, cultivated area, as well as commercialized volume. (Oñoro, 1990:42) But from 1987 on, price-subsidies as well as technical assistance and credit for maize were abolished in order to reduce the deficit of the *Consejo Nacional de Producción* (CNP), which provided a guaranteed outlet for maize, and to promote the production of export crops. (Oñoro, 1990:63) The principal alternatives for maize in 1987 were a group of root-crops belonging to the *Araceae* and *Dioscoreaceae* families, e.g. winged yam, tannia, cush-cush yam and eddoe. (Oñoro, 1990:44) It is hypothesized that the area maize will have decreased significantly compared to 1987, while at the same time the area under the alternative crops has increased.

Finally, it is hypothesized that the area under cocoa has strongly decreased, whereas the area under palm heart will have increased substantially; the 1987 survey mentions severe problems with the production of cacao and increased attractivity of palm heart. (Oñoro, 1990:45)

1.4 Methodology

Generally speaking the same survey as in 1987 has been conducted, with some questions added in order to obtain the additional data mentioned in the objectives. The selection of farmers was based on the list of parcels selected for the survey in 1987.

Using the same survey and sample as in 1987 also leads to the same limitations as of the original survey. In the first place limitations related to the way in which the sample was selected exist. There might be a deviation in the sample towards farmers without off-farm work. From the original selected 50 farmers around 15 percent had to be replaced by other farmers since they either could not be contacted or did not want to be interviewed. The same problem existed in the present survey, the six farmers who could not be contacted could very well be those with (a lot of) off-farm work. (Brink & Waaijberg, 1990:1)

Other limitations are related to the way in which the survey was conducted. The data are collected in one single visit. Several consecutive visits can be assumed to produce more detailed and more reliable information, but this was impossible given time-constraints. Furthermore the original survey was conducted by teams of students, consisting of a Costa Rican and a Dutch student. Neither one of them was used to either the way of thinking or vocabulary of the farmers. For most of the Dutch students there was an additional problem of understanding Spanish. This aspect was less of a problem in the present study since my Costa Rican counterpart who assisted in conducting the survey, has extensive knowledge of area as well as its agriculture and specific vocabulary. A final limitation is lack of incentives for the respondents for giving correct and exact information. (Brink & Waaijberg, 1990:2)

Problems with finding the present owners of the 1987 parcels were caused by inaccurate administration of the settlement and division of parcels in several parts owned by different people. A main factor causing the inaccurate files of the parcels is the IDA-policy which allows a person to have a maximum of two parcels. In practice many people own more parcels, registered at various names. The factual owners were traced down by visiting the parcels and by obtaining information from neighbors and long time residents of the settlement. The division of parcels in two or more parts implied that also two or more owners had to be traced down. Once found all farmers were willing to participate in the survey.

During the processing of the survey the data related to the 1987 parcels were separated from the data of the farm as a whole in case a farm comprised several parcels. This was done in order to facilitate parcel specific comparisons between both surveys. In some cases it was difficult to assign data to the individual parcels within a farm. In case of unclarities or lack of data numbers were assigned according to the relative size of the parcel compared to total farm area. Analyses were made with SPSS for Windows 6.1 and micro TSP 7.0b.

The study is divided in three parts. The first part consists of a general description of the study area. The second part contains the analyses of the survey data and comprises Chapter 3 to 7. The final part discusses the hypotheses and gives the conclusions.

Chapter II

THE RESEARCH AREA

2.1 The Atlantic Zone of Costa Rica

Costa Rica can be classified as a middle-income country according to the World Bank classification, with an average income of 1,960 US \$ in 1992. The country scores favorably on a range of development indicators, like population growth (2.5 percent per year), literacy rate (93 percent), life expectancy at birth (76 years), and an unemployment rate of 4.1 percent. (Jansen et al., 1996:11, World Bank, 1995:127)

Map 2.1: Location of the Atlantic Zone in Costa Rica



Source: adapted from van de Berg & Droog (1992)

The Atlantic Zone of Costa Rica is located at the North-East side of the country (see Map 2.1). It comprises some 545,000 ha, administratively divided in the Limón province, eastern part of the Heredia province, and the Huetar Atlántica planning zone. A main highway runs through the region from Limón to San José. About 25 percent of the roads are either paved or improved; especially recently colonized areas can be badly accessible. The total population is about 225,000 (1990), of which 70 percent lives in rural areas and 50 percent works in the agricultural sector. The population growth rate lays above the national average as a result of immigration to the Atlantic Zone. This influx of people is caused by relatively favorable employment opportunities compared to other regions in Costa Rica.

The land is used for national parks, forests, cattle ranches, banana, palm heart, as well as horticultural plantations, and *Instituto de Desarrollo Agrario* (IDA) settlements. The area includes six national parks, national refuges and biological reserves. The cattle ranches can often be characterized as extensive, functioning as a way of land speculation. (Finnema, 1991, Berg & Droog, 1992) The Atlantic Zone produces about 97 percent of Costa Rica's banana export. The banana export is monopolized by multinationals, but some national companies operate at the production level. Land-ownership in the zone is highly skewed; according to a 1984 census two-thirds of the agricultural land is owned by 16 percent of the farms. (Jansen et al., 1996:15) The economic development of the region has been strongly interwoven with boom and bust periods in the banana-cultivation, which always dominated the regional economy. Ever since the return of large scale banana cultivation in 1956 the government actively promoted development with investments in infrastructure, tax policies and settlement schemes to provide a regional labor supply. The settlement schemes also reduced land pressure in other parts of the country, thus diminishing calls for land reform. (De Vries, 1986)

The combined effect of land concentration and increased population growth led to continuous occupations of under-utilized land by farmer movements; the most important were Neguev, Indio and Maryland. The state responded with the establishment of the *Instituto de Tierras y Colonización* (ITCO), which had, among others, as objective to prevent concentration of land and to improve the socio-economic conditions of small producers. ITCO was the predecessor of IDA, which at present still administers the Neguev settlement. (Oñoro, 1990:6-11) In contrast to the active involvement with the development of the settlement in the past, at present the tasks of IDA are limited to registration and assignment of parcels only.

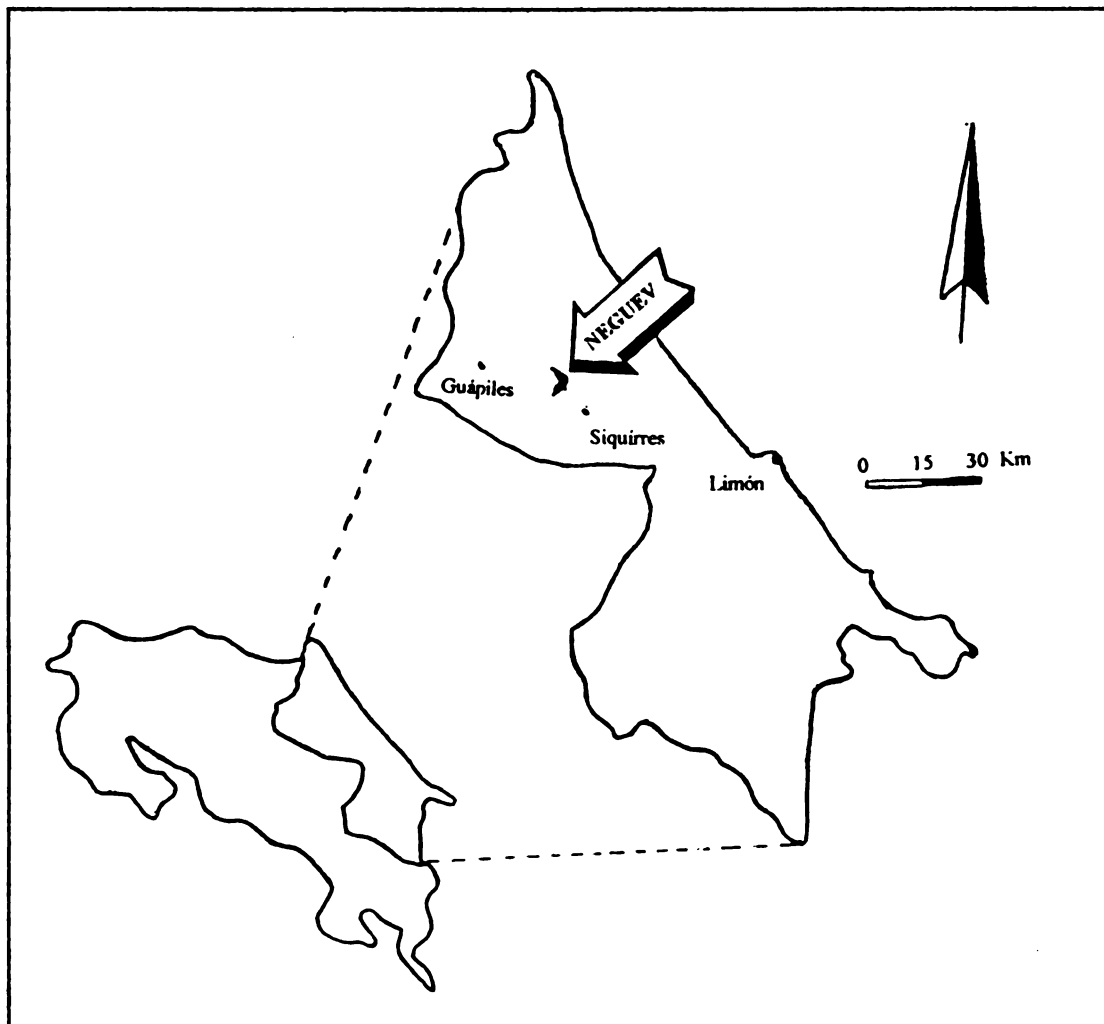
2.2 The Neguev settlement

The Neguev settlement is located in the northern part of the Atlantic Zone of Costa Rica, between the vertical coordinates 5.80 and 5.90, and between the horizontal coordinates 2.40 and 2.50, on the topographical maps of Bonilla and Guacimo (see also Map 2.2 and 2.3). The settlement is situated within the administrative districts of Germania and Cairo of the Siquirres canton, as well as within the districts of Pocora and Río Jiménez belonging to the canton of Guacimo. (Bruin, 1991:1) Both cantons on their turn belong to the Limón province. The most important rivers in the settlement are the Parismina river in the north, the Dos Novillos and Destierro rivers in the west, and finally the Peje river in the east of the settlement. (Oñoro, 1990:2, Mucher, 1992:6)

2.2.1 Climate

The altitude of the settlement varies between 50 and 10 meters above sea level. Yearly precipitation amounts to 3,630 mm, humidity is generally higher than 80 percent. The evotranspiration is on average 2,500 mm, exceeded by precipitation in more than ten months of the year. The driest months are march, April and May in which some crops like maize sometimes suffer from drought. (Mucher, 1992:9) The temperature varies little, having an average value of 25.1°C. In general the climate can be described as "very humid tropical forest". (Bruin, 1991: 2-4) The hot and humid conditions favor the spread of pests and diseases, and lead to higher input requirements. (Oñoro, 1990:37) The abundant rainfall also leads to erosion as well as leaching of nutrients. (Bruin, 1991: 2-4)

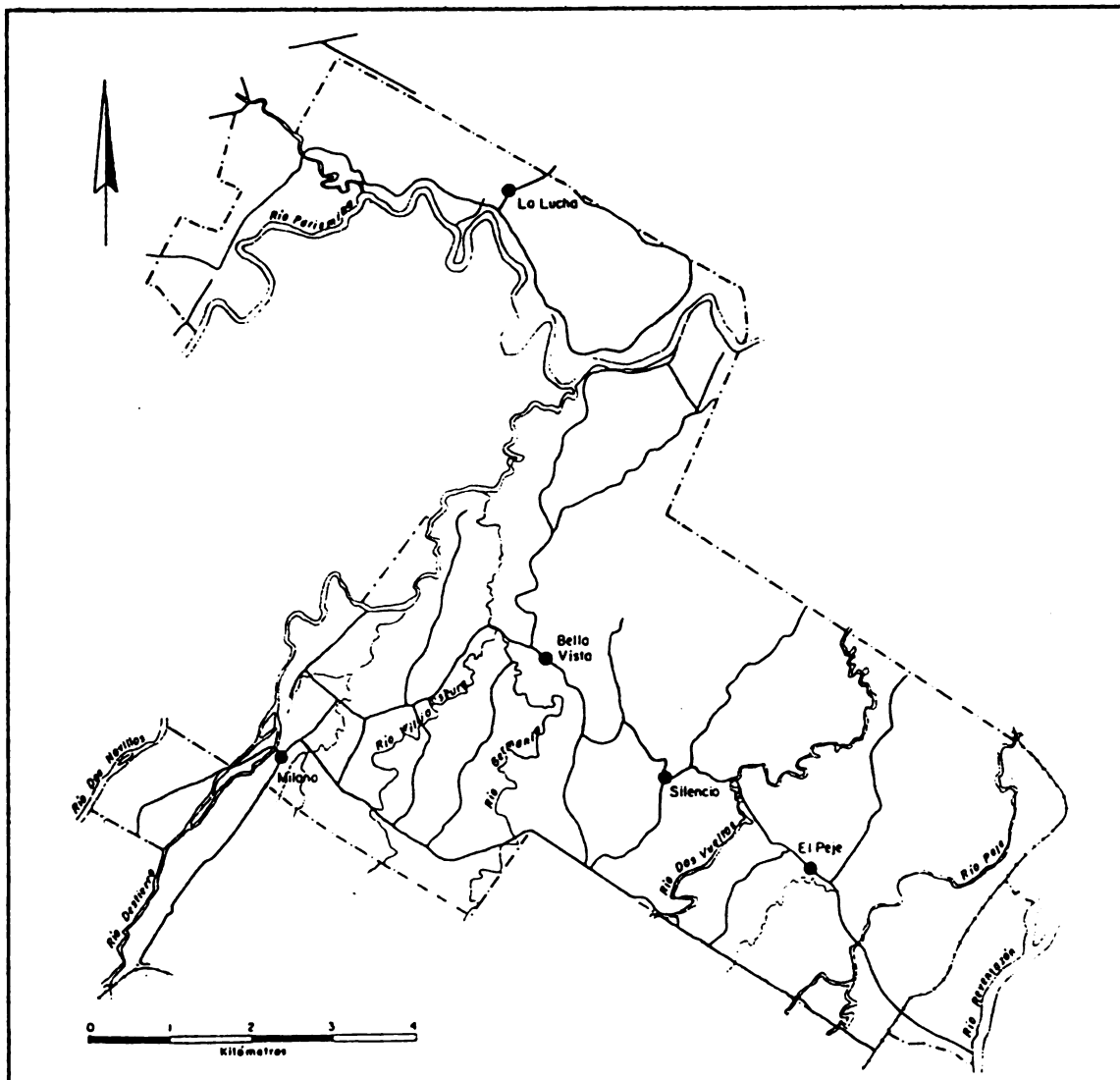
Map 2.2: Location of the Neguev in the Atlantic Zone



Source: Mucher (1992)

Map 2.3: The Neguev settlement

Map 2.3: The Neguev settlement



Source: Ofioto (1990)

2.2.2 Geomorphology and soils

The study area is located at the feet of the northeast sector of the Turrialba volcano. Volcanic mud streams (lahar) and fluvial deposits of different ages produced an undulating landscape dissected by rivers. The lahar material is strongly weathered in most places, resulting in clayey soils. The most recent deposits of the Parismina and Destierro rivers have a high mineral content, which mineralizes quickly. (Mucher, 1992:10) The landscape is crisscrossed by rivers, resulting in slopes of at times more than 30 and hills of more than 10 meters above valley-bottoms. Valleys are swampy and contain more recent fluvial deposits from the major rivers. (Bruin, 1991:4-5) In the Neguev roughly two kinds of soils can be

distinguished: low or non-fertile hilly soils and flat fertile soils. Next to fertility drainage is limiting land use. (Oñoro, 1990:40)

2.2.3 History of the settlement

The Neguev settlement is the result of an invasion by landless agricultural laborers in September 1979, who used to work on the banana plantations. They were organized within the *Unión de Pequeños Agricultores del Atlántico* (UPAGRA). The invaded area was an unproductive *finca*, consisting of pastures and forest. At the same time another group, the *Sindicato de Pequeños Agricultores de Limón* invaded the *finca* from the other side. Under the pressure of the invasion and in order to prevent further escalation of the conflict ITCO bought the *finca* and divided it between the occupants and other people attracted to the area. (Oñoro, 1990:12-14) Eventually the beneficiaries are supposed to repay the original sum ITCO paid for the land, but thanks to improvements in the past years and a general relative increase in land prices, the value of the land has increased much beyond this original value.

