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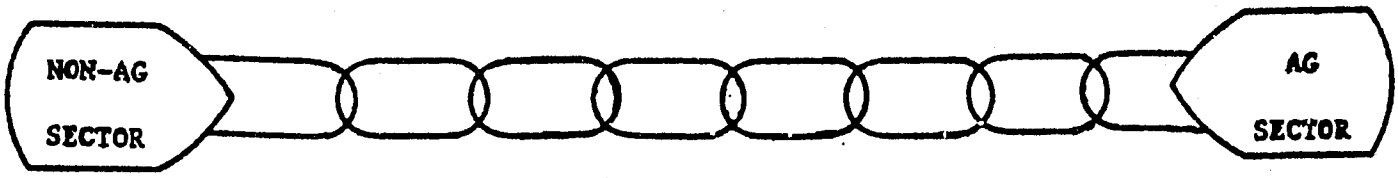
FORMULATION OF LINKAGES IN RURAL REGIONS FOR PURPOSES OF REGIONAL DEVELOPMENT RESEARCH



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IN COOPERATION WITH
DIRECCION DE PLANIFICACION DEL SECTOR AGROPECUARIO

MINISTRY OF AGRICULTURE
GOVERNMENT OF NICARAGUA

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March 1979

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(DIPSA)
OF THE
MINISTRY OF AGRICULTURE
GOVERNMENT OF NICARAGUA

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ABSTRACT

Techniques or tools to measure impacts of government programs and projects on the lowest income groups in LDC's are urgently needed. This research project addresses that need by attempting to establish linkages among the rural poor, urban poor and other sectors of the economy by means of a relatively low cost methodology study. The establishing of these linkages is a prerequisite to any reliable analysis of impacts on the rural and urban poor. This methodology could become an important part of sector analysis conducted in other countries or regions of the world. Personnel in the Development Support Bureau of AID support our belief that the proposed methodology has a high probability of successful application and that the potential benefits clearly justify the investment of funds and staff time to support the project.

The primary objective of this study was to determine whether a methodology for establishing intra-regional linkages, previously utilized in the United States, can be successfully applied in a less developed country. Linkages are defined as market transactions or flows of goods and services among population segments, economic sectors and regional locations. The methodology will be successfully applied if linkages estimated with data collected under this project, supplemented by available secondary data, are sufficient to test the specified hypotheses and provide reliable policy guidance. The secondary objective is to provide data for policy analysis in the country in which field work is undertaken.

The research project had five specific objectives:

1. Select two rural regions in a LDC and describe the general conditions of production including agricultural technology, land tenure and ownership, size of farms, ordering of urban centers, urban and social infrastructure, and other characteristics which distinguish the two regions;
2. Design the specific sectoring of economic activity that captures the important linkages among population segments, economic sectors and regional locations;
3. Construct a questionnaire to be administered in the field establishing linkages and approximate magnitudes of linkages among the population segments, economic sectors and regional locations;
4. Administer the questionnaires, selecting locations and population segments in a manner such that representative linkages are obtained; and,
5. Compare and analyze the linkages of the two rural regions and test hypotheses pertaining to agricultural and regional development emanating from differences in the extent and form of linkages.

Nicaragua was the country selected for study on the basis of the following considerations: (1) it is an agricultural country whose rural sector accounts for most of the Gross National Product; (2) Nicaragua has a type of agricultural development which can be classified into regions and subregions according to natural resources, agricultural production, and geographic characteristics; (3) a regional analysis and planning

program exists in the country which is receiving considerable support from the Government of Nicaragua and the USAID Mission; and, (4) the offer of collaboration of Ministry of Agriculture personnel to support the field work and other data collection of the project. The local cooperating institution was the Direccion de Planificacion del Sector Agropecuario (DIPSA) of the Ministry of Agriculture.

Two regions in Nicaragua were selected for this study. The Central Highlands region, centering on the Matagalpa Department, is representative of small crop farms, primarily basic grains and coffee, and extensive livestock operations. Generally a low level of agricultural technology is employed in this traditional agriculture region. The North Pacific Region includes the Departments of Chinandega and Leon. Large scale cotton farms, utilizing highly sophisticated technology, are intermingled with small scale crop farms, and both large and small scale livestock farms.

An input-output matrix was developed to determine the linkages among the different sectors of the economy. The effort was focused on evaluating the importance of specific linkages involved in the flow of goods and services both to the rural areas and from the rural areas.

Examination of Tables 17-21 reveals substantial differences in purchases of agricultural inputs between the two regions. For example, in the Matagalpa region 79 percent of the chemicals for commercial food crops are purchased at the first order level as compared to zero percent for the Leon-Chinandega region. To some extent, this is a result of inputs from INVIERNO being treated as coming from first order cities.

However, the same is true for commercial export crops although the magnitude of the differences is smaller (.25 and 0.0). INVIERNO does not service producers of commercial export crops such as coffee. Ninety-eight percent of the chemicals and seeds for food crops on traditional farms are purchased at the first order level while none are purchased at the first order level in the Leon-Chinandega region. According to the results, both commercial agriculture and traditional agriculture are much more dependent on the regional center (second-third order cities) in the Leon-Chinandega region than in the Matagalpa region.

While the respondents were asked to list the major inputs and location of purchase for every sector, the data for the nonagricultural sectors other than manufacturing were unusable for our purposes. The respondents simply were not able to give this information for these sectors. These data for both regions for manufacturing in first order cities and manufactoring in second and third order cities, respectively, are presented in Tables 22 and 23. Again as in the case of agriculture, rural manufacturing is much more dependent on the first order cities for its inputs in the Matagalpa region, while it is much more dependent on the regional center in the Leon-Chinandega region. This is also true for the urban commercial manufacturing sector while perhaps not to the same extent.

The final input-output table for each region is presented in Table 27. The coefficients for the Leon-Chinandega regions are presented in parenthesis ( ). The inter sectoral transactions matrix (the Matrix A where $A = (a_{ij})$) can be partitioned into four quadrants. The lower left hand and upper right hand quadrants show clearly the linkages between lower and higher order cities. The last four columns represent the allocation coefficients for household expenditures (rural and urban) and exports (to regional cities, to outside region). The last four rows represent value added, for rural households and urban households, and imports (from the regional center, from outside region). We were disappinted that the sample did not pick up any flows of factors of production between different order cities although there is certain to be significant flows of labor in particular.

Starting in the upper left hand quadrant and numbering from I to IV we note some differences in the linkages for each quadrant. In quadrant I the Matagalpa region has 16 elements while the Leon-Chinandega region has 12 elements. The total number of squares with an element from one of the sectors in it is 16. The number of squares with an element from both sectors is 9. The "agreement ratio" is the number of squares with at least one element. For the quadrant I, the agreement ratio is 0.47 (9/19). If the "agreement ratio" were equal to one, this would imply that while the magnitudes may differ the types of linkages are identical. An agreement ratio equal to zero would imply that the regions are totally dissimilar. Results of these simple comparisons are presented in Table 28.

While it is difficult to interpret the magnitude of the "agreement ratios" it appears that there is considerable difference between the two regions as to the nature of the linkages. Rural households in the Matagalpa region purchase nearly 28% of household goods in first order cities compared to about 18% for the Leon-Chinandega region. Urban households in the Matagalpa region purchase less than 2% of their household goods in first order cities (which is what we would expect because urban households are in higher order cities) compared to less than 1% for the Leon-Chinandega region. (Table 27).

In almost all cases producers in the Matagalpa region buy more of their inputs from first order cities than do producers in the Leon-Chinandega region. (Table 29). Producers in the Leon-Chinandega region rely much more on purchasing imports in the regional center and from outside the region than do producers in Matagalpa.