Cultivation of the land was not really successful in the beginning. The farmers lacked resources and the soil was not suitable for maize, rice or beans, staple crops which the farmers equated to agriculture. In order to prevent further conflicts IDA intervened and incorporated the settlement in Project 0-34, aimed at development of rural areas and financed by USAID. The area was divided into parcels with size depending on quality, and assigned to candidates who met IDA's requirements. The area became a model for rural development, with credit and technical assistance aimed at monocultures. During the last decade the role of IDA changed from active involvement in the development of the settlement to a more distant and passive role of intermediary between farmers and buyers, next to administration of the settlement. (Oñoro, 1990:14-17)

2.2.4 General pattern of land use

The settlement comprises 5,340 ha of which more than 75 percent was originally divided in 311 parcels between 10 and 17 ha. The remaining area contains rivers, streets, communal areas etc. (Mudde, 1987:13) The settlement is divided into five sectors: La Lucha, Milano, Bella Vista, El Silencio, and El Peje. Each of these sectors has its own communal center with a school, sports green, multi-purpose hall, a couple of *pulperias* (small groceries), and a small public center. Until recently only in Milano electricity was provided, running water and telephone services are still only provided in this sector. (Oñoro, 1990:2)

Only a small part of the area in the settlement is used for cultivation of crops, in 1986 only about 16 percent. (Soto, 1986, cited in Mucher, 1992:15) More generally it can be stated that land is used in an extensive manner, characterized by pastures and wastelands with some crops. Poor soils clearly limit the agricultural possibilities, but in spite of this it seems that mainly due to the profitability of off-farm employment, the agricultural possibilities of the land are under-utilized. Finnema (1991), for example found that 30% of the fertile soils was used as forest, wasteland or pasture. (Finnema, 1991:17)

Chapter III

OWNERSHIP, FAMILY COMPOSITION AND HIRED LABOR

3.1 Introduction

The owners of the parcels, their families and hired laborers are discussed in this chapter. First types of ownership, size of the farms and some characteristics of the owners are treated. Subsequently the composition of the family and productive activities in which family members are involved are discussed. Finally in section 3.4 the use of hired labor and its relationship with farm size and off-farm activities of the owner of the farm are analyzed.

3.2 Ownership, size, and owners

3.2.1 Ownership

Several types of ownership are distinguished in the survey: land with a legal title (*escritura*), land without such a title, land rented from other persons, total own land, and finally total farm area. The summary statistics of these variables are given in Table 3.1.

Table 3.1: Size of the farms in the 1996 survey

Type of ownership		Mean	Standard error	Median
	<i>n=</i>	<i>(ha)</i>	<i>(ha)</i>	<i>(ha)</i>
Land with title	46	19.9	2.9	15.0
Rented land	3	6.5	5.3	1.5
Total area	47	20.2	2.8	15.0

Only one case of land without a legal title appears in the 1996 sample which stands in sharp contrast to the situation in 1987; at that time none of the respondents had a legal title to the land.² This change in legal position of the farmer can be expected to have facilitated the selling of land as well as the use of credit. Only 3 farmers are renting land in the last survey.

² Although all farmers had, through assignment of the parcel by IDA, an official right to use the land, it could not be used freely as collateral to obtain credit or sold.

As far as the titling of the land is concerned it should be mentioned that it refers to the existence of a title for the parcel. As a result of the policies of IDA, a maximum of two parcels can be put on the name of one beneficiary. In order to circumvent this two-maximum regulation, the title is sometimes put on the name of a family member or other person. Next to this also "illegal" selling, i.e. selling without permission and therefore registration of IDA, exists. Both these practices complicated the survey since the official data could not be relied upon in the search for the actual owners of the parcels. Also, sample data referring to the producer at times refers not to the *legal* owner of the land, but to the person who considers himself to be the *actual* owner.

3.2.2 Size

Next to a change in legal position of the farmers there has been a rather large shift in size and therefore distribution of land. The average total farm area in the 1987 survey was 12.8 ha, a figure which has increased to 20.2 in the 1996 sample. These average figures however conceal the increased diversity in farm sizes. In Costa Rica it is common to distinguish four principal classes of farms: *minifundio* (less than 4 ha), *finca campesina* (4 to 20 ha), *finca mediana* (20 to 200 ha), and *latifundio* (more than 200 ha). (Schipper, 1993:24) Table 3.2 gives the results of applying this division to the 1987 and 1996 data.

Table 3.2: Distribution of the land in both surveys: common classification³

Year of survey	Distribution of sizes (%)				
	n=	< 4 ha	4 - 20 ha	20 - 200 ha	> 200 ha
1987	51	-	100	-	-
1996	47	2	68	30	-

The table clearly shows the much larger diversity in farm size existing nowadays, compared to the results of the 1987 survey. In the latter case all farms could be classified as *fincas campesinas*, whereas now all but the largest category of *latifundios* are represented in the sample. The majority of the farms (68 percent) however can still be found in the *finca campesina* category. This division in only four categories however obscures a lot of the variability in both samples, especially in the group of farms between 10 to 20 ha. Therefore in diagram 3.1 an alternative classification is presented.

Whereas in 1987 the farms were more or less homogenous in size, varying mostly between the 10 and 20 ha, in 1996 these two categories only cover 56 percent of the sample. Of the other half of the sample about a third is smaller than 10 ha, a third lays between 20 and 30 ha, and a third has become larger than 30 ha. The latter category comprises three extremes, two farms of 61 ha, and one farm of 119 ha,

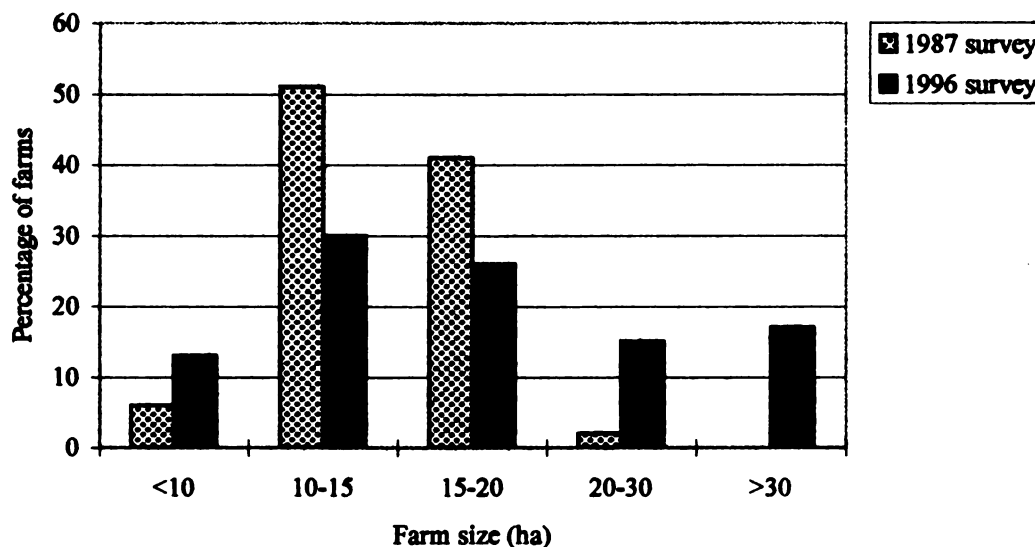
³

In order to increase the readability of the tables zeros have been replaced by '-'.

the latter being almost ten times larger than the average area of 12.8 ha in 1987. The farms in the smallest group vary in size between the 3 and 8 ha.

The existence of farms smaller than present in the 1987 sample indicates that parcels have been split up in different parts. The 1996 sample contains data on 47 of the 53 parcels visited in 1987. Of these 47 parcels 32 were still the same size as in 1987, although now sometimes being part of a larger farm instead of comprising its total area. Another 5 parcels have increased in size with 1 to 3 ha. This might be a result of joining different parts of the same parcel. This is possible since IDA distinguishes different parts on some parcels (for example parcel 14 consists of part 14 and part 14-a) if a road crosses the plot or if there are any other divisions which can be readily distinguished in the field. Each of the different parts have a separate title and can therefore be separately bought and sold. On the remaining 10 parcels an opposite development has taken place, parts of these parcels now belong to different owners. Of these parcels only partial information exists, since only in one case all owners could be contacted.

Diagram 3.1: Distribution of land in both surveys: alternative classification



Due to the incomplete registration of ownership in the settlement the total number of farms can not be derived from the official files. But from the survey results that the 47 farms comprise 73 parcels it can be estimated that from the original 307⁴ parcels about 198 farms are remaining in 1996.

4

The settlement has originally been divided in 311 parcels as stated in chapter 2 but some of these are used for communal centers, resulting in 307 parcels used for agricultural purposes.

3.2.3 Owners

There has been a shift in the way in which farms are acquired (see Table 3.3). The main way of obtaining the farm has become buying of either the improvements or the parcel itself; in the 1987 sample 43 percent of the respondents obtained the farm by buying, whereas in 1996 74 percent of the farms was obtained this way. In contrast to the 1987 sample nobody in the 1996 sample obtained the farm by means of UPAGRA⁵. The same owner as in 1987 was interviewed in 18 cases.

Table 3.3: Way of acquiring the farm

Way of acquiring	1987 survey (%)	1996 survey (%)
Buying	43	61
By means of IDA	28	17
By means of UPAGRA	11	0
Squatting	13	4
Renting	0	2
Exchange	4	2
Buying of improvements	0	13
Total	100	100

Note: 1987 n=53, 1996 n=46, due to rounding errors the individual numbers might not correspond to the total

There has also been a shift in the management of the farms. In 1987 all farms were managed by the owner, whereas in the 1996 sample 9 of the 47 farms were managed by an administrator. In the following section "farmers" pertain to the persons managing the farm, without distinguishing between owners and administrators.

The average age of the respondents is about the same in both samples, being 42 for the 1987 sample and 40 for the 1996 sample. The average number of years of managing the farm has almost doubled from 4.6 to 8.1 years. Considering that the surveys are nine years apart both numbers indicate a change in owners. The average number of years of experience as producer has increased from 16 to 25 years.

⁵

UPAGRA is the organization of small producers which led the occupation of the *finca*.

As can be seen in Table 3.4 the number of farmers in the sample with no education at all has decreased a little from 21 to 17 percent. The amount of people with a completed primary education has increased from 38 to 56 percent. The majority of the respondents still does not have any secondary education (91 percent in 1987, 87 percent in 1996), or university degree (96 percent in both surveys). This might be contributed to the fact that only primary education is available in the settlement itself. The nearest opportunities for secondary education are in Siquirres and Guacimo, both of which are difficult to reach due to a lack of transportation.

Table 3.4: Years of education

Type of education	1987 survey (% of farmers)	1996 survey (% of farmers)
No primary education	21	17
Primary school: uncompleted	41	26
Primary school: completed	38	56
No secondary education	91	87
Secondary school: uncompleted	2	6
Secondary school: completed	7	7
University: completed	4	4

Finally, Table 3.5 summarizes the type of activities of the respondents before obtaining the farm. Compared to the 1987 data more former day laborers are found in the 1996 sample. The amount of farmers who owned another farm before is about the same in both surveys, increasing from 13 to 18 percent, whereas the number of former workers on banana plantations has decreased from 23 to 13 percent. There are more people who formerly worked on a family farm in the 1996 survey, increasing from 0 to 18 percent. In contrast to the first survey none of the respondents of the 1996 survey indicated livestock as a former activity⁶. In both surveys the majority of the farmers already worked in the Limón province before starting on the farm (57 percent in 1987 and 52 percent in 1996). Another quarter of the respondents formerly worked in either Guanacaste or San José. The remaining respondents came from one of the other four provinces before coming to the Neguev settlement.

6

This refers to the last activity in which the farmer was involved before starting the farm in the Neguev. In several cases farmers have do have earlier experiences with livestock, for example obtained while working as a child on the family farm.

Table 3.5: Activity of the farmer before obtaining the farm

Type of activity	1987 survey (% of farmers)	1996 survey (% of farmers)
Producer	13	18
Day laborer	17	29
Administrator	-	4
Bananero	23	13
Family farm	-	18
Agriculture	17	4
Livestock	9	-
Construction	2	2
Student	2	2
Own business	6	9
Motor saw operator	2	-
Other activity	9	-
Total	100	100

Note: 1987 n=53, 1996 n=45 due to rounding errors individual numbers might not correspond to the totals

3.3 Family composition and activities

3.3.1 Family composition

Despite the increased variety in farm sizes still 68 percent of the farms in the 1996 survey can be considered *finca campesina*, or peasant farms (see Table 3.2). General agreement exists on the predominant role of family labor for the peasant mode of production, notwithstanding the fact that labor is hired and family members also work off farm. (Ellis, 1988:8) Considering this importance of family labor the composition of the family constitutes an important factor of production for peasant farms. The family composition of the farms in the 1996 sample is presented in Table 3.6.

The average family size in the Neguev is 4.8 persons, almost half of which consists of children younger than 14. Boys and girls between 15 and 20 are only present on 9 and 6 of the farms, respectively. The above statistics only refer to the persons actually living in the same house as the respondent. It is not

uncommon for girls to get married when they are between 15 and 20 and therefore the lower number of farms with girls might be caused by girls who left their parent's household. Considering the low number of adolescents and older people, the majority of the families in the 1996 sample can be said to consist of two parents with about 2 children younger than 15.

Table 3.6: Family composition in the 1996 sample (n=45)

Category		Average	Range	Number of farms ¹	Total no. of persons
Sex	Age (years)				
Children	0 - 14	2.1	0 - 12	35	93
Boys	15 - 20	0.2	0 - 2	9	11
Girls	15 - 20	0.2	0 - 2	6	7
Men	21 - 60	1.2	0 - 4	40	53
Women	21 - 60	0.9	0 - 2	37	40
Men	61 +	0.2	0 - 1	7	7
Women	61 +	0.1	0 - 1	5	5
Total		4.8 ²			216

Note 1: Refers to the number of farms on which the specific category is present

Note 2: Total does not correspond to the sum due to rounding errors

Table 3.7 compares the family composition in the 1987 and 1996 survey. There are slightly more women, and older people but the differences are minimal. This stability in the composition of the population confirms the changes in owners indicated in section 3.2.

3.3.2 Activities

Not only the composition of the family, but also the type of activities to which the various members of the household dedicate themselves determines the amount of family labor available for agricultural production. Important in this respect is the division of labor according to gender ⁷. Table 3.8 summarizes the activities of the various adult household members in both surveys. The work of children between 0 and 14 is not included and *studying* consists of forms of schooling other than primary education. It

⁷

Since the division of labor between the sexes is a result of social customs, norms and beliefs and not of biological difference, *gender* is preferred to *sexual division of labor*, with gender as "shorthand for the social meaning which is attached to the roles of women and men in different societies" (Ellis, 1988:166).

should be mentioned that a lot of farmers indicate that they started to work on the farm at the age of 9 and a lot of children lend a hand in household activities. Excluding children from this part of the analysis therefore means that part of the labor supply is not included. But considering that all children in the 1996 sample (with the proper age) were following primary education and therefore never full-time included in production activities, the amount of underestimating the labor supply can assumed to be limited.

Table 3.7: Comparison of family composition between the two surveys

Category		% of persons in each category	
Sex	Age (years)	1987 survey	1996 survey
Children	0 - 14	42	43
Boys	15 - 20	7	5
Girls	15 - 20	5	3
Men	21 - 60	24	25
Women	21 - 60	17	19
Men	61 +	2	3
Women	61 +	1	2
Total		100	100

Note: 1987 n=53, 1996 n=45, due to rounding errors individual numbers might not correspond to the totals

In contrast to the 1987 survey none of the family members in the 1996 sample was following any form of secondary education⁸. This may partly be ascribed to the decreased number of adolescents in the sample, being the group most likely to follow secondary education. Another important factor is the earlier mentioned absence of facilities for secondary education in the Neguev and lack of means of transportation to either Guacimo or Siquirres, thus limiting the opportunities of education. Other factors might however also be important, like lack of financial means, since the accessibility of the settlement has greatly improved in the last decade with an unpaved road system and buses serving Milano. A larger number of persons could therefore be expected to follow secondary education.

Domestic activities seem to be have become an almost exclusive domain of women. Of the males in the 1996 sample only boys between 15 and 20 contributed to household activities. The contributions of adult men were larger in the 1987 sample, with 38 percent of the men between 21 and 60, and 17 percent of the men older than 61 performing tasks in this area. This change might be ascribed to the loss of the

8

Data refer to present activities not to previous activities or education.

colonizing character of the Negev in the last decade. In the first years men at times were living alone in the settlement, due to difficult living conditions, implying that they also had to perform domestic tasks.

Table 3.8: Comparison of the activities of the family members

Category		Activities of the various categories in each sample (%) ¹							
		<i>Studying</i>		<i>Domestic work</i>		<i>On farm work</i>		<i>Off farm work</i>	
Sex	Age (years)	1987	1996	1987	1996	1987	1996	1987	1996
Boys	15 - 20	11	-	32	9	100	45	37	64
Girls	15 - 20	7	-	100	100	29	14	7	-
Men	21 - 60	2	-	38	-	94	81	47	49
Women	21 - 60	-	-	85	100	40	13	-	8
Men	61 +	-	-	17	-	100	86	-	-
Women	61 +	-	-	100	100	50	-	-	-

Note 1: The percentages are calculated on basis of the total number of persons in each category. The sum of the percentages per sub-category and survey at times exceeds 100 since the family-members are involved in more than one activity

Note 2: 1987 n=53, 1996 n=47

An opposite, although less extreme, picture emerges with farm activities. The great majority of adult men performs on farm activities, while in 1987 all boys also performed on farm tasks. In 1996 only 45 percent of the boys in the sample were performing on farm tasks. This might be caused by the fact that a higher percentage of boys in this sample were working off farm, thus leaving less opportunity for on farm work. For all three subgroups of women the percentage of women working on the farm has strongly decreased compared to the 1987 survey. This might be attributed to the improved infrastructure, if it is assumed that this facilitates the hiring of (male) day laborers. Roughly the same picture of a male dominated activity emerges for off farm work. A major part of the men and boys work off farm, however none of the older men does so. The great majority of the women does not work off farm in neither one of the samples.

Concluding it can be stated that a considerable part of the adolescent boys supplies labor to on and off farm activities. The contribution of women to these activities is limited, meaning that men comprise the basic supply of on and off farm labor. The above data only refer to the participation of members of the family in certain activities. Only for the producers data also available are on the amount of time they spend on and off the farm, and on the regularity of the off farm work. Table 3.9 gives the amount of time the producers spend on the farm in both surveys.

Table 3.9: Percentage of time dedicated to the farm

Time dedicated to the farm (%)	1987 survey (%)	1996 survey (%)
0 - 25	4	17
26 - 50	15	26
51 - 75	2	4
76 - 100	79	52
Total ¹	100	100

Note: 1987 n=53, 1996 n=47, due to rounding errors individual numbers might not correspond to the totals

Table 3.9 clearly shows that farmers in the 1996 sample spend less time on their farm compared to the 1987 sample. The number of producers who work full-time at their farm has reduced from 79 to 52 percent and more producers spend between 0 and 25 percent of their time at the farm. An opposite movement can be observed for the number of farmers with permanent off farm employment; in 1987 15 percent of the farmers worked off farm on a permanent basis, this figure has increased to 33 percent in 1996. The figure for irregular off farm work is the same in both samples, 11 percent.

3.4 Hired labor

3.4.1 Use of hired labor

The total supply of labor is determined by the availability of family labor and the amount of hired labor. In the survey a distinction is made between permanent and temporally hired labor, with the latter referring to day laborers hired on an *ad hoc* basis. In the 1996 sample 6.4 percent of the farms employed permanent laborers whereas in the 1987 sample 7.5 percent of the farms employed permanent laborers. It should be mentioned that these figures refer to permanent employees other than administrators. If the farms with administrators are included in the analysis an opposite picture emerges. In the 1987 sample there are no farms which are managed by an administrator, leaving the percentage of farms with permanent laborers at 7.5. In the 1996 sample this figure however sharply increases to 26 percent since 9 farms in the 1996 are managed by an administrator.

The second category of labor distinguished in the survey is temporally hired labor. In 1987 on average 31 *jornales*⁹ of temporal labor were hired per farm, an amount which has doubled in the last decade to 62 *jornales* in the 1996 survey. Table 3.10 presents a classification of the amount of temporal labor used on the farms in both samples.

⁹

Jornales is the Spanish term for wage as well as for a day's amount of work. The amount of labor is measured in *jornales*, each consisting of 5 hours of work, i.e. from 6 to 11 a.m.

Table 3.10: Total amount of hired temporal labor

Amount of hired labor (no. of jornales)	1987 survey (% of farms)	1996 survey (% of farms)
0	52	45
0 - 10	10	9
10 - 50	21	19
50 - 100	10	9
< 100	8	19
Total	100	100

Note: 1987 n=52, 1996 n=47, due to rounding errors individual numbers might not correspond to the totals

From the table a small shift towards an increased use of temporal labor emerges. The category of farms hiring more than a total of 100 jornales has increased from 8 to 19 percent, while the lower categories all show a small decrease compared to the 1987 survey. The larger size of the farms in the 1996 survey can be assumed to be partly responsible for this increase in hired labor. Another factor is the increased permanent off farm activities of the producers which increases the demand for hired labor at peak periods in the production. A further analysis of the relationship between farm size and hired labor is presented in section 3.4.2.

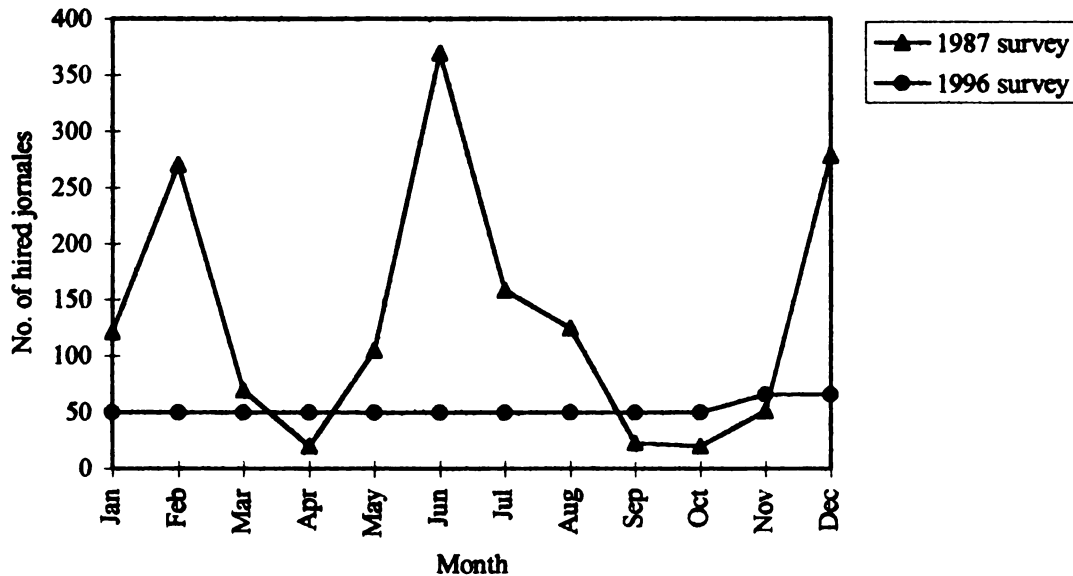
An important feature of agriculture is its seasonal character caused by the bio-physical conditions under which production takes place. This seasonality of production also leads to a seasonal demand for labor. Diagram 3.2 shows the amount of *jornales* hired per month for both surveys. A large difference in the seasonal use of labor between both samples can be observed. The 1987 sample clearly shows seasonal peaks in labor use with strong dips in April and October, whereas in the 1996 sample the amount of hired labor is almost constant around the year. It should be mentioned that in the case of the 1996 survey only of 7 farms data are available on the division of hired labor over the different months.

Another 21 farms did not hire any labor at all, whereas the remaining farms could only give an estimation of the total amount of labor hired in the past year. For the 1987 sample for 51 farms data are available on the division of hired labor over the months of the year and a maximum of 13 farms hires labor. In the 1996 sample a total of 26 farms hires an amount of 2948 *jornales* through the year against 1626 *jornales* in the 1987 survey.

The lack of data on the spread of hired labor over the year might be caused by a change in the type of activities for which temporal labor is hired. According to Table 3.11 there has been a shift from maize to palm heart in accordance with the shift in cropping patterns in the Neguev. The percentage of labor spend on other crops is about the same in both samples, about 15 percent. Next to the increase in palm heart area more land has been brought under pasture in the past decade; a change expressed in Table 3.11 by the increased use of hired labor for pasture and livestock. Palm heart as well as livestock activities are characterized by a stable labor demand as a result of continuous production instead of

distinct sowing-growing-harvesting cycles. This may account for the lack of data on the month in which labor is hired in the 1996 survey, it is more difficult to remember amounts of incidentally hired labor than labor hired in relation to annual crop cycles.

Diagram 3.2: Amount of *jornales* hired per month for both surveys



The last aspect of hired labor included in the survey is the wage rate. The average wage rate indicated in the 1987 survey was ₡41¹⁰ per hour, corresponding to ₡164 per hour in 1996 prices¹¹. In the 1996 survey the average wage rate was ₡212 per hour, a decrease with ₡48 per hour in real terms.

3.4.2 Relationship between hired labor, farm size and off-farm activities

Table 3.12 presents correlation coefficients between the presence of an administrator on the farm, the number of permanent laborers and the amount of hired temporal *jornales* on one side and the size of the farm and off-farm activities of the owner on the other side. Only in the case of permanent laborers (other than administrators) significant correlation can be estimated. A positive relationship exists with farm size as well as off-farm activities.

¹⁰

Colones (₡) is the monetary unit used in Costa Rica, 200 colones is about equivalent to 1 US \$ (march 1996).

¹¹

The wage in terms of 1996 prices is calculated by extrapolating an agricultural deflator for the 1987-1992 period (World Bank, 1994:221)

Table 3.11: Activities of temporal laborers

Activities	1987 survey	1996 survey
	(%)	(%)
Maize	16	-
Palm heart	-	19
Other crops	16	15
Agricultural activities	8	-
Pasture, livestock activities	16	50
Various activities on the farm	36	15
Other activities	8	-
Total	100	100

Note: 1987 n=52, 1996 n=47, due to rounding errors individual numbers might not correspond to the totals

Table 3.12: Correlation between hired labor, farm size and off-farm activities

	Farm size	Off-farm activities
Administrator	0.16 (0.28)	-0.11 (0.46)
Permanent labor	0.81 (0.00)	0.52 (0.00)
Temporal labor	0.26 (0.08)	0.04 (0.78)

Note: n=47, the numbers in parentheses are two-tailed significance levels

The absence of significant correlations for the presence of an administrator can be attributed to the fact that small farms are also used as investment opportunities by absentee landowners, permanent laborers on the other hand are only hired on the large farms, leading to significant results for the latter. The hiring of temporal laborers has a weak relation to farm size but none to off-farm activities of the owner. The fact that smaller farms apparently also hire temporal laborers can therefore not be attributed to off-farm obligations of the owner. As a result of the change in cropping patterns to palm heart and livestock, both activities with stable labor demands, neither seasonality in labor demand requiring hired labor even on small farms offers a plausible explanation.

Chapter IV

SOIL QUALITY AND LAND DEGRADATION

4.1 Introduction

First a soil classification mainly based on color which is used by the framers will be discussed, followed by a classification of soils in the survey samples based on fertility, drainage, slopes and presence of stones. The second part of this chapter consists of the description of land degradation by the respondents, its causes and effects according to them. Finally it is attempted to get an insight into possible degradation during the past decade by comparing indirect indicators from both surveys.

4.2 Soil quality

4.2.1 Available soils

The survey contains data on soil types distinguished by the farmers as well as a predetermined classification based on principal characteristics limiting production. Of the 47 farmers 19 distinguished only one type of soil at their farm, 23 farmers distinguished two different soils, 4 differentiated between three types of soils, whereas one farmer even distinguished four different soils on his farm. The soils are described in terms of color (colored, dark), material (sandy, clayey), location (high, low, close to a river), drainage (dry, swampy), and quality (fertile, acid, cultivable). Two main groups are distinguished by the farmers: *tierra negra* and *tierra colorada*. *Tierra negra* refers to a dark-colored soil found in low, flat places with no limitations for production, except for (temporary) inundations if located close to a river or in a depression such that water accumulates during rainy periods. *Tierra colorada* refers to an acid, reddish soil found in relatively high places and on slopes, low in fertility and only suitable for crops like pineapple, cassava and some perennial crops. (Oñoro, 1990:39) Other often mentioned types of soils are swamps (often *tierra negra*) and soils which are occasionally inundated. Limitations of the soils are described in terms of lack of fertility, inundations and suitability for growing maize, beans and rice, the main staple crops in Costa Rica.

The predetermined soil-classification is based on fertility, drainage, slopes and presence of stones in the fields. Table 4.1 presents the number of farms on which each of these classes occur as well as the average percentage of farm area occupied by each class. It should be noted that at times farmers classify a soil as being without any problems considering their objective of having pastures, cassava and/or palm heart, all of which are not demanding as far as fertility is concerned. This first class therefore also includes some soils which are not suitable for most annual crops, like for example maize.

Most of the farms indicate the presence of swamps, which in most cases refers to small depression in between hills where water accumulates and which sometimes can be used as pastures in dryer periods. The swampy and badly drained areas often contain fertile soils and several farmers indicated a desire for

drainage constructions in order to be able to use these soils. Slopes are not seen as an important factor influencing production by the farmers since this characteristic was never mentioned by themselves, even if their farm obviously contained several steep hills.

Table 4.1: Classification of soils based on main limiting factors

Class of soil	Percentage of farms	Area (% of farm area)
Soil without problems	49	56
Soil with low fertility	62	77
Badly drained soil	21	22
Swamps	43	10
Soil with considerable slopes	34	34
Soil with a lot of stones	13	11

Note: n=47

4.2.2 Relationships between soil quality and other farm characteristics

It can be hypothesized that relationships exists between available soil types and other farm characteristics. The area under annual crops can be expected to be positively correlated to the amount of soils without any problems, whereas the area under pasture can be assumed to have a positive correlation to land of low fertility, being one of the few profitable uses which can be made of this land. Next to this the amount of labor spend off-farm can be expected to be negatively related to the amount of soil without problems, assuming more intensive use of these soils, therefore requiring more labor.¹²

Only for the 1987 sample a significant relationship between crops and soil without problems could be estimated (see Table 4.2), but this equation does not explain more than 2 percent of the variability in the area under crops, thus indicating that other factors are more important than the availability of suitable soil. The opposite situation exists for area under pasture, in this case only for the 1996 sample a significant equation could be estimated, but again only a limited amount of the variation is explained (see Table 4.3). As far as the relationship between off-farm work and soil quality are concerned no significant equations could be estimated, indicating that other factors are more important determinants of labor use.

¹²

For all equations a Chow breakpoint test as been performed to determine the stability of the regression coefficients between the 1987 and 1996 sub-samples. In case no significant differences existed only one estimation is made, pooling both samples.