The results of applying the methodology to two dissimilar regions in Nicaragua indicate that it is possible to discern important differences in the nature of linkages. While there are serious gaps in the data, some useful results were obtained. It is possible to conclude that rural households in the region where traditional agriculture is most common are more dependent for purchasers in the local community in which they reside. Urban households are also more dependent on first order cities for their household expenditures. This same conclusion holds for purchased inputs. Producers

(agriculture and non-agriculture) in the Matagalpa region buy more of their inputs from first order cities. Producers in the Leon-Chinandega region rely much more on purchasing inputs in the regional center and outside the region than the producer in Matagalpa.

While these results have to be interpreted cautiously, the implication is that government programs such as construction of infrastructure will have a greater positive indirect impact on rural regions and reducing poverty if carried out in the Matagalpa region. This is because the linkages to the large regional center or outside the region are greater in the Leon-Chinandega region. However this would be a valid conclusion in the relatively short run. Over a long period of time, the nature of the linkage between different orders of cities may change because of long run impact of such government programs on the structure of the economy. It would be interesting to determine to what extent linkages change over time and as economic growth take place.

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INTRODUCTION

Purpose and Objectives of Study

The Linkages in Rural Regions Study was conceived as a partial answer to the need for developing methodologies that will improve the agricultural and rural sector analysis as a basis for the planning process in Less Developed Countries (LDC's). Development plans usually include several goals that are affected directly or indirectly by agricultural programs and projects. Some goals refer to economic aggregates, e.g., increased production, greater foreign exchange earnings, higher farm incomes and increased food supplies, while others take into account the distribution of benefits, such as higher incomes for the poorer segments of the population or higher rates of economic growth in selected regions.

Considerable progress has been made in recent years in the development of models to analyze the impact of programs and projects on regional production and prices, a notable example being the linear programming model of Mexican agriculture. There has been little progress, however, in the analysis of impacts on selected population groups.

Considering AID's interest in assisting the poorest groups in LDC's and similar interests on the part of many LDC governments, there is a clear need to develop better methodologies for the analysis of impacts of programs and projects on these segments.

This small research project addresses that need by attempting to establish linkages among the rural poor, urban poor and other sectors of the economy by means of a relatively low cost methodology study. The establishing of these linkages is a prerequisite to any reliable analysis of impacts on the rural and urban poor. If the methodology proves successful, it could become an important part of sector analysis conducted elsewhere. The Development Support Bureau of AID believes that the proposed methodology has a high probability of successful application and that the potential benefits clearly justify the investment of funds and staff time to support the project.

The primary objective of this study was to determine whether a methodology for establishing intra-regional linkages, previously utilized in the United States, can be successfully applied in a less developed country. Linkages are defined as market transactions or flows of goods and services among population segments, economic sectors and regional locations. The methodology will be successfully applied if linkages estimated with data collected under this project, supplemented by available secondary data, are sufficient to test the specified hypotheses and provide reliable policy guidance. The secondary objective is to provide data for policy analysis in the country in which field work is undertaken.

The research project had five specific objectives:

1. Select two rural regions in a LDC and describe the general conditions of production including agricultural technology, land tenure and ownership, size of farms, ordering of urban centers, urban and social infrastructure, and other characteristics which distinguish the two regions;

2. Design the specific sectoring of economic activity that captures the important linkages among population segments, economic sectors and regional locations.

3. Construct a questionnaire to be administered in the field establishing linkages and approximate magnitudes of linkages among the population segments, economic sectors and regional locations;

4. Administer the questionnaires, selecting locations and population segments in a manner such that representative linkages are obtained; and

5. Compare and analyze the linkages of the two rural regions and test hypotheses pertaining to agricultural and regional development emanating from differences in the extent and form of linkages.

Selection of Country

Nicaragua was the country selected for study on the basis of the following considerations: (1) it is an agricultural country whose rural sector accounts for most of the Gross National Product; (2) Nicaragua has a type of agricultural development which can be classified into regions and subregions according to natural resources, agricultural production, and geographic characteristics; (3) a regional analysis and planning program exists in the country which is receiving considerable support from the Government of Nicaragua and the USAID Mission; and, (4) the offer of collaboration of Ministry of Agriculture personnel to support the field work and other data collection of the project. The local cooperating institution was the Direccion de Planificacion del Sector Agropecuario (DIPSA) of the Ministry of Agriculture.

METHODOLOGY

In-Country Contacts

After an initial visit in Washington with Dr. Richard Suitor, the AID/Washington Project Manager on the project, we traveled to Managua in June, 1977 to establish contacts and to make arrangements to begin the project there.

Richard Hughes, Rural Development Officer in USAID/Nicaragua, and three members of his staff, Tim O'Hare, John Becker and Armando Gonzalez, all were helpful in coordinating the project, in visiting the potential regions selected for study, and in making contacts with personnel in various Nicaraguan Government agencies. Tim O'Hare was designated as the AID in-country project coordinator for the project. He was a valuable resource in helping us develop the project methodology, sampling procedures, and coordinating initial trips to the field. We were provided temporary office space in AID which greatly facilitated the implementation of the project.

Through the help of the above individuals, we were able to contact and employ Sra. Beatriz Glover as Research Associate on the project. Beatriz is a Peruvian citizen living in Managua with her husband who is employed there. She is an economist trained at the University of Texas at Austin. Beatriz was invaluable in coordinating many aspects of the study including the field interviewing in the two regions.

Sr. Leonardo Green, Director of DIPSA, the Agricultural Planning Agency in the Ministry of Agriculture, also provided much assistance in organizing the study and in the field interviewing. DIPSA provided a jeep and driver for the interviewing, for which the salary and vehicle costs were reimbursed by the project.

Ing. Rodrigo Gonzalez, Director of the Livestock Division of the Ministry of Agriculture, provided office space and equipment for use by Beatriz Glover. From the standpoint of logistics support, we were most fortunate in having the support of DIPSA and other Ministry of Agriculture personnel. Preston Pattie of the Department of Agricultural Economics at Michigan State University, who was working in DIPSA on a related rural food and living expenses study, provided much assistance to us also in developing our sampling procedures and the questionnaires.

Selection of Two Regions for Study

An initial hypothesis in developing this study was that agricultural and regional characteristics (i.e., farm size, agricultural technologies, land tenure, agricultural and industrial specialization, size, location and ordering of urban places, urban functions, income distribution, etc.) influence the extent and form of linkages in rural regions.

To make a comparison of the form and nature of these linkages in regions of distinct characteristics, we selected the North Pacific Region formed by the Departments of Leon and Chinandega, an area of commercial agriculture in which the dynamic activity is the cultivation, processing and exportation of cotton; and, the Central Highlands Region, an area of

traditional agriculture, cultivation of basic grains and coffee. This region includes the Departments of Jinotega, Esteli and Matagalpa. Most of the field interviewing in this latter region was done in Matagalpa.

Selection of Sample

Within the two indicated regions we proceeded to identify places--urban centers, population segments and economic sectors--in which existing linkages could be identified. Urban centers are population segments which have been classified as "First and Second Order Centers" and "Third Order Centers." Originally, the main distinction between the two categories was to be size of the town, in terms of population such that First and Second Order would refer to communities with less than 2,500 people and Third Order would refer to communities with over 2,500 people. At the same time, it was determined that all cabaceras would be Third Order communities. However, as the interviewing proceeded, we faced the contradiction that some cabaceras in the sample had a population under 2,500. Taking into account that the information gathered was going to be analyzed on the basis of an input-output model, one of the most important elements to be considered was population segments, that is, urban segment versus the rural segment. It was decided to drop size of the towns and stay with the "municipio versus localidad" classification for the Second-Third and First Orders, respectively.

One other consideration to select the communities in the sample was physical access because of the difficulties that might come about in the case of rain while gathering the information, since in many cases physical access consisted of travel on dry season roads only.

Population segments, urban and rural, can be classified according to the type of economic activity performed by each group. Some of the urban centers have productive commercial activities which are somewhat sophisticated (manufacturing, food processing, public services, etc.). These imply the use of some technology. These centers can be distinguished from other urban centers which are involved in simple productive activities and provide only very basic services, if any at all (water, sewer, etc.). The same procedure is applicable to the rural sector. We have distinguished traditional subsistence agriculture from commercial agriculture which also requires the use of some technology.

Activities realized by population segments constitute the economic sectors which at the same time define population segments as indicated in the previous paragraph. Each one of these elements, or socio-economic variables mentioned is a category shown in an input-output matrix in such a way that enables the reader to observe the economic and social relations existing in the regions as a whole, as well as their nature and extent.

Development of Survey Instruments

These relationships are understood as flows of goods and services that occur among communities. The information on flows of goods and services i.e., the "linkages" existing among communities, was planned to be obtained through the use of personal interviews using questionnaires. The questionnaires or survey forms were elaborated so that the answers wanted would fit in the structure of the input-output matrix satisfying its elements. The information is general for the community as a whole. Linkages were not expressed in terms of quantity but in terms of percentages and proportions. In this way it was possible to have a significant

idea about production patterns in each of the selected regions in the study, including those activities generating employment, those activities which demand services, determination of the most dynamic urban and rural centers within the sample, and which are the most dependent urban and rural places.

Size of Sample

The final step in selecting the communities in the sample was done while we were field testing the survey forms. By a judicious process of elimination, we selected the urban and rural centers from which the information was to be gathered. Five municipios were selected for each region and five or more localidades were selected within each municipio. The total number of interviews in First Order towns was 55. Ten interviews were taken in Second and Third Order towns. Personnel in INVIERNO offices in the Matagalpa Region provided us useful information in selecting the municipios and localidades in that Region.

As indicated earlier, the municipios were designated as "Second or Third Order" places and the localidades all were designated as "First Order" places by definition.

List of Towns Interviewed in the Central Highlands Region (Matagalpa)

MATIGUAS	SAN DIONISIO	MUY MUY	ESQUIPULAS	SAN RAMON
Manceras	El Cobano	Balsamo	Cinta Verde	San Pablo
Muy Muy Viejo	El Carrizal	El Esquirin	El Castillo	Azancor
El Bijagual	Piedra Larga	Mal Paso	El Barro	Guadalupe
El Anzuelo	Las Cuchillas	Compagua	Terrero	El Horno
Saiz	El Corozo	El Corozo	Cumaica	Yucul

List of Towns Interviewed in the North Pacific Region

CHINANDEGA DEPARTMENT

POSOLTEGA	EL VIEJO	CHICHIGALPA
Las Mayorga	El Manzano	Valle Viejo
El Bosque	Jiquilillo	Sirama
Calle Real	Tom Valle	El Pellizco
del Bosque	La Chorrera	Cosmapa
El Tololar	Tonala	El Guanacastal
Juan XXIII	Cuatro Esquinas de Amayo	Cuitanca
Posolteguia	La Picota	

LEON DEPARTMENT

LA PAZ CENTRO	TELICA
Las Sabanetas	El Panal
Momotombo	El Hatillo
La Fuente	Jicarito
La Paz Vieja	El Ojochal
Tecuaname	El Maranonal

Note: The towns underlined are cabaceras; the towns below each cabaceras are localidades.

Interviewing Procedures

Two separate questionnaires were developed. Copies of these are in the Appendix. One was used in the First Order towns and the other was used in the Second and Third Order towns. In some cases data was obtained in much the same manner as used by DIPSA in the Standard of Living Study; i.e., a group of knowledgable people was brought to one location in the community and interviewed as a group. If the group could not answer some of the questions in the questionnaire, they were asked to indicate who might know the answer. When a person was suggested, the interviewer would go to that person to complete the questionnaire. Thus, in many cases the interviewer filled out the survey form with more than one person.

As a starting point it was suggested that the Mayor or perhaps the manager of a bank be approached to get a general picture of the economic activity of the town. They could provide information on what types of activities are most important and what the major trade linkages are.

A key question was incorporated in the Second and Third Order survey form asking for the names of the towns with which the municipio had most commercial relations. Eight towns were mentioned as an average. From these, five towns were selected to obtain the First Order interviews. Apart from the persons mentioned, the bulk of the information was obtained from teachers in rural schools and from agricultural producers who at the same time were leaders of the town. This was true for both the municipios and localidades.

CHARACTERISTICS OF THE MATAGALPA REGION [1]

Topography and Climate

The Department of Matagalpa is located in the Central Interior region of the country which also includes the departments of Jinotega and Esteli. The area of Matagalpa is 6,794 Km^2. Most of the region is between 200 and 500 meters, especially in the central part and between 500 and 1000 meters toward the northeast of the region. The dominant climate is subtropical humid, although in the interior valleys climate is subtropical dry. Towards the east, the weather is subtropical very humid. The average annual temperature reaches between 18°C to 24°C. Precipitation in the entire region is distributed among six months (May to November) in the western part of the region and over seven to nine months in the eastern part, at heights over 1,000 meters. Precipitation in the valleys reaches between 600 and 1,000 mm annually, and from 1,500 to 1,750 mm in the mountains of the west. In the most humid areas, precipitation reaches 3,000 mm as an annual average.

Vegetation and Soils

In the Western part of the Department of Matagalpa the soils are alluvial. In the interior there are small extensions of Brown-Forest soil (subtropical), and Latosol undulating to rolling. The same occurs in the oriental extreme of the department. The largest extensions are

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[1] Extracted from Regionalizacion Biofisica de La Republica de Nicaragua, UNASEC (1975), and Inventorio de Recursos Naturales.

covered with a Lithosol, Regosol, and Red-yellow Podzolic soil. The agricultural potential of this soil is very low due to excessive slopes. These soils have little forseeable agricultural potential other than for forest and limited pasture. Small areas of less sloping land would be suited for subsistence cropping.

Vegetation in the department is varied. Almost all the eastern part is cultivated with coffee, except for the southeastern extreme and the central part, in which crops intermingling with pastures can be observed, and also a few broadleaf evergreen forests, which have almost all been cut down. In the interior of the department coffee plantations intermingle with savanna, partly in pastures with scattered shrubs and patches of forest. In the western part, vegetation is even more varied. Deciduous forests and shrubs surround crops intermingled with shrubs and savanna partly in pasture with scattered shrubs and patches of forest.

Crop and Livestock Activities

Coffee cultivation has been the most important activity in this century. Production of basic grains such as corn, beans and rice is also important; however, yields obtained are low with the exception of rice production which uses high technology. Recently, cotton production has become important and crop diversification is occurring.

From 1935-1950, wheat was planted in a 300 mz area, between Jinotega and Sn. Rafael del Norte, but due to losses occurring during the humid years this crop was abandoned. Other crops in the region are sugar cane, shade grown tobacco, cigarette tobacco, vegetables and flowers. Methods of sprinkling and gravity irrigation are used in cultivation of shade

grown tobacco and flood irrigation is used in rice cultivation. Erosion of the soil is the most important agronomic problem in the region to the point of destroying the arable layers.

Cattle production is a very important activity in the region, although it does not provide the economic returns obtained from most crops. The major problems with cattle raising are low milk production and poor quality of pastures. However, a powdered milk processing plant in the region encourages milk production. Unfortunately, the burning of the pastures at the end of the dry season leaves the soils nude and exposed to erosion.