Table 4.2: Relationship between crops and soil without problems

Survey	Dependent variables			Adjusted R ²
	Variable	Coefficient	t-statistic	
1987 (n=265)	Constant	2.84	14.99	0.02
	Soil without problems	0.15	2.61	

Note: all variables are measured in hectares

Table 4.3: Relationship between pastures and soil with low fertility

Survey	Dependent variables			Adjusted R ²
	Variable	Coefficient	t-statistic	
1996 (n=235)	Constant	14.90	12.61	0.10
	Soil with low fertility	0.62	5.28	

Note: all variables are measured in hectares

4.3 Soil degradation

In the 1996 survey a section on to soil degradation has been added. In the literature it has been reported that farmers perceive soil erosion to be more serious if located further away from their own farm. (Midmore et al., in print:23) Therefore the survey not only included questions on soil degradation at the farm, but also on the occurrence of degradation in the Neguev as a whole. Of the farmers 23 indicated the presence of soil degradation in the past years, in 18 cases no degradation occurred, and 6 farmers did not know if degradation had occurred. This latter group consists of farmers which recently obtained the farm, some of them as recent as just a couple of months, and therefore could not make a statement about the last couple of years. For the Neguev as a whole 24 farmers indicated the presence of soil erosion, 14 farmers stated that soil degradation did not occur in the settlement, and 9 farmers did not now if erosion occurred at other places in the Neguev. Of the 18 farmers indicating no soil degradation at their own farms, 4 indicated that erosion did occur in the Neguev. These respondents all owned flat parcels and indicated that erosion occurred at locations with hills. Therefore it does not seem that farmers are biased to only seeing soil degradation away from their own farm. Considering the importance of time-lags with degradation processes a positive correlation between the time farmers have been managing their farms and the indication of the existence of soil degradation could be assumed to exist. However the correlation between amount of years of managing the farm and reporting of degradation is -0.26. This might be accounted to the fact that farmers who have managed to survive for a longer period are the ones having the better parcels on which less or no degradation occurs.

Table 4.4 presents the main categories with which farmers describe soil degradation for their own farm and the Neguev as a whole. Soil degradation is described in terms of fertility, necessity of applying fertilizers, changes in production, plagues and pests and the impossibility of growing annual crops. The latter category relates to growing crops like maize which demand a high amount of nutrients, which at most places is only possible with a considerable amount of inputs. These areas are in generally only suited for profitable production of cassava, pineapple, palm heart and pasture. Several farmers who had been in the Neguev more or less since the initiating occupation mentioned that when they started one could grow any crop without chemical inputs, but after two or three harvests inputs like fertilizer and pesticides became necessary and now in some cases crops like maize are not possible anymore.¹³ This describes the classical text book example of soil degradation of removing of practically all nutrients together with the natural vegetation after which the remaining limited supply of nutrients is exhausted with a couple of harvests.

Table 4.4: Main descriptions of degradation

Description	On-farm degradation (no. of farmers)	Degradation in the Neguev (no. of farmers)
Decreased fertility	11	9
Necessity of fertilizers	7	3
Increased plagues and pests	2	2
Lower production	2	7
Impossibility of growing annual crops	-	2

Note: n=47

Of the farmers indicating the occurrence of degradation on their farms 9 did not know its cause. The factors leading to soil degradation as mentioned by the other farmers are presented in Table 4.5 Farmers mention that certain agro-chemicals (herbicides, fungicides and pesticides) kill the soil and necessitate the use of more chemicals to control pests and diseases. Only very incidentally are tractors used in the Neguev for agricultural purposes. Tractors as a cause of degradation does therefore not refer to actual agricultural use, but the use during the removal of natural vegetation. Deforestation or removal of the natural vegetation as such are also mentioned as factors leading to soil degradation.

The deforestation which has occurred not only in the Neguev but also in the whole of the Atlantic Zone of Costa Rica, might be the cause of a change in climate mentioned by some farmers. According to them

13

A situation most clearly described by one farmer with: *cuando la gente siembra, la tierra no responde más* (if the people sow, the earth does not reply anymore)

the last couple of years there have been unusual distinct dry periods during the summer¹⁴, leading to a decreased production of palm heart and slower recuperation of pastures. Other causes of degradation which have been mentioned by the farmers are leaching of nutrients and topography. The first was referred to as "washing" of the soil during the first stages of palm heart cultivation when there is insufficient ground cover, the latter refers to occurrence of soil degradation on slopes.

Table 4.5: Principal causes of degradation

Cause	On-farm degradation <i>(no. of farmers)</i>	Degradation in the Neguev <i>(no. of farmers)</i>
Use of agro-chemicals	4	4
Use of tractors	1	-
Deforestation	3	5
Leaching of nutrients	1	1
Topography	-	2

Note: n=47

The effects of soil degradation are summarized in Table 4.6. Most often farmers mention a decrease in production as an effect of soil erosion. The second most mentioned effect is an increased necessity of fertilizer followed by an impossibility of growing annual crops like maize. Increased necessity of fertilizer was often related to the absence of the need for inputs during the initial phases of the settlement, as discussed before.

Table 4.6 Primary effects of degradation

Effects	On-farm degradation <i>(no. of farmers)</i>	Degradation in the Neguev <i>(no. of farmers)</i>
Decrease in production	12	12
Necessity of fertilizer	8	8
Impossibility of growing annual crops	2	4

Note: n=47

14

In Costa Rica "summer" refers to the period December to April, which for the country as a whole is the dry period.

Table 4.7: Comparison of the description of problems on the same parcels

Problems	1987 survey	1996 survey
	(%)	(%)
No problems	42	32
Low fertility	25	8
Unsuitable for growing annual crops	10	37
Inundations	9	14
Other	13	10
Total	100	100

Note: 1987 n=53, 1996 n=47, due to rounding errors individual numbers might not correspond to the totals

Finally, land degradation can also be indirectly assessed through comparing the way in which limitations of the same parcels are described in both surveys (see Table 4.7) The largest change apparent from the table is the increase in soils defined in terms of the suitability for maize, rice and beans, mainly at the expense of soils classified more generally as infertile. This shift between the two infertility classes can probably be attributed to the abolishment of a guaranteed price for maize, making its production with the necessary high amount of inputs unprofitable. Slightly less soils are defined as having no problems and a minor increase exists in soils with water-problems. The decrease in soils with no problems might point at the occurrence of land degradation in the past decade.

Chapter V

CAPITAL AND LAND USE

5.1 Introduction

This chapter focuses on the use of capital and land. First the use and possession of machinery and equipment are analyzed and compared for both surveys. Subsequently the amounts spend on various categories of inputs are summarized. The second part of the chapter deals with the general use of the land as well as the shift in cropping patterns during the past decade. The final section tests several hypotheses of relationships between farm size and land use.

Table 5.1: Use and possession of machinery and equipment in both surveys

	Use (%) ¹		No. of units in possession (%) ¹							
			<i>1 unit</i>		<i>2 units</i>		<i>3 units</i>		<i>4 units</i>	
	1987	1996	1987	1996	1987	1996	1987	1996	1987	1996
Knapsack sprayers	93	94	51	62	26	21	8	9	-	2
Chain saws	43	38	26	36	-	-	-	-	-	-
Vehicles	32	43	30	36	2	6	-	-	-	-
Tractors	26	4	-	4	-	-	-	-	-	-
Plows	11	2	-	6	-	2	2	-	-	-
Rakes	25	2	4	-	-	-	-	-	-	-
Electric motors	6	36	6	36	-	-	-	-	-	-
Combustible motors	13	6	13	6	-	-	-	-	-	-

Note: for the 1987 survey n=53, for the 1996 survey n=47

Note 1: the numbers refer to the percentage of farms using or owning the equipment

5.2 Capital

5.2.1 Machinery and equipment

In Table 5.1 a distinction is made between use and possession of fixed capital. In both surveys knapsack sprayer are the most often used form of equipment, with use as well as ownership being about the same

in both surveys. The second most used form of equipment is the chain saw, owned by a larger percentage of farmers in the last survey. This is surprising because it could be assumed that as a result of the extensive deforestation the use of chain saws has decreased. However, these figures only refer to the use or not of a specific type of equipment. It could be that the amount of use has decreased compared to the 1987 survey, limiting it now to incidental cutting of trees, for example for posts, instead of extended use to clear new land.

The category of vehicles is not restricted to agricultural vehicles since "normal" vehicles can also be used as well for transport of both inputs and produce. The availability of vehicles can thus play an important role in production, considering that all outlets for inputs are located several kilometers outside of the settlement boundaries and output markets are even further away. In Table 5.1 it can be observed that both the use and possession of vehicles has increased in the 1996 survey, indicating easier access to inputs as well as better marketing opportunities.

The decline in use of tractors can be attributed to the loss of the colonizing character of the settlement since they are mainly used for conversion of forest into pastures and cropland. Another factor is the decrease in annual crops in the settlement and subsequent increase in pastures. As a consequence of the decrease in use of tractors, use and ownership of rakes and plows also has declined. It should be noted that the strong increase of use and ownership of electric motors is caused by a widespread presence of electric water pumps for domestic use, as a result of the availability of electricity.

5.2.2 Input use

In both surveys data are collected on the amount spend on several categories of inputs in the past year. In most cases the farmers were unable to give a monetary estimation, but if asked about the use of specific products could estimate the quantity used. These quantities are converted into monetary values through multiplication with an average product price¹⁵. Tables 5.2 and 5.3 present the input use of the 1996 and 1987 survey, respectively¹⁶.

For almost all categories the average total expenses per farm are lower for the 1987 survey, which can ascribed to the smaller average farm size compared to the 1996 survey. For all categories except machinery and herbicides, expenses have risen during the past decade. Surprisingly, the amount spend on fungicides and herbicides per farm is higher in 1996. Since neither one is used for the major crop in the latter survey, palm heart, this means that either their prices have risen dramatically or that more is applied per hectare of crops, or both. The change in focus to livestock has apparently led to a considerable increase in expenditure per animal, from ₺1280 to ₺4054. At the same time indicates the median that the majority of the farms spends substantially less than the average per animal.

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Three outlets used by the farmers were visited and their prices as of February 1996 were averaged to obtain the product price. This approach does not take fluctuations during the previous year into account which may lead to an overestimation of the costs since several farmers mentioned considerable increases of input prices.

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The 1987 expenses are transformed into 1996 prices by extrapolation of an agricultural deflator for the 1987-1992 period (World Bank, 1994:221)

Table 5.2: Input use in the 1987 survey (in 1996 prices)

	No. of farmers using the input			Mean	Mean	Median	Units
	<i>N.d.</i> ¹	<i>No</i>	<i>Yes</i>	(<i>¢/farm</i>)	(<i>¢/unit</i>)	(<i>¢/unit</i>)	
Machinery	9	22	22	37980	3236	2480	/total farm area
Herbicides	9	5	39	35520	3720	2252	/area pasture and crops
Fungicides	8	30	15	7384	2372	1336	/area crops
Insecticides	6	22	25	9836	3136	1008	/area crops
Fertilizer	5	15	33	48264	12452	8856	/area crops
Livestock ²	4	14	35	13304	1280	732	/animal
Other inputs	2	41	10	4164	396	232	/total farm area

Note 1: No data: farmer could not give an estimation of neither monetary expenses nor quantities used

Note 2: The inputs for livestock refer to medicines, honey and salt

Table 5.3: Input use in the 1996 survey

	No. of farmers using the input			Mean	Mean	Median	Units
	<i>N.d.</i> ¹	<i>No</i>	<i>Yes</i>	(<i>¢/farm</i>)	(<i>¢/unit</i>)	(<i>¢/unit</i>)	
Machinery	1	43	3	51667	2281	2121	/total farm area
Herbicides	3	10	34	39692	2502	1438	/area pasture and crops
Fungicides	2	37	8	22457	9013	5000	/area crops
Insecticides	2	39	6	18017	4099	3750	/area crops
Fertilizer	3	20	24	59749	17439	10200	/area crops
Livestock ²	5	8	34	194535	4054	1600	/animal
Other inputs	1	39	7	43007	11550	6744	/total farm area

Note 1: No data: farmer could not give an estimation of neither monetary expenses nor quantities used

Note 2: The inputs for livestock refer to medicines and food supplements like for example salt

5.3 Land use

5.3.1 General categories of land use

In Table 5.4 statistics of eight different land uses are presented for the 1996 survey. By far the most important land use in terms of area is pasture, occupying 80 percent of total farm area. Annual crops

comprise on average only a small part of the parcels, less than 2 hectares, which corresponds to 3.9 percent of the total area. The same goes for perennial crops, occupying on average a little more than 2 hectares, corresponding to 5.4 percent of the area. The fourth main use of the land is forest, constituting on average 3 hectares per farm.

Table 5.4: Land use in the 1996 survey

Use	Mean ¹ (ha)	Median (ha)	Minimum (ha)	Maximum (ha)	No. of farms	Total area (ha)
Annual crops	1.86	1.00	0.13	8.00	20	37
Perennial crops	2.13	2.00	0.25	6.00	24	51
Pastures	18.12	11.39	1.00	109.00	42	761
Fallow	2.13	2.25	0.25	4.50	6	13
Forest plantations	0.55	0.55	0.10	1.00	2	1
Forest and woodlands	3.23	1.50	0.50	10.50	14	45
Wastelands	4.50	3.50	1.50	9.72	6	27
Other uses ²	2.26	2.00	0.04	5.75	7	16
Total farm area	20.22	15.00	3.00	119.00	47	950

Note 1: Means are calculated with exclusion of the farms on which the land use is not present

Note 2: Other uses refers for example to land used for a house or other constructions

Table 5.5 shows large shifts in land use between both surveys. The area under annual crops has reduced from 23.6 percent to 3.9 percent, whereas the area under pastures has almost doubled from 41.2 percent to 80.1 percent. This shift towards livestock can probably be attributed to the abolishment of a guaranteed price for maize, the most important annual crop in 1987, and a lack of profitable alternatives. Surprising is the decrease in area with perennial crops. The development of palm heart observed in the field suggests an increase in area with perennial crops, but apparently a decrease in other perennial crops outweighed the growth of palm heart. The trend towards deforestation indicated in the 1987 survey has continued in the last decade; area under forests decreases from 15.2 percent to only 4.7 percent of total survey area in 1996.

5.3.2 The principal crops in both surveys

There have been significant shifts not only between the various types of land use, but also within the categories of annual and perennial crops. Table 5.6 shows for both surveys how many farmers ranked each of the crops as first, second and third most important. The table clearly shows the decreased importance of annual as well as perennial crops mentioned before; whereas in 1987 only 3.7 percent of the farmer did not have any crops, in 1996 this percentage has risen to 42.6. Next to this overall

decrease in area also less diversity in crops exists nowadays; in 1987 21 different crops were mentioned among the three most important crops opposed to 13 crops in 1996.

Table 5.5: Comparison of land use in both surveys

Use	1987 survey	1996 survey
	(%)	(%)
Annual crops	23.6	3.9
Perennial crops	8.6	5.4
Pastures	41.2	80.1
Fallow	1.3	1.3
Forest plantations	0.6	0.1
Forest and woodlands	15.2	4.7
Wastelands	5.8	2.8
Other uses ¹	2.7	1.7
Total farm area ²	100	100

Note 1: Other uses includes vegetable gardens and orchards for the 1987 survey (0.07% of farm area)

Note 2: 1987 n=53, 1996 n=47, due to rounding errors the totals might not correspond to the sum of individual numbers

In 1987 maize most often appeared as number one (22 times) and a total 26 farmers mentioned this crop among the three most important crops. The decrease in importance of maize can be attributed to the abolishment of its guaranteed price. In contradiction to the analysis of the 1987 data its primary role has not been taken by roots and tubers, but by palm heart. (Oñoro, 1990:44). In 1996 palm heart was indicated by 13 farmers as their most important crop, with a total of 14 farmers mentioning it. Winged yam and eddoe for example have both decreased in importance and none of the other alternative roots and tubers of the 1987 analysis were mentioned in the 1996 survey. The failure of roots and tubers to take the leading role of maize may be contributed to commercialization problems often mentioned by the farmers.

The importance of cassava has strongly decreased compared to 1987. However, cassava production in Costa Rica has strong cyclic character with sharp fluctuations in price and production. (Jansen et al., 1996:22) On the basis of the two surveys it is therefore not possible to determine if the cassava-area is declining or if there have been fluctuations in the production during the past decade. Cassava with its low prices and lack of outlets is mentioned by almost all farmers as a typical example of the production problems in the Neguev, leading in many cases to a waste of the crop in 1996 since harvesting is not worth the effort.