Forest activity also is very important in the region. The forests are mainly broadleaf evergreen forests but there are also thin pine forests and atrophied masses of broadleaf deciduous forests. Pine forests do not exist any more in commercial quantities; exploitation is only possible on a limited scale, at a high cost with very limited possibilities for exportation. The broadleaf evergreen forests in the western part of the region are being destroyed by the expansion of the agriculture and cattle "frontier" from the eastern part of the region.

Land Use in Matagalpa

Crop uses of the land occupy an area of 61,800 Ha. (618 Km^2), corresponding to 9% of the departmental area. The agricultural area is distributed in the western and northern part of the department. Coffee is the most important crop with 36,800 Ha. (368 Km^2). Annual crops cover 25,000 Ha. (250 Km^2).

Livestock uses of the land occupies 546,400 Ha. (5,464 Km^2). This is equivalent to 80% of the departmental area and the largest use. Forestry

Forestry uses occupy 712,000 Ha. (712 Km^2), equivalent to 10% of the departmental area. This area is distributed in the western and southern parts of the department.

Livestock and Crop Development Potential

The region presents excellent potential for cattle activity; however, it is important to distinguish development in the valley from development in the mountains. Development of crops is possible in the valleys, while on lands of greater slopes there is potential for perennial crops and for cattle raising. However, deterioration of these lands represents a real problem urging solution.

Ecologically most tropical and subtropical crops can be produced in the region due to the variety of climates existing, although the main limitation is the soils. This means that annual crops and some perennial crops should be produced only on flat lands since undulating and sloped lands are not easily adaptable to row crops due to erosion potential.

CHARACTERISTICS OF THE CHINANDEGA AND LEON REGION[1]

Topography and Climate

The North Pacific Region is located on the northwestern part of the country and has an area of 9,084 Km^2. It includes the entire departments of Leon and Chinandega except the municipios of Nagarote and San Nicolas. Chinandega has an area of 4,662 Km^2 and Leon has 5,234 Km^2. The greater part of the region is under 200 meters above sea level but in the Cordillera de los Morrabios, San Cristobal Volcano is 1,745 meters and in the northern part of the region the Cerro Variador reaches 1,522 meters.

The dominant climate is tropical dry with temperatures higher than 24°C as an annual average. At greater heights climate becomes Premontano humid with temperatures between 18°C and 24°C. Precipitation is distributed during six months (May to November); the rest of the year is totally dry. Precipitation is very abundant in the western part of the region (Cosiguina) with some 2,200 mm in the rainy months. Precipitation decreases towards the plains and the southern part of the Leon region with 1,500 mm during the six rainy months. Geographical conditions alter normal precipitation in the area, increasing on the volcanoes and decreasing in the low internal valleys to 1,200 mm.

Soils and Vegetation

There is a great variety of soils in the Chinandega-Leon region. In the west the soils are Ando, in level to undulating volcanic plains with

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[1]Extracted from Regionalalizacion Biofisica de La Republica de Nicaragua, UNASEC (1975), and Inventorio de Recursos Naturales.

fans at the base of volcanic mountains. Slopes are generally 2% to 5%. Dark brown to dark permeable sandy loam to loam soils are 30 to 60 cm in depth. Locally, the soils are underlain at varying depths by an impervious horizon. They are generally neutral to highly acid in reaction. Under natural conditions those soils have a high content of organic matter. There are inclusions of alluvial and lithosol soils and also areas of stony land.

The agricultural potential of this soil is high to very high. The majority of this land is well suited to intensive mechanized cultivation of annual crops. With ample use of nitrogenous and phosphatic fertilizers, the soils are capable of high to very high yields. Conservation practices are required to prevent serious wind and water erosion of the top soil.

In the extreme southwestern part of Leon, there is a Noncalcic Brown soil in level to undulating plains of basins and coastal areas. Typical soils are grayish-brown, clay loams and stony loams 20 to 75 cm thick over alluvial-colluvial material, sandstones, shales and limestone. They are generally low in organic matter and slightly acid to neutral. The surface layer becomes very hard or extremely hard when dry although it is friable when moist. These soils are of moderate fertility. The agricultural potential is high. These soils are topographically well suited to intensive mechanized cultivation of annual crops. Although they are of moderate fertility, production is variable because of uncertain rainfall. With irrigation and fertilizers, productivity could possibly become very high.

In the southern interior of the Leon region, the soil is Ando on hilly uplands of strongly dissected volcanic ash and lava deposits. These are Brown-gray and black loam soils developed from volcanic ash and other

similar materials. They are stony in some places. The surface layer of these soils is generally rich in organic matters and overlies deep deposits of grayish ash, tuff, and lava. The soils are well-drained, friable and neutral to acid reaction. The agricultural potential of these soils is medium to low. Because of steepness of slopes, most of this land is not suited to intensive mechanized cultivation of annual crops. However, much of it is suited to perennial crops such as coffee and fruits. It is suited for forest and pasture. In this area, Lithosol, Regosol and Red-Yellow Podzolic soils can also be found; in the northwestern part of the Chinandega region they occur on steep to very steep slopes. Lithosols, the most extensive of this group, are shallow, stony hills which show little or no evidence of soils formation other than an accumulation of a few centimeters of weathered material underlain by hard bedrock. The Regosols are comprised mainly of steep volcanic cones composed of recent volcanic ash, tuff, and other volcanic materials. Red-Yellow Podzolic soil occurs on inclined mild slopes. The agricultural potential is very low. Because of excessive slopes, these soils have very little forseeable agricultural potential other than for forest and limited pasture. Small areas of less sloping land would be suited for subsistence cropping.

The soil in the central interior of the region and eastwards is alluvial on nearly level plains adjacent to streams and in valleys and basins. The hazard of flooding is high in some places. These soils are composed of geologically recent materials generally near streams, and also of much older material generally in valleys and basins. They show little or no evidence of soil forming processes other than accumulation of organic matter in the surface horizon. They are usually deep soils

with a wide range of textures ranging from sands to clays. The soils are generally slightly acid to acid in reaction. Drainage varies from excessive to very poor; flooding occurs in some places.

The agricultural potential of these soils is medium. This land is topographically well suited to intensive, mechanized agriculture. Areas which have desirable soil textures and drainage provide some of the most productive land in the country. Drainage, management, and flooding problems exist in some areas. Irrigation and fertilizers would be beneficial in many places. These soils are interrupted by small extensions of Noncalcic-Brown soil on Intermontane hilly uplands, dissected old plains and footslopes of mountains. Also, patches of Lithosol, Regosol and Red-Yellow Podzolic soil can be found.

Crop and Livestock Activities

Before 1950, the arable lands in the region were planted with corn, lima beans and rice. Other lands were cultivated with sugar cane, sesame and cotton. However, with the increase in cotton prices this crop displaced the others, including sugar cane, and took over even the marginal lands for cultivation.

Eventually, the decrease in cotton prices and the recurrence of plagues caused a reduction of the area cultivated with this crop. This situation indicated a diversification in agriculture. However, in the last 20 years cotton prices have fluctuated and so has the area dedicated to its cultivation.

The most important crops in the region are: cotton, sugar cane, banana, peanuts, corn and rice. The marginal areas of these crops are

planted with sorghum and sesame. Other crops are coffee, okra, cassava, henequen, vegetables and fruits.

Weather represents a limitation with respect to the number of crops that could be produced in the region. Because of the long lasting dry season, only annual tropical crops can be produced in most areas. These crops have a growing period of six months or less. Both production and number of crops grown could be increased with irrigation, the implementation of which is one of the best possibilities for development of the region. The lands actually under irrigation affect primarily sugar cane cultivation and then banana, rice, pastures and some rotation crops such as corn, okra, sorghum and vegetables. Ditch irrigation is more common (sugar cane and rice) but lately sprinkler irrigation has been expanding.

It is important to mention that some pastures are being irrigated on soils well-suited for crop agriculture. Another problem in the region, mainly in the fertile lands, is the need for crop rotation with the purpose of incorporating organic matter in the soil. The top parts of the volcanoes are continuously deforested (timber exploitation) leaving the lands unprotected and exposed to both water and wind erosion, which in turn, affects the flat land areas through the formation of gullies and deposits of coarse materials, the latter obstructing the delta and creek areas.

In the region, the livestock industry occupies an important place, although its value of production does not even approach the value of most crops. The main problem rests on the extensive use given to the pastures. More intensive use is certainly possible for most of the pasture lands.

Food production in most pastures is below their potential; natural pastures yield less than the improved pastures, although many of the latter pastures are in poor condition due mainly to inadequate management techniques.

Burning the fields at the end of the dry season leaves the soil unprotected and exposed to water erosion mainly. In general, the farms can be improved by a rotation grazing system which includes preserving and supplying animal feed, use of crop waste and introduction of specialized breeds of cattle.

The forest activity occupies third place in importance in the region. The forests have been cut down and burned to open lands for agriculture and livestock industry. In earlier years, trees only were cut down for exports, construction, and firewood. Mangrove trees were cut down for tanning and props. Presently, there are 200 mz. planted with bamboo for the production of props since the Ministry of Agriculture and Livestock has restricted the deforestation of mangrove trees to protect the fauna in the region.

There are three kinds of forests: broadleaf and deciduous forests; pine forests; and, mangrove forests. The broadleaf and deciduous forests provide wood for construction and props; mangrove forests provide props, and pine forests, of low density and size, are found in areas of difficult access for which reason they can be used locally only.

Land Use in Leon

Crop uses of the land occupy an area of 124,000 Ha. (1,240 Km^2), equivalent to 24% of the departmental area; it is distributed mostly in

the central part of the department. Cotton is the most important crop followed by annual crops and sugar cane.

Livestock uses cover 259,100 Ha. (2,591 Km^2), equivalent to 50% of the departmental area. The areas dedicated to cattle activity are found in the undulating lands of the north and the flat lands of the Pacific Coast.

Forestry uses cover 136,500 Ha. (1,365 Km^2), equivalent to 26% of the departmental area. Pine forests, broadleaf forests and mangroves are included in this category. The pine forests cover 6,800 Ha. (68 Km^2), and are located on the northern highlands. The broadleaf forests cover 118,000 Ha. (1,180 Km^2), and are distributed all over the department. Mangroves occupy 11,700 Ha. (117 Km^2); they are found on the low lands of the Pacific coast. There are other uses in the department which occupy 3,800 Ha. (38 Km^2).

Land Use in Chinandega

Crop uses of the land occupy 109,500 Ha. (1,095 Km^2), equivalent to 23% of the departmental area. This is distributed on the southeast region of the department. Crops such as cotton, sugar cane, corn and banana are the most important and they occupy an area of 108,700 Ha. Coffee is cultivated in small areas (8.00 Ha.).

Livestock uses of the land cover 132,500 Ha. (1,325 Km^2), equivalent to 28% of the departmental area. Cattle are scattered all through the department, although the most important concentrations occur in the northern highlands.

Forestry uses of the land occupy 224,200 Ha. (2,242 Km^2), equivalent to 48% of the departmental area. Two types of forests have been identified: Broadleaf and Mangrove forests. The first type covers an area of

156,700 Ha. (1,567 Km^2) and the main concentrations are found in the Cosiguina peninsula, in the Marrabios mountain range and in the flat lands of the interior. Most of the species lack commercial value. Mangroves occupy 67,500 Ha. (675 Km^2) and they are distributed on the low lands of the Estero Real and on the Corinto Bay.

HIGHWAY AND ROAD NETWORK IN THE THREE DEPARTMENTS

The road network has been classified by types of pavement (high-type surface, gravel surface, dirt surface and dry season roads). The pavement structure consists of either asphalt or concrete. The difference between gravel surface roads and all weather dirt roads is that the first has a better layout and improved drainage, both being usable all year long. The dry season roads do not have any of the above characteristics and can not be used during the rainy season.

The road network corresponding to the departments selected for this study is indicated in Table 1.

TABLE 1: TYPE OF PAVEMENT, BY DEPARTMENT, FOR CHINANDEGA, LEON AND MATAGALPA, NICARAGUA

	All Weather			Dry Season Only	
Department	Asphalt or concrete.	Gravel surface	Dirt surface		Total
Chinandega	152.8	225.9	298.5	1,075.0	1,752.2
Leon	200.1	162.6	546.6	1,020.4	1,929.7
Matagalpa	135.7	332.1	914.3	670.9	2,055.0

Source: Ministerio de Obras Publicas, Direccion General de Caminos, Dec., 1976.

POPULATION CHARACTERISTICS OF THE THREE DEPARTMENTS

The most populated of the three departments considered for this study is Leon with 212,100 inhabitants, 21,052 more than Chinandega and 20,868 more than Matagalpa. However, the largest Department is Matagalpa, with an area of 6,794 Km^2, followed by Leon with 5,234 Km^2 and Chinandega with 4,662 Km^2. (Table 2)

TABLE 2: POPULATION, AREA AND DENSITY OF THE DEPARTMENTS OF CHINANDEGA, LEON AND MATAGALPA, JUNE 30, 1977

Department	Urban Pop.	Rural Pop.	Total Pop.	Area a)	Density b)
Chinandega	99,374	91,674	191,048	4,662	40.97
Leon	111,918	100,182	212,100	5,234	40.52
Matagalpa	52,058	139,174	191,232	6,794	27.26

Source: Oficina Ejecutiva de Encuestas y Censos

a) The area, in Km^2, does not include underwater area

b) Measured in inhabitants per Km^2

Density in the Departments of Chinandega and Leon is almost the same, around 40 people per square kilometer. Density in the Department of Matagalpa is lower, 27.26 people per square kilometer. It should be noted, however, that the Matagalpa density was determined excluding the population and area of the Rio Blanco Municipio, which was recently incorporated into Matagalpa.

Population distribution in urban and rural areas generally has the same pattern for the Departments of Chinandega and Leon; however, this is not true in the Department of Matagalpa which has a rural population considerably larger than its urban population. The Government of Nicaragua defines those areas as urban with concentrations larger than 1,000 people, and concentrations lower than 1,000 people are considered rural.

The last population census in Nicaragua was completed in 1971. The data included in this report were first based on the 1971 census and then projections were made to 1975 using natural growth and internal migration factors, the latter being very significant due to high rates of migration resulting from the 1972 earthquake in the city of Managua. On the basis of the 1975 projections, the Oficina Ejecutiva de Encuestas y Censos has made estimates for years 1977-1980. These estimates are based on the average annual rates of demographic growth.

Matagalpa Department

For purposes of this study, the municipios selected in this department are San Ramon, Esquipulas, Muy Muy, San Dionisio and Matiguas. The largest municipio in both population and area is Matiguas with 26,454 people and 1910 Km^2. San Ramon has 16,913 people in 768 Km^2 of area. Esquipulas follows with 8,250 inhabitants and 222 Km^2 of area. Muy Muy has 6,410 inhabitants in 378 Km^2. Finally, San Dionisio has 3,866 inhabitants and 101 Km^2 of area (Table 3). The highest densities are found in San Dionisio with 38.27 inhabitants per square kilometer; Esquipulas has about the same density. Matiguas has the lowest density, 13.85, due to the great area of this municipio.