A new group of crops which appeared in the 1996 survey are ornamentals, encompassing flowers and houseplants which are produced for export to the United States and Europe. This development is facilitated by two large plantations close to the Neguev, Costa del Flores and Matas de Costa Rica.

Table 5.6: The importance of crops in both surveys

Crop	Importance of crops in 1987 (no. of farmers)				Importance of crops in 1996 (no. of farmers)			
	No. 1	No.2	No.3	Total	No. 1	No.2	No.3	Total
Palm heart	2	-	-	2	13	1	-	14
Maize	22	2	2	26	3	1	1	5
Rice	4	3	2	9	-	-	-	-
Beans	2	8	6	16	-	-	-	-
Cassava	2	11	9	22	3	5	-	8
Maize/cassava	-	-	1	1	-	-	-	-
Winged yam	-	1	-	1	-	-	-	-
Eddoe	2	1	1	4	-	1	-	1
Gourd	1	-	-	1	1	-	-	1
Plantain	5	4	2	11	3	1	1	5
Banana	1	-	3	4	-	-	-	-
Banana/plantain	-	1	-	1	-	1	-	1
Sweet pepper	5	2	-	7	2	2	-	4
Red pepper	-	-	-	-	-	-	1	1
Cucumber	-	-	-	-	-	1	-	1
Pineapple	-	5	1	6	-	-	1	1
Soursop	1	-	-	1	-	-	-	-
Papaya	-	-	1	1	-	-	-	-
Fruits	1	-	1	2	-	-	-	-
Curcuma	-	-	-	-	-	-	1	1
Sugar cane	-	2	-	2	-	-	-	-
Coconut	1	-	-	1	-	-	-	-
Coffee	-	1	1	2	-	-	-	-
Cacao	2	4	3	9	-	-	-	-
Ornamentals	-	-	-	-	2	-	-	2
No crops	2	8	20	30	20	34	42	96
Total	53	53	53	159	47	47	47	141

Here farmers gain experience as laborers as well as getting into contact with possible export opportunities. The development in the settlement of ornamentals is however limited by the necessity of a fertile soil as well as high investment costs and a high level of risk due to the quality requirements of production for export.

In general it can be stated that land use in the Neguev has shifted from a large diversity of crops in 1987 with as dominant crops maize and cassava, to the production of a limited number of crops in 1996 with palm heart as the leading crop.

5.3.3 *The reasons for not having annual or perennial crops*

As stated before there has been a sharp increase in farmers who do not have any crops. In Table 5.7 reasons for not having annual crops are summarized. Most often a lack of suitable soil for growing annual crop is mentioned by the farmers. As an illustration of low or unstable prices almost all farmers cited the case of cassava. A lot of farmers started growing this crop since it requires almost no inputs and it used to have a high price, but during the period of the survey a lot of cassava was not even harvested due to lack of buyers offering a reasonable price. Several farmers expressed in this context a fear for a similar development with the price of palm heart, a crop which is rapidly expanding in the Neguev. More generally farmers lamented the lack of agricultural planning in the settlement leading to sharp fluctuations in prices and production.

Table 5.7: Reasons for not having annual crops in the 1996 survey

Reason	Percentage of answers
Soil is not suitable for annual crops	37
Low or unstable prices	22
Preference for other activities	15
Rentability is too low	11
Problems with commercialization	7
Risk	4
Lack of time	4
Total	100

The category of farmers with a preference for other activities mainly consists of farms with an administrator and an absentee owner who has a preference for livestock since it requires much less supervision than crops. The reference to low rentability includes the factors of high input prices, large amounts of labor and low output prices, all of which make a crop unattractive from an economic point of view. Problems of commercialization refer to a lack of buyers visiting and/or offering a reasonable price,

as well as a lack of own means of transportation to markets in for example San José. The category risk relates to production-risks as well as price-risks. Finally, the lack of time relates not only to the total amount of time necessary for a crop but also to the fact that labor is necessary at certain specific points in time, like for harvesting, an inflexibility which makes crops less attractive than livestock.

A comparable table for perennial crops indicates that the most important reason for not having perennial crops is a preference for other activities (see Table 5.8). This might be related to the long term commitment which characterizes perennial crops making it less flexible than other activities. The second reason is a lack of financial means. This might be connected to the fact that with perennial crops a longer period than with annual crops exists in between investment and start of the production in which no income can be obtained from the crop. Next to this, costs of obtaining seeds or seedlings are in general much higher than for annual crops; a lot of farmers for example mentioned the costs of palm heart seedlings as an important barrier to start its production. The other reasons are the same as with annual crops, although different in terms of importance.

Table 5.8: Reasons for not having perennial crops

Reason	Percentage of answers
Preference for other activities	24
Lack of financial means	18
Problems with commercialization	18
Soil is unsuitable for perennial crops	18
Lack of time	12
Low or unstable prices	6
Rentability is too low	6
Total ¹	100

Note 1: due to rounding errors the sum of individual numbers does not correspond to the total

5.3.4 Relationships between farm size and land use

It can be hypothesized that relationships exist between farm size and land use. First of all, it is well known from the literature that larger farms tend to use their land in a more labor extensive way than smaller farms (see for example Ellis, 1989:1990). Since pastures require less labor per hectare than crops, area under pasture can be expected to be positively related to farm size. Another reason for expecting this positive relationship is that in order to be profitable a relatively large area of pasture and therefore a relatively large farm is needed. For crops (annual as well as perennial) an inverse relationship with farm size can be expected, due to the mentioned inverse relationship between labor intensity and size in combination with their higher labor demands per hectare.

For the percentage of farm area under pasture the Chow breakpoint test indicated significant differences between both samples and thus separate equations have been estimated (see Table 5.9). Although the regressions are significant at a 5 and 10 percent level for the 1987 and 1996 survey, respectively, only a very limited amount of the variation in area under pasture is explained by either equation. In the 1987 survey small farms had relative large shares of pasture whereas an opposite relationship exists in the 1996 sample.

Table 5.9: Regression equations for the percentage of farm area under pasture

Survey	Variable	Dependent variables			Adjusted R ²
		n=	Coefficient	Significance	
1987	Farm size	53	-0.03	0.04	0.06
1996	Farm size	47	0.01	0.01	0.11

In the case of percentage of farm area under crops an identical weak relationship exists for both samples and therefore the data are pooled (see Table 5.10). The regression is significant at the 5 percent level but its explanatory power is very low. It can be concluded that the other factors than farm size are more important determinants of land use, although a slightly stronger positive relationship between large farms and relative amount of pasture has come into being in the 1996 survey.

Table 5.10: Regression equations for the percentage of farm area under crops

Survey	Variable	Dependent variables			Adjusted R ²
		n=	Coefficient	Significance	
Samples are pooled	Farm size	100	-0.01	0.00	0.08

Chapter VI

CROPPING, LIVESTOCK AND AGROFORESTRY SYSTEMS

6.1 Introduction

The details of three production systems are studied in detail in this chapter. First the characteristics of the four most important crops are discussed: palm heart, cassava, maize and plantain. The second part contains a description of the livestock activities; herd composition, problems and alternatives of livestock production as well as herd size and stocking rate are addressed. Finally, section 6.4 reviews the components of the agroforestry systems in the settlement: "natural" trees, forest plantations, and living fences.

6.2 Cropping systems

The four main crops of the 1996 survey are discussed in detail in this section. Area, production and input data are given as well as information on the goal of production, source of the seeds, reasons for growing the crop, main problems and alternatives crops. First palm heart is described being the most important crop, followed by cassava, maize and finally the production of plantain is reviewed.

6.2.1 Palm heart

Palm heart is produced in the Neguev by harvesting of the meristem of small palms. Production starts 9 to 12 months after planting, new shoots can be harvested every four months and production goes on indefinitely. Its relatively high price makes it an attractive crop for small farmers, although recent increases in production led to a drop in prices. The relatively high initial investment costs are an obstacle for small farmers, especially after the abolishment of special credit schemes. Considering the growing national and international demand for palm heart (Jansen et al., 1996:23) the palm heart area in the Neguev can be expected to increase further in the future.

Table 6.1: Characteristics of palm heart production

	n	Mean	Standard error	Min.	Max.	Median
Area (ha)	14	2.3	0.45	0.5	6.0	2.0
Inputs (€/ ha)	12	40140.7	10650.73	7208.6	19470.0	25851.8
Production (no. of meristems/ha)	12	5516.3	787.98	1000.0	9600.0	5300.0

Note: inputs and production are totals for one year

A total of 14 produces of palm heart are found in the 1996 sample, but only for 12 data are available on input use and production. An area of 5 to 6 hectares is about sufficient to maintain one family, but as can be seen in Table 6.1 on average the palm heart area is about half of this with 2.538 hectares, while the median indicates that half of the farmers has less than 2 hectares. The increased importance of palm heart is obvious from its increased area from 4 ha in 1987 to 33 ha, i.e. 3.5 percent of the farm area, in 1996. On average the farmers spend ₺40141 per year on herbicides and pesticides. Due to the absence of diseases in palm heart no insecticides or fungicides are necessary, while labor costs are not included due to lack of data. With a price of ₺48 per meristem, average revenue per hectare is about ₺516,227, excluding labor costs.

Palm heart production is directed at sale, 8 of the 14 producers also use a couple of meristems per month for home consumption. The palm heart is in most cases obtained from neighbors, friends etc. (58 percent), other sources mentioned are nurseries and IDA. The reason most often mentioned for growing palm heart is its rentability. Another important factor is the availability of a market for the crop, followed by an absence of plagues and pests. The latter is related to a fourth reason of low costs, since no pesticides and fungicides are needed which reduces production costs compared to other crops.

The main problem of the palm heart cultivation is the *taltuza*, mentioned by 10 out of the 14 farmers, a rodent which feeds on the roots of the palm heart. Two other farmers did not have any problems at all, whereas the other 2 producers mentioned occasional inundations and a sudden decrease in production, respectively. Of the 14 producers, 7 did not have an alternative for palm heart production. The other producers mentioned pineapple, livestock, cassava and maize as possible alternatives.

6.2.2 Cassava

Cassava is a crop suitable for poor soils and requiring little labor, which is mainly produced for export to the United States and Europe. Cassava production is characterized by sharp fluctuations in price and production caused by a *monkey see, monkey do* mentality which leads to a sharp increase in production if prices are high. The excessive supply leads to a decrease in prices at harvest time and causes a decline production in the next season. (Jansen et al, 1996:22) During the survey it was often mentioned that several farmers did not harvest their production as a result of too low prices, indicating a period of excessive supply.

Table 6.2: Characteristics of cassava production

	n	Mean	Standard error	Minimum	Maximum	Median
Area (ha)	8	1.71	0.55	0.25	5.00	1.25
Inputs (₺/ha)	7	44533.01	33714.73	0.00	244000.00	7762.50
Production (kg./ha)	4	8550.01	2930.44	2000.00	16100.00	8050.00

Note: inputs and production are totals for one year

A total of 8 farmers produces cassava for sale. Several other farmers had tiny plots solely for home consumption about which no data were collected. Only of 6 farmers data on the goal of production are available; 5 of them produce for sale whereas one only produces for home consumption. The latter might be caused by the earlier mentioned decline in prices at the time of the survey which makes it unprofitable to produce for the market. The majority of the farmers (67 percent) obtained the cassava from friends, neighbors etc. For 2 farmers easiness of production (low input and labor requirements) is the reason for growing cassava, one produced because there was a market for cassava and one because the production is fast compared to perennial crops. The two remaining farmers mentioned using the soil for something and instructions of the owner. Only 4 farmers mentioned a problem with cassava production, namely the market, referring to a lack of buyers offering reasonable prices. Of the others, 2 farmers did not have any problems and for 2 farmers no data are available. Finally, only 1 farmer had an alternative for cassava, gourd.

6.2.3 Maize

Maize offered a secure source of income for many years due to a guaranteed price policy. In the context of a Structural Adjustment Program the maize market has been liberalized and the guaranteed price abandoned. (Jansen et al., 1996:19) As a result of this the maize area in the Neguev has strongly decreased in the period between the two surveys: from 102 ha in 1987 to only 6 ha in the 1996 survey. In the latter survey the production for the market was limited to fresh cobs in contrast to the focus on dry mature maize in the 1987 survey.

Table 6.3: Characteristics of maize production

	n	Mean	Standard error	Minimum	Maximum	Median
Area (ha)	5	1.26	0.71	0.05	4.00	1.00
Inputs (€/ha)	3	73957.00	29869.24	20000.00	123139.00	78732.00
Production (cobs/ha)	4	39050.00	27361.21	1000.00	120000.00	17600.00

Note: inputs and production are totals for one year

As can be seen in Table 6.3 farmers on average have 1.26 ha of maize with half of the farms having one hectare or less. Compared to palm heart and cassava a lot more is spend on inputs per hectare, which probably can be attributed to higher fertilizer needs in comparison to the two first crops. As with the other two crops a large variability in input use as well as production exists.

Of the 5 farmers 2 produce solely for home consumption whereas 3 produce for the market. Most farmers obtain their seed from an agricultural supply shop, with only 1 farmer obtaining the seeds from neighbors or friends. As a reason for growing maize both the rapidity of the crop compared to perennial crops and the existence of a market for fresh cobs are mentioned 3 times.

The most often mentioned problems are the market or prices and necessity of fertilizer. In the case of the market or prices reference was always made to the guaranteed price for dry mature maize in earlier

times, whereas now there only exists an insecure market for fresh cobs. The necessity of fertilizer is seen as a problem as a result of constant price increases of all inputs, which combined with the lower and insecure prices makes the production of maize unattractive for most farmers, except for the ones with fertile soils. Of the 5 farmers 2 did not have an alternative for maize whereas the others named gourd, sweet pepper and papaya as possible substitutes.

6.2.4 Plantain

The last crop which has been analyzed in detail is plantain. Some production characteristics are given in Table 6.4. Relatively little is spent on inputs, only about €14,000 per hectare compared to around €40,000 for both palm heart and cassava and €73,000 for maize. Again most of the farmers have a fraction of the average amount of hectares, in this case 4 farms have 1.50 ha or less with just one farm have 4 ha of plantain. This might be attributed to the fact that 2 farms produce solely for home consumption and one produces for home consumption as well as the market.

Table 6.4: Characteristics of plantain production

	n	Mean	Standard error	Minimum	Maximum	Median
Area (ha)	5	1.5	0.65	0.50	4.00	0.7
Inputs (€/ ha)	5	14231.7	5975.03	800.00	30000.00	13333.3
Production (no. of bunches/ha)	3	1808.8	1162.48	40.00	4000.00	1386.6

Note: inputs and production are totals for one year

The plantain was obtained from neighbors and friends in 3 cases, 1 from own shoots and in one case the plantain was already present on the farm at the time of arrival. Reasons for growing plantain are quite diverse, varying from little labor requirements to instructions of the land owner, use of the product for home consumption, permanent source of income and an alternative land use with a good price. As problems, plagues and pests are mentioned (33 percent), diseases (33 percent) and a third has no problems at all. As alternatives from off farm work, cassava, gourd and pineapple are reported.

6.3 Livestock systems

6.3.1 Herd composition according to production purpose

Livestock systems can be divided into three groups on the basis of type of end product: dairy farming, dual purpose systems (a combination of milk and meat production) and meat production. The latter group can be further subdivided into three subsequent stages: breeding, early growth and fattening. Farmers specialize in one of these stages or have integrated production systems of 2 or all stages. (Jansen et al., 1996:27). In practice the distinction between the various systems is not always clear. For example, several farmers are specialized in production of calves, but also use some milk for home

consumption. Some of them classify this as dual purpose, whereas others denominate this as breeding. Table 6.5 presents the average herd size of each category, total number of animals as well as the percentages of each category, according to the classification given by the farmers.