TABLE 3: TOTAL ESTIMATED POPULATION FOR THE DEPARTMENT OF MATAGALPA, AS OF JUNE 30, 1977

Municipio	Urban Pop.	Rural Pop.	Total Pop.	Surface Area in Km^2 a/	Density in Km^2
Matagalpa	25,573	44,645	70,218	1880	37.35
Ciudad Dario	7,048	18,997	26,045	736	35.38
Esquipulas	2,758	5,492	8,250	222	37.16
Matiguas	2,887	23,567	26,454	1910	13.85
Muy Muy	2,015	4,395	6,410	378	16.45
Sebaco	3,915	6,938	11,121	317	35.08
San Dionisio	908	2,858	3,866	101	38.27
San Isidro	2,886	4,940	8,006	192	41.69
San Ramon	895	15,655	16,913	768	22.02
Terrabona	1,086	8,020	9,257	290	31.92
Rio Blanco	2,087	3,667	5,922	NA	NA
Total Dept.	52,058	139,174	191,232	6794 b/	27.26

a/ Does not include surface area under water.
b/ Does not include the surface area of Municipio de Rio Blanco.

TABLE 4: POPULATION PROJECTIONS FOR THE DEPARTMENT OF MATAGALPA, 1977-1980

Municipio	1977	1978	1979	1980
Matagalpa	60,218	72,276	74,395	76,577
Ciudad Dario	26,045	26,489	26,940	27,399
Esquipalas	8,250	8,443	8,641	8,844
Matiguas	26,454	26,947	27,450	27,962
Muy Muy	6,410	6,598	6,791	6,990
Sebaco	10,853	11,121	11,396	11,678
San Dionisio	3,766	3,866	3,969	4,075
San Isidro	7,826	8,006	8,192	8,383
San Ramon	16,550	16,913	17,284	17,664
Terrabona	9,106	9,257	9,411	9,568
Rio Blanco	5,754	5,922	6,094	6,271
Total Dept.	191,232	195,838	200,563	205,411

TABLE 5: POPULATION PROJECTIONS FOR THE URBAN AREAS, DEPARTMENT OF MATAGALPA, 1977-1980

Municipio	1977	1978	1979	1980
Matigalpa	25,573	26,404	27,262	28,148
Ciudad Dario	7,048	7,192	7,339	7,489
Esquipulas	2,758	2,844	2,933	3,025
Matiguas	2,887	2,959	3,033	3,109
Muy Muy	2,015	2,080	2,147	2,216
Sebaco	3,915	4,034	4,157	4,283
San Dionisio	908	940	973	1,008
San Isidro	2,886	2,995	3,109	3,227
San Ramon	895	929	964	1,001
Terrabona	1,086	1,117	1,149	1,182
Rio Blanco	2,087	2,152	2,219	2,288
Total Dept.	52,058	53,646	55,285	56,976

TABLE 6: POPULATION PROJECTIONS FOR THE RURAL AREAS, DEPARTMENT OF MATAGALPA, 1977-1980

Municipio	1977	1978	1979	1980
Matagalpa	44,645	45,872	47,133	48,429
Ciudad Dario	18,997	19,297	19,601	19,910
Esquipulas	5,492	5,599	5,708	5,819
Matiguas	23,567	23,988	24,417	24,853
Muy Muy	4,395	4,518	4,644	4,774
Sebaco	6,938	7,087	7,239	7,395
San Dionisio	2,858	2,926	2,996	3,067
San Isidro	4,940	5,011	5,083	5,156
San Ramon	15,655	15,984	16,320	16,663
Terrabona	8,020	8,140	8,262	8,386
Rio Blanco	3,667	3,770	3,875	3,983
Total Dept.	139,174	142,192	145,278	148,435

Source: Oficina Ejecutiva de Encuestas y Census.

Chinandega Department

In the Chinandega Department, the municipios chosen for the study were Chichigalpa, El Viejo and Posoltega. Of these, the most populated is El Viejo with 29,411 inhabitants; this municipio is also the largest of all municipios in the Department of Chinandega with an area of 1,271 Km^2. Chichigalpa has 27,465 people distributed over 253 Km^2. This municipio has the higher density of the three with 108.55 inhabitants per square kilometer. Finally, Posoltega has 8,498 people in an area of 144 Km^2; its density is 59.01 inhabitants per square kilometer. The lowest density among the municipios selected is found in the municipio of El Viejo, 23.14 inhabitants per square kilometer.

TABLE 7: TOTAL ESTIMATED POPULATION FOR THE DEPARTMENT OF CHINANDEGA, AS OF JUNE 30, 1977

Municipio	Urban Pop.	Rural Pop.	Total Pop.	Surface Area in Km^2 a/	Density in Km^2
Chinandega	42,145	17,818	59,963	625	95.94
Chichigalpa	18,298	9,167	27,465	253	108.55
Cinco Pinos	538	4,593	5,131	59	86.96
Corinto	15,541	1,367	16,908	10	1690.80
Morazan	1,891	2,103	3,994	224	17.83
Posoltega	1,928	6,570	8,498	144	59.01
El Realejo	682	1,825	2,507	100	25.07
San Francisco	522	5,115	5,637	144	39.14
San Pedro	532	3,465	3,997	76	52.59
Santo Tomas	848	3,018	3,866	34	114.29
Somotillos	2,494	11,780	14,274	928	15.38
El Viejo	12,284	17,127	29,411	1271	23.14
Villanueva	1,671	7,726	9,397	794	11.83
Total Dept.	99,374	91,674	191,048	4662	40.97

TABLE 8: POPULATION PROJECTIONS FOR THE DEPARTMENT OF CHINANDEGA, 1977-1980

Municipio	1977	1978	1979	1980
Chinandega	59,963	62,145	64,410	66,671
Chichigalpa	27,465	28,295	29,154	30,041
Cinco Pinos	5,131	5,243	5,359	5,477
Corinto	16,908	17,408	17,923	18,455
Morazan	3,994	4,062	4,131	4,201
Posoltega	8,498	8,737	8,985	9,241
El Realejo	2,507	2,532	2,558	2,585
San Francisco	5,637	5,761	5,888	6,017
San Pedro	3,997	4,101	4,209	4,319
Santo Tomas	3,866	3,950	4,037	4,127
Somotillo	14,274	14,676	15,090	15,515
El Viejo	29,411	30,378	31,377	32,409
Villanueva	9,397	9,611	9,830	10,054
Total Dept.	191,048	196,899	202,951	209,202

TABLE 9: POPULATION PROJECTIONS FOR THE URBAN AREAS, DEPARTMENT OF CHINANDEGA, 1977-1980

Municipio	1977	1978	1979	1980
Chinandega	42,145	43,894	45,716	47,613
Chichigalpa	18,298	18,930	19,601	20,287
Cinco Pinos	538	547	557	567
Corinto	15,541	16,026	16,526	17,042
Morazan	1,891	1,938	1,986	2,035
Posoltega	1,928	2,018	2,113	2,212
El Realejo	682	689	697	705
San Francisco	522	533	544	555
San Pedro	532	547	563	579
Santo Tomas	848	869	891	914
Somotillos	2,494	2,592	2,694	2,799
El Viejo	12,284	12,761	13,256	13,770
Villanueva	1,671	1,728	1,787	1,848
Total Dept.	99,374	103,080	106,931	110,926

TABLE 10: POPULATION PROJECTIONS FOR THE RURAL AREAS, DEPARTMENT OF CHINANDEGA, 1977-1980

Municipio	1977	1978	1979	1980
Chinandega	17,818	18,251	18,694	19,148
Chichigalpa	9,167	9,357	9,553	9,754
Cinco Pinos	4,593	4,696	4,802	4,910
Corinto	1,367	1,382	1,397	1,413
Morazan	2,103	2,124	2,145	2,166
Posoltega	6,570	6,719	6,872	7,029
El Realejo	1,825	1,843	1,861	1,880
San Francisco	5,115	5,228	5,344	5,462
San Pedro	3,465	3,554	3,646	3,740
Santo Tomas	3,018	3,081	3,146	3,213
Somotillo	11,780	12,084	12,396	12,716
El Viejo	17,127	17,617	18,121	18,639
Villanueva	7,726	7,883	8,043	8,206
Total Dept.	91,674	93,819	96,020	98,276

Leon Department

In this Department, two municipios were selected for the study, La Paz Centro and Telica. La Paz Centro has 15,641 people and is the largest municipio in Leon. It has an area of 872 Km^2 and the lowest density with 17.93 inhabitants per square kilometer. Telica has 12,509 inhabitants distributed over 364 Km^2, for a density of 34.36 inhabitants per square kilometer.

TABLE 11: TOTAL ESTIMATED POPULATION FOR THE DEPARTMENT OF LEON, AS OF JUNE 30, 1977

Municipio	Urban Pop.	Rural Pop.	Total Pop.	Surface Area in Km^2 a/	Density in Km^2
Leon	77,843	26,676	104,519	852	122.67
Achuapa	1,553	9,613	11,166	342	32.64
El Jicaral	525	3,166	3,691	206	17.91
Larreynaga	5,452	14,618	20,070	834	24.06
Nagarote	9,667	5,662	15,329	602	25.46
La Paz Centr.	8,463	7,178	15,641	872	17.93
Quezalguaque	519	3,695	4,214	48	87.79
El Sauce	4,067	12,000	16,067	700	22.95
San Nicolas	270	3,669	3,939	210	18.75
Santa Rosa del Penon	639	4,316	4,955	204	24.28
Telica	2,920	9,589	12,509	364	34.36
Total Dept.	111,918	100,182	212,100	5,234	40.52

a/ Does not include surface area under water.

TABLE 12: POPULATION PROJECTIONS FOR THE DEPARTMENT OF LEON, 1977-1980

Municipio	1977	1978	1979	1980
Leon	104,519	107,954	111,507	115,182
Achuapa	11,166	11,452	11,745	12,046
El Jicaral	3,691	3,779	3,869	3,962
Larreynaga	20,070	20,599	21,142	21,700
Nagarote	15,329	15,742	16,167	16,603
La Paz Centr.	15,641	15,974	16,314	16,661
Quezalguaque	4,214	4,309	4,407	4,507
El Sauce	16,067	16,580	17,110	17,656
Santa Rosa	4,955	5,011	5,068	5,126
San Nicolas	3,939	4,011	4,085	4,160
Telica	12,509	12,837	13,175	13,522
Total Dept.	212,100	218,248	224,589	231,125

TABLE 13: POPULATION PROJECTIONS FOR THE URBAN AREAS, DEPARTMENT OF LEON, 1977-1980

Municipio	1977	1978	1979	1980
Leon	77,843	80,715	83,693	86,781
Achuapa	1,553	1,597	1,642	1,688
El Jicaral	525	532	539	546
Larreynaga	5,452	5,600	5,752	5,908
Nagarote	9,667	9,912	10,163	10,420
La Paz Centr.	8,463	8,636	8,812	8,992
Quezalguaque	519	536	554	573
El Sauce	4,067	4,232	4,404	4,582
San Nicolas	270	275	281	287
Santa Rosa del Penon	639	649	659	670
Telica	2,920	3,025	3,134	3,247
Total Dept.	111,918	115,709	119,633	123,694

TABLE 14: POPULATION PROJECTIONS FOR THE RURAL AREAS, DEPARTMENT OF LEON, 1977-1980

Municipio	1977	1978	1979	1980
Leon	26,676	27,239	27,814	28,401
Achuapa	9,613	9,855	10,103	10,358
El Jicaral	3,166	3,247	3,330	3,416
Larreynaga	14,618	14,999	15,390	15,792
Nagarote	5,662	5,830	6,004	6,183
La Paz Centr.	7,178	7,338	7,502	7,669
Quezalguaque	3,695	3,773	3,853	3,934
El Sauce	12,000	12,348	12,706	13,074
San Nicolas	3,669	3,736	3,804	3,873
Santa Rosa del Penon	4,316	4,362	4,409	4,456
Telica	9,586	9,812	10,041	10,275
Total Dept.	100,182	102,539	104,956	107,431

RESULTS AND INTERPRETATION OF DATA

This section presents the results of the tabulation of the data collected in the two regions. Most of the data was in terms of percentage of total sales going to each destination, where destination was in terms of both economic sector and order of city. In addition, data on type and origin of inputs were collected for all agricultural and manufacturing sectors. Calculation of the input-output coefficients and the sectoral allocation of total household expenditures and total exports are explained. Voids in the data for input-output analysis and suggestions for correcting these problems in further studies are discussed. The input-output tables for the two regions are presented and interregional comparisons are made. Finally it should be pointed out that the final input-output tables presented in this section resulted from the combined use of both the data from the sample survey and data derived from secondary sources.

Intersectoral Linkages

Product Flow From Origin to Destination

To facilitate exposition of the final results, data from the questionnaires had to be aggregated from the level of specific products to more general categories. Three levels of aggregation are involved. First, each questionnaire represents a city and in the case of the non-agricultural sectors it was necessary to aggregate over very specific

product categories to major economic sectors (e.g. manufacturing, construction) on a city level. Next we had to aggregate over cities to a municipio level. Finally, we aggregated over the five municipios in each region to arrive at the regional levels where the analysis was carried out.

A product or service was classified under one of four subheadings: (1) Commercial Agriculture; (2) Traditional Agriculture; (3) Rural Non-agriculture; and, (4) Urban Commercial. The complete list of economic sectors and their respective code numbers which will be used throughout the remainder of this report are indicated in Table 15.

Since the data collected were in terms of percentages (either percent of total sales or percent of gross output), weights have to be used to aggregate over specific products and cities. The exact method of aggregation and weights used depends upon which category of products is being considered. In the agriculture sectors, export crops and food crops are handled separately. Animal products are classified under commercial agriculture, when the farms are greater than ten manzanas. To get to the municipio level of aggregation for the agricultural sectors, the weights applied were the proportion of total population in the municipio represented by each localidad. This is clearly unsatisfactory, but in the absence of data on the sub-municipio level, it was felt this would be better than treating each first order city equally. Since the major activity in these small towns is agriculture, relative population size will reflect at least somewhat the importance of the localidad in terms of agricultural production. For the agricultural sectors it was not necessary to aggregate over crops for each questionnaire because there were few crops and the responses were uniform. To aggregate over municipios it was necessary to aggregate over specific crops and products.

TABLE 15: LIST OF ECONOMIC SECTORS AND CODE NUMBERS USED IN DEVELOPING INPUT-OUTPUT TABLES

1.0	COMMERCIAL AGRICULTURE
1.1	Export Crops
1.2	Food Crops
1.3	Animal Products
2.0	TRADITIONAL AGRICULTURE
2.1	Export Crops
2.2	Food Crops
3.0	RURAL NONAGRICULTURE
3.1	Manufacturing
3.2	Construction
3.3	Storage, Transportation
3.4	Commerce
3.5	Services
3.6	INVIERNO
4.0	RURAL HOUSEHOLDS
5.0	URBAN COMMERCIAL
5.1	Manufacturing
5.2	Construction
5.3	Utilities
5.4	Commerce
5.5	Storage, Transportation
5.6	Finance
5.7	Services
5.8	INVIERNO
6.0	URBAN HOUSEHOLDS

Data on crop production were available so the weights used were the proportions of total production for the region that each crop represented for the municipio. The final step was to aggregate over crops since value of crops was not available by department and to be consistent with the methodology used for the nonagricultural sectors, the weights used were the proportions of total manpower used in the production of each crop for the department.