Breeding is the most common livestock production system with 21 out of 37 farmers practicing it. Breeding refers to a production system directed at the sale of calves at an age of about 7 to 8 months, therefore in this category the largest percentage of calves can be found (31.3 percent). The larger number of female calves (22.0 percent) can be attributed to the fact that a number of these are kept to increase the number of reproductive cows and/or replace older cows. A focus on production cows is clearly visible if the percentages in the highest two age categories are compared; 57.7 percent cows against 10.3 percent bulls. Four of the farmers who classify their herd as breeding also used milk for home consumption.

Early growth and fattening both aim at an increase in weight but the focus is on different age categories. Early growth refers to the fattening of heifers and steers until they weigh 350 kg, whereas fattening refers to buying cows and bulls at a weight of 350 kg and selling them at a weight of about 425 kg. (C. Aragón: personal communication) It can therefore be expected that the early growth herds have high percentage of animals in the 1-2 year category and the fattening herds a high number of older animals. This is reflected in Table 6.5 with percentages of 81 and 56.4 respectively.

Table 6.5: Average herd size, totals and per age category in years (percentages)

Purpose	n	Total (no.)	Cows			Bulls			Oxen
			< 1	1 - 2	> 2	< 1	1 - 2	> 2	
Breeding	21	47.3	22.0	18.8	38.9	9.3	4.0	6.3	0.4
Early growth	4	24.8	4.0	43.5	15.3	-	37.5	-	-
Fattening	4	83.5	7.5	10.5	36.0	5.7	19.5	20.4	0.4
Dual purpose	6	18.0	19.4	26.1	42.8	9.4	1.1	1.7	-
Milk	2	2.5	-	-	80.0	20.0	-	-	-
Average	37	41.6	17.5	19.0	37.3	7.9	9.4	8.7	0.2

The dual purpose herds are in composition more or less similar to the breeding herds, only with less bulls in the older age categories. Of these farmers 4 explicitly indicated that they use the milk only for home consumption, implying that their management seems identical to farmers with breeding herds who use milk for home consumption. Finally the two farmers who have cows for milk production only have 2 cows each which supply milk for the household and not for sale, i.e. a subsistence oriented production system. The low number of oxen (0.2 on average) reflects the fact that animal traction does not play an significant role in the agricultural systems of the Neguev.

6.3.2 Reasons for (not) having livestock, problems and alternatives

Table 6.6 summarizes the motivation of farmers to be involved with a certain livestock production system. Rentability as well as easiness of management are important reasons for being involved in the meat production systems. A preference for breeding is as well as the existence of a market are also mentioned with this system. The dual purpose system is practiced for household consumption of milk and sale of meat, as well as a way of reducing the risk by diversifying the production.

Of the total sample of 47 farmers 10 did not have any livestock. Reasons for not having livestock are summarized in Table 6.7 for each of the production categories. For all categories lack of money is the most often mentioned reason for not having any livestock. Lack of terrain is mentioned as a barrier for meat production since a significant area of pasture is required to reach a reasonable production, as a result of the low nutritive value of unimproved pastures. Low prices of meat are also mentioned as a reason for not getting engaged in meat production.

Table 6.6: Reasons for being involved in with a specific production system

Reason	Breeding (%)	Early growth & Fattening (%)	Dual purpose (%)	Milk (%)
Market	10.0	-	27.3	-
Rentability	26.7	20.0	-	-
Preference	16.7	-	-	-
Experience	3.3	-	-	-
Management	13.3	50.0	-	-
Risk	-	-	18.2	-
Consumption	-	-	27.3	50.0
Other reasons	16.7	30.0	27.3	50.0
Total	100.0	100.0	100.0	100.0

A low rentability is mentioned for milk production which can be attributed to the higher amount of inputs needed for production for the market, like housing and food concentrates. However the most often mentioned reason for not being involved in dairy farming is the absence of commercialization possibilities, which have to be organized really well due to the perishable character of milk. Finally the breed used for milk production is not well adapted to the climatic conditions in the Atlantic Zone, hampering the production of milk in the Zone.

Table 6.7: Reasons for not having livestock

Reason	Meat (%)	Milk (%)	Dual purpose (%)
Lack of money	50.0	22.2	57.1
Lack of terrain	12.5	-	-
Rentability	-	11.1	-
Market, low prices	12.5	33.3	-
Climate	-	11.1	-
Other preferences	12.5	11.1	14.3
Other reasons	12.5	11.1	28.6
	100.0	100.0	100.0

Of the farmers involved in meat production 23 did not have any problems, 1 mentioned a lack of terrain, parasites, and 3 farmers mentioned low prices as problems. Finally, 6 of the farmers involved in breeding mentioned crops as an alternative, 3 dairy farming and 1 an early growth system. Of the farmers involved in early growth and fattening 2 also mentioned crops as an alternative, whereas breeding and dual purpose systems were both mentioned once. Of the meat producing farmers 14 did not have an alternative for the system in which they are involved.

6.3.3 Herd size and stocking rate

Table 6.8 presents some numbers on herd size for both surveys. The size of the herds are calculated in terms of number of heads as well as animal units¹⁷, the latter being a more precise measure of the relative size of the herds. On average there are a lot more animals in the 1996 survey, in terms of number of heads as well as animal units. However if the number of heads and animal units per hectare pasture are compared there does not seem to have been a change in the past 9 years. Apparently the growth in herds has been matched by a increase of area under pasture. However, these numbers are averages which obscure the diversity within both samples. Therefore cross-tables have been made for number of animal units and stocking rate (Tables 6.9 through 6.12)

As a result of the larger variability in farm size also a larger variability in animal units per farm exists in the 1996 survey. In the 1987 survey 26 percent of the farms did not have any livestock against 21 percent in the 1996 survey (Table 6.9 and 6.10). Of the 14 farms in the 1987 survey smaller than 10

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To determine the number of animal units in a herd the following formula is applied: $1/3 * \text{no. of animals younger than 1 year} + 2/3 * \text{no. of animals between 1 and 2 years} + \text{no. of animals older than 2 years}$. (Schipper, 1993:13)

hectare, all have 5 or less animal units. The two extremes within the category of 10 to 20 hectare are the 27 percent which do not have livestock and the 4 percent which have between 25 and 50 animal units.

Table 6.8: Herd size in both surveys

Survey	No. of heads			No. of animal units			
	<i>n</i>	Mean / farm	Median / farm	/ ha ¹	Mean / farm	Median / farm	/ ha ¹
1987	39	13.7	12.0	2.1	9.8	8.3	1.5
1996	37	41.6	23.0	2.1	30.6	18.0	1.6

Note 1: Number of heads and animal units per ha pasture on the farm.

A positive relationship between farm size and number of animal units exists in the 1996 survey, which is logical since none of the farms has stables nor uses food supplements. Therefore the area under pasture, which is positively correlated to farm size, determines the number of animals which can be kept. Again it can be seen that there are more animal units in the 1996 sample, with 60 percent of the farms having more than 10 animal units against 30 percent in the 1987 survey.

Table 6.9: Cross-table of total farm area and number of animal units for the 1987 survey (in percentages)

No. of animal units	Size classes			
	<i>n</i> =	< 10 ha	10 - 20 ha	Total
No livestock	14	-	27	26
0 - 5	14	100	25	26
5 - 10	9	-	17	17
10 - 25	14	-	27	26
25 - 50	2	-	4	4
Total	53	100	100	100

Note: due to rounding errors the totals may not correspond to the sum of the numbers

Not only the number of heads or animal units is important but also the stocking rate, i.e. the number of animal units per hectare of pasture. For Costa Rica a range of 1.5 through 2 animal units per hectare is deemed acceptable. (Aragón, 1992:17) The average the stocking rate in the 1987 survey is 1.9, a number which has decreased to 1.6 in the 1996 survey. However, as with the animal units a large variability exists within the samples. Table 6.11 and 6.12 present for the farms with livestock cross-tables between the farm size and stocking rate for the 1987 and 1996 survey, respectively.

Table 6.10: Cross-table of total farm area and number of animal units for the 1996 survey (in percentages)

No. of animal units	Size classes						Total
	n =	< 10 ha	10 - 20 ha	20 - 30 ha	30 - 40 ha	> 40 ha	
No livestock	10	67	23	-	-	-	21
0 - 5	3	33	4	-	-	-	6
5 - 10	6	-	15	29	-	-	13
10 - 25	16	-	46	43	25	-	34
25 - 50	5	-	12	14	25	-	11
> 50	7	-	-	14	50	100	15
Total	47	100	100	100	100	100	100

Note: due to rounding errors individual numbers might not correspond to the totals

Considering the acceptable range of 1.5 to 2 animal units 31 % of the farms in the 1987 survey have too many animal units per hectare which might result in a degradation of the pastures due to overgrazing. All of these farms can be found in the category of 10 to 20 ha. In the 1996 survey 30 % percent of the farms has more than 2 animal units per ha pasture, but this time also farms of less than 10 ha are exceeding the acceptable limit to stocking rate.

Table 6.11: Cross-table of total farm area and stocking rate for the 1987 survey (in percentages)

Stocking rate	Size classes			Total
	n =	< 10 ha	10 - 20 ha	
0.0 - 0.5	5	-	13	13
0.5 - 1.0	9	100	21	23
1.0 - 1.5	11	-	29	28
1.5 - 2.0	2	-	5	5
2.0 - 2.5	7	-	18	18
> 2.5	5	-	13	13
Total	39	100	100	100

Note: due to rounding errors the totals may not correspond to the sum of the numbers

In the category 10 to 20 ha 35 percent of the farms has too many animal units per hectare pasture, an increase of 5 percent compared to 1987. It could be expected that larger farms will have more extensive

systems with less pressure on the pastures, but in both largest two categories of the 1996 sample 25 percent of the farms has between 2 and 2.5 animal units per hectare, whereas in the category of 20 to 30 ha only 14 % of the farms are exceeding the limit.

Table 6.12: Cross-table of total farm area and stocking rate for the 1996 survey (in percentages)

Stocking rate	Size classes						Total
	n =	< 10 ha	10 - 20 ha	20 - 30 ha	30 - 40 ha	> 40 ha	
0.0 - 0.5	3	50	5	14	-	-	8
0.5 - 1.0	6	-	15	29	25	-	16
1.0 - 1.5	10	-	30	29	-	50	27
1.5 - 2.0	7	-	15	14	50	25	19
2.0 - 2.5	7	50	20	-	25	25	19
> 2.5	4	-	15	14	-	-	11
Total	37	100	100	100	100	100	100

Note: due to rounding errors the totals may not correspond to the sum of the numbers

6.3.4 Relations between farm size, pasture availability and herd size

Several relationships have been estimated between size measures and herd size. For all equations a Chow-breakpoint test has been performed to determine if significant differences between the samples exists. In case of significant differences separate equations have been estimated (Table 6.13). Comparing both tables an opposite picture emerges as far as joining of both samples can be justified. For animal units equations with total farm area as well as the percentage of total farm area under pasture can be estimated with both samples joined. With stocking rate only for the area under pasture the samples can be pooled.

As could be expected, a significant positive relationship exists between the number of animal units and the total farm area. For the 1987 survey the relationship between total area under pasture and number of animal units is not significant at the 5% level, whereas for the 1996 survey a strongly significant relationship exists with an R^2 of 81 percent. This difference might reflect the "residual" character of livestock in 1987 compared to the focus on this activity in the 1996 survey. The percentage of total farm area under pasture can be seen as an indication of the specialization in livestock. In this case the samples could be joined again and a significant relation with animal units exists, explaining 20 percent of the variation in animal units.

As far as stocking rate is concerned a negative relationships might be expected with farm size, assuming that larger farms have more extensive production systems. No significant relationships however could be

estimated for stocking rate. Apparently the number of animal units per hectare of pasture is determined by other factors than the size of the farm or the amount of available pasture.

Table 6.13: Relation between animal units and various size measures

Survey	Total farm area (ha)			Total area under pasture (ha)			Percentage pasture		
	Coefficient	t-statistic	R ²	Coefficient	t-statistic	R ²	Coefficient	t-statistic	R ²
Pooled	1.5	14.8	0.75	-	-	-	0.4	4.3	0.21
1987	-	-	-	0.7	2.0	0.10	-	-	-
1996	-	-	-	1.5	12.2	0.81	-	-	-

Note: 1987 survey n=39, 1996 survey n=37

Table 6.14: Presence of tree species in both surveys

Species	1987 survey	1996 survey
	(% of farms)	(% of farms)
Laurel	45.3	66.0
Gavilán	39.6	40.4
Caobilla	17.0	4.3
Cedro	5.7	23.4
Cedro amargo	5.7	-
Pilón	1.9	4.3
Almendro	3.8	17.0
Manú	22.6	-
Campano	5.7	-
Fruta dorada	3.8	-
Jícaro	5.7	2.1
Guácimo	9.4	4.3
Anonillo	5.7	21.3
Surá	7.5	12.8

6.4 Agroforestry systems

6.4.1 Natural trees

In 1987 40 percent of the farmers had harvestable wood in forests and 66 percent had harvestable trees dispersed in pastures. For the 1996 survey these numbers are 28 and 94 percent, respectively. The strong decline of the wood in forests is directly related to the decreased area under forest, woodland and forest plantations from 15.8 percent in 1987 to 4.8 percent in 1996. The increased presence of dispersed harvestable trees in the pastures is generated by the increased area under pastures. On average there are 33 harvestable trees per farm in the 1987 survey against 122 trees in the 1996 survey.

The decline in forest area can be expected to lead to a decrease in diversity of species. Table 6.14 shows the species present at the farms in both surveys, in forests as well as dispersed in the pastures. Compared to 1987 there are less species mentioned by the farmers in the 1996 survey. The decline in diversity might be ascribed to the decrease in forest area since in pastures only selected trees are maintained. Laurel is the most common tree, present in forest as well as pastures. Gavilán is a hard type of wood used for posts and corrals. (Oñoro, 1990:50)

6.4.2 Forest plantations

In the 1987 survey 8.5 percent of the farmers had forest plantations. Considering the expected scarcity of wood in the future as a result of deforestation, an increase of forest plantations might be anticipated. However, in the 1996 survey an identical percentage of farmers has forest plantations. Considering the long term character of the plantations one would expect to find these on the same parcels as in 1987. However none of the parcels which had plantations in 1987 had these in 1996 which implies that the plantations in the last survey are relatively young. Table 6.15 and 6.16 summarize data of plantations in both surveys.

As expected, none of the plantations in the 1996 survey is older than 9 years. In the 1996 survey the forest plantations are larger in terms of area and number of trees, with an average size of 2 ha compared to 1.2 ha in 1987. In 1987 laurel, gavilán, pilón and pino were used, whereas in 1996 only laurel was present in the plantations. In the 1987 survey two respondents mentioned not growing well of some trees and problems with obtaining seeds as problems, whereas in the 1996 survey only not growing well of some trees is mentioned by one farmer as a problem of forest plantations.

Table 6.15: Summary data of forest plantations in the 1987 survey

Variable	n	Mean	Standard error	Minimum	Maximum
Area (ha)	3	1.2	0.4	0.5	2.0
Age (years)	5	4.3	1.8	0.5	10.0
No. of trees	2	21.5	1.5	20.0	23.0

Table 6.16: Summary data of forest plantations in the 1996 survey

Variable	n	Mean	Standard error	Minimum	Maximum
Area (ha)	2	2.0	1.0	1.0	3.0
Age (years)	3	2.0	1.0	1.0	4.0
No. of trees	3	81.7	18.3	45	100

Table 6.17: Species used in the living fences (% of farmers with living fences)

Species	1987 survey (%)	1996 survey (%)
Madero negro	60	68
Poró	31	43
Javillo	23	21
Other species	14	7

6.4.3 Living fences

Living fences are an often used alternative for dead posts. In 1987 66 percent of the farmers used living fences, against 94 percent in 1996 the increase can be ascribed to the expansion of pastures which necessitates more fences. Table 6.17 shows that there has been little change in species used for living fences. Madero negro is still the most often used species, followed by poró and javillo. In 1987 63 percent of the farmers did not have any problems related to living fences. Maintenance and damages caused by domestic animals and rodents were the most often mentioned problems by the remaining respondents. In 1996 77 percent of the respondents did not mention any problems, whereas the rest mentioned rodents, damages by domestic animals and little survival of trees.

INSTITUTIONAL CONTEXT AND FUTURE DEVELOPMENTS

7.1 Introduction

Several institutional aspects are included in the survey. First the use of credit in both surveys will be compared, followed by an analysis of technical assistance. Part 7.4 discusses the involvement of respondents in rural organizations, followed by a review of the expectations of the farmers with regard to the role of the government. Finally expected developments in land use are reviewed on the basis of the plans farmers have with their farms.

7.2 Credit

In the 1987 sample 57 percent of the farmers made use of credit in the previous year, of which 93 percent was directed at crops. In the 1996 survey on the other hand, only 11 percent of the farmers had made use of credit, of which 80 percent was livestock credit. This change in the destination of credit reflects the change in production pattern from crops to livestock. The source from which credit was obtained provides insight in the reasons for the decline in the use of credit. In 1996 all credit was provided by banks, whereas in 1987 the source of the credit is much more diverse, varying from cooperatives and informal sources to banks and IDA, with the latter providing no less than 77 percent of the credit.

This prominent role of IDA was a result of *Programa 0-34*, a development program of which agrarian credit provided by the *Caja Agraria* formed a principal activity. (Oñoro, 1990:60) This program ended in 1988 (Oñoro, 1990:69) and, also due to a change in government policy, the role of IDA changed to intermediation instead of active involvement in the settlement. The decline in use of credit might therefore for a large part be ascribed to a decreased role of IDA in the settlement.

Considering the decrease in use of credit it is interesting to look at the reasons for not obtaining credit in both surveys (see Table 7.1). There is a sharp increase in the number of farmers who did not obtain credit due to high interest rates. This can be contributed to the abolishment of special agrarian credit which accompanied the reduced role of IDA. There is also an increase in farmers who do not need credit which might be related to the increased ownership by people from outside the settlement with more extensive financial resources. The large category of other reasons for the 1987 survey refers to people who had recently arrived at the time of the survey and of people who were in the process of applying for credit and did not yet know if it would be approved.

Table 7.1: Reasons for not obtaining credit

Reason	1987 survey	1996 survey
	(%)	(%)
Difficult to obtain	-	2.7
Expensive, high interest rates	4.3	32.4
Unable to fulfill the requirements	13.0	5.4
Risk, fear of inability to repay	8.7	8.1
Presence of other debts	8.7	2.7
Lack of possibility	8.7	-
Not applied	4.3	16.2
Not needed	13.0	24.3
Not wanted	17.4	2.7
Other reasons	21.7	5.4
Total	100	100

Note: 1987 n=23, 1996 n=37, due to rounding errors the individual numbers might not correspond to the totals

Table 7.2: Activities for which more credit is desired (% of farmers mentioning alternatives)

Activity	1987 survey	1996 survey
	(%)	(%)
Specified crops	47.5	-
Palm heart	3.3	18.8
Crops/agriculture	3.3	6.3
Livestock	16.4	20.8
Buying of land	-	4.2
No credit desired	29.5	50.0
Total	100	100

Note: 1987 n= 47, 1996 n=44, as a result of rounding errors the individual numbers might not correspond to the totals

The final part of the credit section in the survey refers to activities for which the respondents would like to receive more credit. In 1987 30 percent of the farmers did not mention any activities for which they want to receive more credit. In 1996 this percentage has increased to 50, in accordance with the previous

increase in respondents who did not need credit. Table 7.2 clearly reflects the change from a wide diversity of crops towards a concentration on livestock and palm heart activities; in 1996 palm heart and livestock constitute 79 percent of the activities for which more credit is desired. Also 2 respondents in the last survey would like to receive credit to buy more land, which is in accordance with the process of land concentration in the past decade.

7.3 Advice and technical assistance

Table 7.3 shows which persons or institutions are consulted in case of problems with the management of the farm. The increase of farmers mentioning MAG as a source of advice is a result of farmer groups which have been recently started by this ministry. As a result of the decreased activities of IDA, as mentioned in the credit section, there has been a sharp decrease in technical assistance provided by this institution. The percentage of farmers consulting a veterinarian has stayed about the same, just as the category of family and friends. More than twice as much respondents do not consult anybody in the 1996 survey.

In the 1987 survey 38 percent of the respondents did not receive any technical assistance, against 96 percent in 1996. Again an indication of the decreased involvement of the various organizations with the settlement. Table 7.4 summarizes the activities for which the farmers would like to receive more technical assistance.

Table 7.3: Persons or institutions consulted by the farmer

Person or institution	1987 survey (%)	1996 survey (%)
MAG	-	9.8
IDA	50.0	5.9
Veterinarian	16.7	19.6
Family, friends, neighbors	9.3	13.7
Other	3.7	7.8
Does not consult anybody	20.3	43.1
Total	100	100

Note: 1987 n=51, 1996 n=47, due to rounding errors individual numbers might not correspond to the totals

Considering the shift from crops towards livestock the still relatively high percentage of respondents which would like to receive technical assistance for crops is surprising. However, in contrast to the 1987 survey in the 1996 this relates to only 4 different crops, palm heart, plantain, chili and cucumber, whereas in the first survey a wide variety of crops was mentioned, which is in accordance with the shift

in production activities during the past decade. Only a slight increased number of farmers would like to receive assistance for livestock. It might be that farmers do not need help with their livestock due to sufficient own experience.

Table 7.4: Activities for which farmers would like to receive more technical assistance

Activities	1987 survey (%)	1996 survey (%)
Crops	59.0	34.7
Livestock	18.0	26.5
Crops & livestock	3.3	2.0
Other activities	4.9	8.2
No more assistance wanted	14.8	28.6
Total	100	100

Note: 1987 n=46, 1996 n=43, due to rounding errors individual numbers might not correspond to the totals

7.4 Farmers' organizations

Table 7.5 shows a sharp decline in the presence of farmers' organizations in the Neguev settlement. In 1987 only 11 percent of the farmers could not mention any organization active in the Neguev settlement against 72 percent in 1996. Active participation in organizations has also decreased from 58 percent in 1987 to 13 percent in the 1996 sample. The decreased role of IDA is obvious again: in 1987 4 percent went to IDA meetings whereas in 1996 these meetings are not mentioned by any respondent. The MAG meetings refer to recently started small farmer groups in which farmers discuss their problems and possible solutions. The category of various committees so dominantly present in the 1987 survey comprises of committees for agriculture, health services, school and education, roads and bridges and church committees. In the 1996 survey none of these committees are mentioned.

It might be that the majority of the committees have been dissolved since their goals have largely been reached; significant improvements have been made with regard to health services, road improvement and education. But on the other hand it also might be a symptom of a greater individuality of present farmers compared to a decade ago; in 1987 53 percent of the farmers had the opinion that farmers had to organize themselves in order to improve their living conditions whereas only 11 percent of the respondents in the 1996 survey mentioned organization as an option. Compared to 1987 there is an increased disbelief in own power: 17 percent in 1987 had the opinion that they themselves can not contribute to an improvement of their living conditions against 45 percent in 1987. About the same percentage of respondents referred to working harder as an option for improvement, 13 percent in 1987 and 19 percent in 1996.

Table 7.5: Organizations known to the farmers

Organization	1987 survey	1996 survey
	(%)	(%)
UPAGRA	47	9
IDA meetings	4	-
Development committees	9	2
Various committees	21	-
MAG meetings	-	6
Palm heart cooperative	-	9
Other organizations	8	2
No organization known	11	72
Total	100	100

Note: 1987 n=53, 1996 n=47, due to rounding errors individual numbers might not correspond to the totals

Table 7.6: The most important action of the government

Government action	1987 survey	1996 survey
	(%)	(%)
Credit with low interest	21	26
Developing commercialization possibilities	14	10
Road improvements	12	5
Lowering or stabilizing input prices	4	17
Technical assistance	8	5
Assisting small farmers	2	7
Stable and good product prices	2	5
Lowering of taxes	2	5
Other actions	12	12
Government does not act	6	10
Total	100	100

Note: 1987 n=52, 1996 n=42, due to rounding errors individual numbers might not correspond to the totals

7.5 The role of the government

Not only the role farmers can play in the improvement of their living conditions was included in the survey, but also their opinions with regard to the function of the government. Table 7.6 summarizes the most important actions the government should take in the opinion of the farmers, as far as improvement of the living conditions in the settlement is concerned. In both surveys the provision of credit against a low interest rate is mentioned most times, followed by development of commercialization possibilities. The latter is related to the third action mentioned, improvement of the road system, since better infrastructure will make the settlement more accessible and therefore will improve commercialization possibilities. Further, stabilization of input as well as output prices are mentioned. In the 1987 survey 6 percent of the respondents did not expect any concern with small farmers from the government, a number which has increased to 10 percent in the last survey.

7.6 Future developments

The final part of the study covers plans farmers have with their farms. Table 7.7 summarizes for farm size, crops, livestock and agroforestry the data from both surveys. In both surveys about 80 percent of the farmers is planning on increasing the size of their farm. The trend of land concentration discussed in chapter 3 can therefore be expected to continue in the future. In accordance with the shift in cropping patterns the majority of the farmers in 1987 were planning an increase of area under annual crops whereas 96 percent of the farmers in 1996 only wants to maintain the present area of annual crops.

Table 7.7: Plans farmers have with their farms

1987 survey (%)			Activity	1996 survey (%)		
Increase	Maintain	Decrease		Increase	Maintain	Decrease
17	79	4	Farm size	15	80	4
60	30	9	Annual crops	4	96	-
60	40	-	Perennial crops	42	58	-
17	77	6	Livestock	10	89	1
17	81	2	Agroforestry	13	87	-

Note: 1987 n=53, 1996 n=45

The increase in perennial crops desired by 42 percent of the farmers in the 1996 sample refers almost exclusively to starting with or expanding the area under palm heart. The leading role of this crop in the agriculture of the settlement can therefore be expected to be enforced in the future. As far as livestock and agroforestry activities are concerned the great majority in both surveys wants to maintain the level of activities. The future trend in land use therefore seems to entail a continuation of the increase in farm

size and a concentration on livestock and palm heart, in which a relative strong growth of palm heart activities can be expected.

Chapter VIII

CONCLUSIONS

8.1 Introduction

In the light of the analysis of the survey results presented in chapter 3 through 7 this final chapter will start with reconsidering the hypotheses discussed in section 1.3. First some more general hypotheses regarding the composition of the population and ownership are reviewed, followed by a reassessment of the hypotheses relating to changes in land use. Finally, last section of concluding remarks recapitulates the major results from part two.

8.2 The hypotheses reconsidered

The more general hypotheses treat the change in the composition of the population of the Neguev, a trend towards land concentration, land degradation and credit use. The hypotheses regarding changes in land use treat deforestation, pastures, maize, cocoa and palm heart.

The relative number of women has increased in the 1987-1996 period as a result of improved living conditions.

A comparison of the family composition (Table 3.7) shows that the relative numbers for each age and sex group are practically identical for both samples. The percentage of women older than 15 in the 1987 sample is 24 against 23 percent in the 1996 sample, men older than 15 compose 33 percent of the sample population in both surveys. The relative low number of women can apparently not be ascribed to the living conditions in the settlement. It might be that young adult men earn a living as laborers in the settlement before starting their own farm and family whereas girls leave their family's household and settlement when they get married. Both factors lead to a continuation of the relative high percentage of men in the Neguev.

Instead of the relative homogeneous farms of the 1987 survey a more diverse mix of large extensive farms coexisting with smaller intensive farms has emerged

Diagram 3.1 clearly shows the greater diversity in size which exists in the 1996 survey. Whereas in 1987 92 percent of the farms were between 10 and 20 ha, in 1996 only 56 percent could be found in this category. More farms smaller than 10 ha (13 percent against 6 percent in 1987) as well as a considerable amount of larger farms were present in the last survey. Although significant relations between farm size and area under crops and pasture could be estimated their explanatory power is very low. (Table 5.9 and 5.10). For the 1996 survey a slightly stronger positive relation between farm size

and pasture area was estimated, indicating a shift towards large farms specializing in livestock. It can therefore be concluded that a more diverse mix exists as far as farm size is concerned, with a trend towards large farms specializing in extensive livestock activities.

Relative small, intensive farms will more often indicate the occurrence of land degradation on their farm.

Table 5.10 indicates a significant negative relation between farm size and the percentage of farm area under crops. Although the regression equation has a low adjusted R^2 (0.08) it indicates a weak tendency towards more intensive use of land by small farms, since crops are the most land and labor intensive activities in the Neguev. As stated in section 1.3 this relative intensive use over a decade might have caused land degradation on these farms. If land degradation has occurred one would expect a negative correlation between farm size and presence of land degradation. However, the Spearman correlation coefficient between farm size and presence of degradation is 0.14 and not significant. Thus, despite the fact that smaller farms do tend to use their land more intensive no significant increase in degradation results.

In 1996 more farmers have a legal title to the land and therefore more use of credit is made

In contrast to the 1987 survey when none of the respondents had a legal title to the land¹⁸, in 1996 98 percent of the farmers was in the possession of such a title (Table 3.1). This title in several cases however covers only part of the farm since many have more than two parcels, which is the maximum number of parcels assigned by IDA. Therefore the legal position of the farmers in practice might not have improved as much as indicated by the widespread possession of titles to land. At the same time much less use of credit was made in the last survey, 11 percent against 57 percent of the respondents in 1987. As can be derived from Table 7.1 not the legal position, but the diminished role of IDA and high costs of loans are the major cause of this decrease. Next to this there has been an influx of owners from outside the settlement who do not need credit as a result of sufficient own resources. It can therefore be concluded that legal titles are not the determining factor for the decision of obtaining credit, but foremost the interest rate and need for external financing.

In 1996 there will be significantly less forested area than in 1987, implying that practically no forest will be remaining in the Neguev settlement.

In 1987 15.8 percent of the survey area was covered by either natural forest or forest plantations; in 1996 this number has decreased to less than a third of this with 4.8 percent. Despite this decrease in forested area the average number of trees which could be harvested has increased from 33 in 1987 to

¹⁸ Farmers did have the legal right to work the land, i.e. the land was officially assigned to them by IDA. However, as a result of IDA policy 'full' ownership was only awarded after ten years of consecutive working of the land. Possibilities to rent or sell the land, or using it as collateral for credit were thus limited. (Oforo, 1990:38)

122 in the last survey. This large increase is a result of the doubling of area under pasture with dispersed trees to offer shade for the livestock.

As a result of the assumed increased number of larger, extensive farms, the area under pasture is expected to have increased.

As stated above the area under pasture has doubled from 41 to 80 percent of farm area (Table 5.5). This increase is not solely a result of extensive land use on larger farms, as becomes clear from the limited explanatory power of the regression between farm size and percentage of farm area under pasture (Table 5.9). Other important factors are rentability of livestock systems and a preference of farmers for these systems. As far as rentability is concerned the limited options farmers have with regard to land use are important; only palm heart, cassava and pineapple are possibilities from an economic point of view, due to the poor soil quality. Of these alternatives for pasture palm heart requires significant investments, cassava suffers from sharp price fluctuations whereas there are no buyers in the settlement for pineapple. Next to this livestock is attractive for the new owners from outside the settlement since it requires little supervision of labor. All of these characteristics make livestock an attractive option compared to other land use options.

The area under maize will have decreased significantly in the 1996 survey in favor of root-crops like winged yam, tannia, cush-cush yam and eddoe.

The maize area has decreased from 102 ha to 6 ha in 1996; a practical disappearance as a result of the abolishment of the guaranteed price for dry mature maize. However the leading role of maize is not taken by root-crops but by palm heart in addition to the above mentioned increase in pastures. Lack of commercialization possibilities account for the failure of the alternative root-crops to take the place of maize, winged yam and eddoe for example even decreased in area.

In 1996 the area under cacao has strongly decreased, accompanied by an increase in palm heart area.

In 1987 cacao was mentioned by 9 farmers as one of their three major crops whereas in 1996 none of the respondents mentioned this crop. An important factor to the decline of cocoa is the spread of the *Monilia* fungus, which has led to a disappearance the crop from the whole Atlantic Zone. The total area under palm heart on the other hand has increased from just 4 ha to 33 ha, i.e. 3.5 percent of the farm area in 1996. As stated before, palm heart is now the most important crop in the Neguev settlement. Considering the fact that 42 percent of the respondents in 1996 is planning on increasing their palm heart activities combined with a functioning cooperative for palm heart producers and a promising international market, one can expect an further increase of the importance of palm heart for the farmers in the Neguev.

8.3 Concluding remarks

One of the primary characteristics of the Neguev settlement, its homogeneous distribution of land, has been lost as a result of a concentration of land which has occurred in the decade between both surveys. Both the growing presence of absentee landowners which accompanied this land concentration and the stable composition of families indicate extensive changes in owners. Despite these developments 38 percent of the owners of 1987 were still present in 1996. The amount of time spend off-farm working by the owners has increased substantially: almost 50 percent of the owners spends less than 50 percent of their time on the farm and the number of adolescent boys working off-farm has also doubled. This off-farm work is done by 33 percent of the owners in the last survey on a permanent basis, more then a doubling compared to 1987, whereas in both surveys 11 percent works off-farm on an irregular basis.

From the analysis also an increase in use of hired labor appears, both by small and large farms. Next to this change in total amount of hired labor also a loss in seasonal character of this hiring occurred. In 1987 clear peaks in labor demand and thus hiring of labor existed as a result of the cropping pattern. The shift from a diversity of crops towards livestock and palm heart, both of which have a stable labor demand, led to a loss of the labor peaks.

Farmers distinguish two major soil types on the basis of color, material, location, drainage and quality: *tierra negra* and *tierra colorada*. Limitations of the soils are described in terms of fertility, inundations and suitability for staple crops. The slope of soils is never mentioned as a factor limiting production; the predominance of pastures probably prevents the occurrence of erosion and therefore the awareness of the dangers of using steep soils for agriculture. No meaningful relations could be found between soil quality and cropping patterns. Despite its importance for agriculture, land use is thus not determined by the bio-physical potentials of the soil. Other factors like instability of prices and preferences for certain factors are also important.

Land use has shifted from a high diversity of crops towards a concentration on livestock and palm heart; in 1996 80 percent of farm area is occupied by pasture. Despite the growth in palm heart to 3.5 percent of farm area the total area under perennial crops has decreased just as the area under annual crops. Ornaments are a new type of land use which appeared in the last survey whereas forested areas have dwindled to only 4.8 percent of the area. Major reasons why farmers have no crops in the 1996 survey are unsuitability of the soil, unstable prices and a preference for other activities. Next to these reasons perennial crops are also avoided as a result of a lack of financial means and because of commercialization problems. Expenses on inputs have increased in the past decade, per farm as well as per relevant unit. The large increase in expenses on fungicides and herbicides, both not used for palm heart, indicate a substantial price increase for these inputs¹⁹. As far as the other inputs are concerned an increase in the amounts used might also be partly responsible for the increased expenditures. None of the forest plantations of the 1987 survey were still present in the last survey, the maximum age of the plantations in 1996 was just 4 years, they have been probably been converted into pasture despite their long term focus.

¹⁹ The agricultural deflator which had been used should therefore be replaced by input-specific deflators, preferably determined on the basis of prices in the Neguev. This however requires a extended time-series database of all relevant prices.

The most important livestock production system is breeding with 21 out of 37 farmers practicing this system. This is reflected in the on average relative large number of calves and cows in the herds. Despite an increase in heads as well as animal units the stocking rate has been stable in the past decade and lays within the acceptable limits for Costa Rica. However in both samples about 30 percent of the farms exceeds this limits by having more than 2 animal units per hectare, thus risking overgrazing of their pastures.

Land degradation was observed by 49 percent of the farmers in the 1996 survey, but practically only for crop, not for pastures. Degradation is described in terms of a declining fertility, increasing need for fertilizers, increase in plagues and pest and a lower production. Despite the fact that the occurrence of erosion is suggested in the literature (Bruin, 1991:2-4) none of the farmers mentioned it. As factors causing land degradation agro-chemicals and deforestation were mentioned. On the same parcels as visited in 1987 less soil is defined as having no problems, an indirect indication of the occurrence of land degradation during the past decade.

Farmers in the 1996 survey seem to operate on an more individual basis. The number of people not consulting anybody in case of management problems has almost doubled whereas only 11 percent of the farmers mentions farmers' organizations as a way of improving their living conditions, in contrast to 53 percent in 1987. The number of organizations operating in the settlement has decreased considerably, 72 percent of the respondents in 1996 is not able to mention any organization supporting the farmers in some way. The diminished role of IDA is clearly visible in a decrease in credits obtained from this institute and a drop in people consulting them in case of problems. Credit with low interests and developing of commercialization possibilities are major actions expected from the government, although 10 percent does not expect any concern from the government with small farmers at all.

Concluding the Neguev in 1996 can be said to be dominated by livestock production, with a focus on breeding, and as most important crop palm heart. The large diversity in crops and organizations has changed in a focus on two activities with a larger variety in farm sizes as a result of land concentration. Judging the plans farmers have with their farms the concentration of land can be expected to continue just as the concentration on livestock production. The importance of palm heart can be expected to increase given the 42 percent of the farmers wanting to increase their activities in this field, coupled with a functioning cooperative and promising international markets. Given the limited bio-physical qualities of the soil the increased land concentration might be the only economical viable development for the settlement. A continuation of this trend will slowly move the Neguev towards its initial shape of a large *finca*, again with livestock but this time lined with palm heart instead of forests.

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REPOSA

CATIE

UAW

MAG

CARACTERIZACION GENERAL DE FINCAS

Febrero 1996

HISTORIA 02

Preguntas al productor/administrador sobre unidad productiva:

- 01 Hace cuantos años maneja esta finca?
 - 02 Como obtuvo la finca?
 - 03 Cual era el uso de la tierra de su finca antes?
 - 04 Hace cuantos años se tambó el bosque virgen?
 - 05 Observaciones:
- Datos personales sobre el productor/administrador.*
- 06 Cuantos años tiene?
 - 07 Donde nació?
 - 08 Que grado de instrucción tiene?
 - 09 Que hacia antes de obtener esta finca?
 - 10 Donde?
 - 11 Cuantos años de experiencia como productor tiene?
 - 12 Que parte de su tiempo trabaja en la finca?
 - 13 Si (tambien) tiene un trabajo fuera de la finca, en que trabaja, donde, cuanto tiempo, y es fijo o no?
 - 14 Observaciones:

IDENTIFICATION 01

- 01 Numero:
- 02 Fecha:
- 03 Comienzo de la encuesta: Fin de la encuesta:

04	Nombre	Fincas	Productor /	Informante
05	Provincia			
06	Cantón			
07	Distrito			
08	Segmento			
09	Barrío o caserío			
10	Carreteras o camino			

- 11 Posición del informante dentro de la unidad productiva.
- 12 En caso de administrador, que es la función del administrador en la finca?
- 13 Tiene otras fincas y donde?
- 14 Observaciones:

COMPOSICIÓN Y ACTIVIDAD FAMILIAR 03

- 01 Niños (0-9 años): M, F
- 02 Jóvenes (10-14 años) y adultos (15 años o más):

Nombre	M/F	Edad	Estudia	Trabajo		
				Fines	Ahora	Domó

03 Observaciones:

MANO DE OBRA 04

- 01 Tiene empleados permanentes?
- 02 Cuántos son?
- 03 Puede dividirse según categorías/actividades?

Numero	M / F	Días/semana	Horario	Categoría o descripción de actividades

04 Puede dar un idea cuanto mano de obra temporal utilizó el año pasado?

Mes	Numero de personas	M / F	Cuanto Días	Para que actividades

- 05 Cuanto es el jornal? Por cuanto hora al día?
- 06 Observaciones:

7 TENCIA DE LA TIERRA 06

07 Cuantos parcelas/quartos tiene la finca?

	Forma de tenencia	Ha / Manzana
01	Tierra propia con escritura	
02	Tierra propia sin escritura	
03	Tierra arrendada de otras personas	
04	Tierra propia en manos de otros	
05	Tierra bajo otras formas de tenencia	
06	Área total de la finca	

07 Observaciones:

8 USO DE LA TIERRA 06

13 Uso de la tierra:

	Uso	Ha/Manzana
Tierras de labranza		
01	Cultivos anuales o transitorios	
02	Huertas comerciales, caseras o cultivos de invernadero	
03	Tierras en rastrojo o descanso	
04	Otros cultivos de labranza	
05	Cultivos permanentes	
Pastor:		
06	Pastos mejorados (semilla mejorada, Brachiaria & Arachis pintoi)	
Pastos no mejorados (potreros)		
07	Pastos no mejorados (potreros)	
08	Plantaciones forestales	
09	Bosque y montes	
10	Charcales y tarconales	
11	Otra clase de tierras	
12	Área total de la finca	

13 Observaciones:

TIPO DE TIERRA/SUELO 67

01 A. Que tipo de suelo distingue usted mismo en su propia finca?

Nombre y caracterización	Problemas o limitaciones	Ha /	Uso principal

02 B. Puede dividir su finca según nuestra clasificación?

Tipo de suelo	Ha/	Uso principal	Causa del productor (ver)
Buena tierra sin problemas			
Tierra de baja fertilidad			
Tierra muy pedregosa			
Tierra con pendiente fuerte			
Tierra con mal drenaje			
Tierra pantanosa			

03 Observaciones:

DEGRADACIÓN 68

01 Hay degradación en su propia finca?
(por ejemplo bajada de la fertilidad, problemas con agua, mas insumos necesarios, erosión)

02 Donde y con cual cultivo?

03 Que es la causa?

04 Que es el efecto/resultado de esa degradación en sus cultivos/pastos?

05 Observaciones:

06 Hay degradación en el Niquet?

07 Donde y con cual cultivo?

08 Que son causas de la degradación?

09 Que son efectos/resultados de esa degradación?

10 Observaciones:

Puede dar nos una estimación de los costos totales de insumos el año pasado (colones/fnca)?

Categoría	Uso en 1995	Propiedad al día de vista
01		
02		
03		
04		
05		
06		
07		
08		
09		
10		
11		
12		
13		
14		
15		
16		

01 - Utilización de maquinarias:

02 - Tracción animal:

03 - Herbicidas:

04 - Purgativas:

05 - Insecticidas:

06 - Fertilizantes:

07 - Medicinas veterinarias:

08 - Semillas y plantas:

09 - Otros:

10 Observaciones:

17 Observaciones:

ESTRUCTURAS PERMANENTES 11

01 Que construcciones (semp)permanentes tiene usted en la finca (por ejemplo corral, corralero de ganado, lechería, bodega, granja)?

02 Observaciones:

CULTIVOS 12

Puede dar información sobre los tres cultivos mas importantes?

Cultivo 1:

01 Que variedades son y como obtuvo las semillas?

02 Há/manzana/número (por estación)?

03 Cuanto es la producción?

04 Que insumos usa y cuanto?

05 -/ para propio gasto/venta:

06 Porque este cultivo?

07 Cuales son los problemas mas grandes relacionados a este cultivo?

08 Que alternativa tiene para este cultivo?

09 Observaciones:

Cultivo 2:

10 Que variedades son y como obtuvo las semillas?

11 Há/manzana/número (por estación)?

12 Cuanto es la producción?

13 Que insumos usa y cuanto?

- 14 -/- para propio gasto/venta:
- 15 Porque este cultivo?
- 16 Cuales son los problemas mas graves relacionados a este cultivo?
- 17 Que alternativa tiene para este cultivo?
- 18 Observaciones:
- Cultivo 3:
- 19 Que variedades son y como obtuvo las semillas?
- 20 He/razana/numero (por estacion)?
- 21 Cuanto es la produccion?
- 22 Que insumos usa y cuanto?
- 23 -/- para propio gasto/venta:
- 24 Porque este cultivo?
- 25 Cuales son los problemas mas graves relacionados a este cultivo?
- 26 Que alternativa tiene para este cultivo?

27 Observaciones:

28 Que otros cultivos tiene?

29 Si no tiene cultivos anuales, porque no?

30 Si no tiene cultivos permanentes, porque no?

31 Observaciones:

Tiene ganado vacuno?

	Propósito		
	Ciema	Lleche	Doble Propósito
01	Hembras -1 año		
02	Hembras 1/2 años		
03	Hembras +2 años		
04	Total hembras		
05	Vacas en lactancia		
06	Machos -1 año		
07	Machos 1-2 años		
08	Machos +2 años		
09	Terra reproductoras		
10	Bueyes		
11	Total machos		

12 Porque (no) tiene ganado de lechar?

13 Cuales son los problemas mas grandes relacionados a la producción de lechar?

14 Que alternativa tiene para producción de lechar?

15 Porque (no) tiene ganado de carne?

16 Cuales son los problemas mas grandes relacionados a la producción de carne?

17 Que alternativa tiene para producción de carne?

18 Porque (no) tiene ganado de doble propósito?

19 Observaciones:

Cuales otros animales tiene usted?

Categoría	Total
20 Cerdos para reproducción	
21 Cerdos para carne	
22 Caballos	
23 Yeguas	
24 Mulas	
25 Pollos/gallinas/gallinas	
26 Porce/carnacas/ganacos	
27 Chompigos	
28 Pocos	
29 Otros	

30 Observaciones:

01 Si tiene bosque en la finca, ya hay árboles madurables?

02 Tiene árboles dispuestos madurables en su finca?

03 Que especies y cuantos son?

04 Observaciones:

05 Tiene plantaciones forestales?

06 Cuantas hectáreas?

07 Que especies?

08 Cuantos años tienen los árboles?

09 Cuales son los problemas mas grandes relacionados a plantaciones forestales?

10 Observaciones:

11 Tiene cercas vivas?

12 Que especies?

13 Cuales son los problemas mas grandes relacionados con cercas vivas?

14 Observaciones:

15 Tiene árboles, dispuestos o en bosques, para otros usos?

Hube transformaciones en los años transcurrido?

01 - en el tamaño de su finca:

02 - en los cultivos:

03 otro:

04 Que son las transformaciones mas importantes de los años transcurrido en la Neguer?

03 Observaciones:

FUTURO DE LA FINCA 16

Que planes tiene en cuanto a su finca total o por partes para los siguientes cinco años?

Categoría	Igual/mas/menos	Especificaciones	Porque?
01 Tierra			
02 Carnado de carne			
03 Carnado de leche			
04 Cultivos anuales			
05 Cultivos permanentes			
06 Plantaciones forestal			
07 Ornamentales			
08 Ocos			

09 De que dependará la realización de esos planes?

10 Cuanto tiempo mas quiere ser productor?

11 Que hace después con el finca (por ejemplo traspasar a un hijo, vender)?

12 Observaciones:

ASISTENCIA TECNICA 17

01 Si tiene problemas en cuanto al manejo de la finca a quien consulta?

De cuales organizaciones ha recibido asistencia técnica el año pasado?

	Organización	Actividades	Frecuencia	Como fue su experiencia
02	MAG			
03	IDA			
04				

05 Si recibe poca asistencia, quienes reciben mas asistencia?

06 En que actividades quisiera recibir (mas) asistencia técnica y o quien?

07 Cuales son los problemas mas grandes relacionados a la asistencia técnica?

08 Observaciones:

CREDITO 18

ORGANIZACION CAMPESINA/RURAL/SOCIAL 19

01 Que organizaciones campesinas/rurales/sociales tienen presencia en el área y con que objetivos?

02 Para que actividades?

03 Quien se lo brindó (formal o informal)?

04 Si era crédito formal, de que organización?

05 A que interés y bajo que condiciones?

06 Como fue su experiencia con crédito?

07 Si no recibió crédito, porque no?

08 Para que actividades quisiera recibir (mas) crédito?

09 Observaciones:

02 Que experiencia tuvo con ellas?

03 Que es su contribución/función dentro ellas?

04 Observaciones:

01 Que podria hacer el gobierno para mejorar la agricultura y la vida en su area?

02 Que considera como lo mas importante?

03 Que piensa que ustedes mismos podrian hacer?

04 Observaciones:

EVALUACIÓN DE LA CONVERSACIÓN 21