The nonagricultural sectors presented a greater problem because of the lack of output data on a municipio level by specific product. Some help was derived from another study carried out by DIPSA (5)when employment data on a localidad level by specific occupation were obtained for the department of Matagalpa. These employment data were used to ascertain the relative importance of each specific product on a city level. Using these weights, we were able to aggregate to a level of product classification indicated in Table 15 on a localidad basis. Although these secondary data were for the Matagalpa region and for first order cities, they were used to aggregate within the second and third order questionnaires. These data were used also in the Leon-Chinandega region. Since the object of the study is to compare the two regions, it was felt that using the same weights in each region was better than assigning equal weights to products within each localidad in the Leon-Chinandega region.

The results of the aggregation process are presented in Table 16. Shown are the flow of total sales as a percent of total supply going to satisfy intermediate demand in first order, or second and third order cities, by economic sector, rural or urban households, exports to a region center,[1/]

[1/] The regional center for the Matagalpa region is the city of Matagalpa. The regional center for the Leon-Chinandega region is the combined cities of Leon and Chinandega.

TABLE 16: TOTAL SALES FLOW MATRIX FOR THE MATAGALPA REGION AND FOR THE LEON-CHINANDEGA REGION[a/]

Source of Supply \ Source of Demand[b]	1.1	1.2	1.3	2.1	2.2	3.1	3.2	3.3	3.4	3.5	3.6	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	Rural Households 4.0	Urban Households 6.0	Exports Matagalpa (L-C) 7.0	Exports Regional 8.0	Total
First Order Cities (Localidades)																								
1.1						(1.5)			3.0			(5.3)			70.0							(33.1) 67.0	(20.1)	(100) 100
1.2									14.0			(24.3)			(6.3) 38.0					36.0		(37.5) 12.0	(31.0)	(100) 100
1.3									(24.0)						(15.0)					(19.5)		(26.7)	(3.3)	(100) 100
2.1												(9.6)			(15.5) 27.0							(67.5) 73.0	(7.5)	(100) 100
2.2						(22.6) 1.0			(12.5) 22.0						(20.6) 52.0					(20.7) 16.0	(1.9)	(22.2) 9.0		(100) 100
3.1	(3.2) 4.0						(5.0) 26.0		(2.0) 3.0				1.0		(2.9) 11.0			1.0		(50.5) 47.4	5.0	(5.9) 2.0		(100) 100
3.2																								(100) 100
3.3																								(100) 100
3.4																				(100.0) 100.0				(100) 100
3.5																								(100) 100
3.6																								(100) 100
Secon' and Third Order Cities																								
5.1		6.0					(0.5) 1.0		(1.1)				(0.9) 17.9		(34.3) 6.0					(3.2) 3.0	(10.3) 61.1	(44.9) 5.0	(5.5)	(100) 100
5.2																								(100) 100
5.3																								(100) 100
5.4															(19.9) 76.3					(23.0) 9.0	(17.1)	(31.8) 14.7	(0.7)	(100) 100
5.5	100.0																							(100) 100
5.6	(99.7)																				(0.3)			(100) 100
5.7																				(36.9)	(63.6)			(100) 100
5.8					100.0																			(100) 100

Source: Basic Data obtained from Survey Forms. See Tables in Appendix C

a/ Data for the Leon-Chinandega Region are presented in Appendix C

b/ As a percent of total supply.

and exports out of the region. The table includes data for both regions; the data for the Leon-Chinandega region are in parenthesis. This enables easier comparison of the linkages. These comparisons will be discussed in greater detail later. However, it seems clear that while there is considerable agreement as to the existence of linkages between the regions, the magnitudes are very different and suggest that the methodology can be used to identify differences in linkages.

Purchase of Inputs: Agriculture

The respondents were also required to list the major inputs and the location from which the input was purchased. The results of this tabulation for the Matagalpa and Leon-Chinandega regions are presented in Tables 17 and 18, respectively. While the respondents were asked to give the relative importance of each input, these data were not used. Instead input coefficients by crop group and farm size were derived from crop specific data (6). These coefficients for the Matagalpa and Leon-Chinandega regions are presented in Tables 19 and 20, respectively. Input coefficients for beef/milk production are presented in Table 21. One set of coefficients was used for both regions due to lack of regional data. These data will be combined with the sales flow data in Table 16 to calculate additional input-output coefficients.

Examination of the tables reveals substantial differences between the two regions. For example in the Matagalpa region 79 percent of the chemicals for commercial food crops are purchased at the first order level as compared to zero for the Leon-Chinandega region. To some extent, this is a result of inputs from INVIERNO being treated as coming from first order cities.

TABLE 17: PURCHASED INPUTS AND LABOR FOR AGRICULTURE, AND PROPORTION OF TOTAL INPUTS BY TYPE OF INPUT AND ORIGIN FOR THE MATAGALPA REGIONS

Sector of Destination	Order of City of Origin	Input: Chemicals	Seeds	Feed Grain	Labor
Commercial Agriculture					
Food Crops	1	.79	.88	--	1.00
	2	--	--	--	--
	3	.01	.01	--	--
	Matagalpa	.20	.11	--	--
Export Crops	1	.25	--	--	1.00
	2	--	--	--	--
	3	.39	--	--	--
	Matagalpa	.36	--	--	--
Animal Products	1	--	--	--	1.00
	2	--	--	--	--
	3	--	--	.15	--
	Matagalpa	--	--	.85	--
Traditional Agriculture					
Food Crops	1	.98	.98	--	1.00
	2	--	--	--	--
	3	.02	.02	--	--
	Matagalpa	--	--	--	--
Export Crops	1	1.00	--	--	1.00
	2	--	--	--	--
	3	--	--	--	--
	Matagalpa	--	--	--	--
Animal Products	1	--	--	--	--
	2	--	--	--	--
	3	--	--	--	--
	Matagalpa	--	--	--	--

TABLE 18: PURCHASED INPUTS AND LABOR FOR AGRICULTURE, AND PROPORTION OF TOTAL INPUTS BY TYPE OF INPUT AND ORIGIN FOR THE LEON-CHINANDEGA REGION

Sector of Destination	Order of City of Origin	Input: Chemicals	Seeds	Feed Grain	Labor
Commercial Agriculture					
Food Crops	1	--	--	--	1.000
	2,3	.310	--	--	--
	Leon-Chinandega	.690	--	--	--
Export Crops	1	--	--	--	--
	2,3	.222	--	--	--
	Leon-Chinandega	.718	--	--	--
	Managua	.062	--	--	--
Animal Products	1	--	--	--	--
	2,3	1.000	--	.500	--
	Leon-Chinandega	--	--	.500	--
Traditional Agriculture					
Food Crops	1	--	--	--	1.000
	2,3	.391	--	--	--
	Leon-Chinandega	.609	--	--	--
Export Crops	1	--	--	--	1.000
	2,3	.445	--	--	--
	Leon-Chinandega	.555	1.000	--	--

TABLE 19: INPUT COEFFICIENTS[a] BY CROP GROUP AND SIZE OF FARM FOR THE MATAGALPA REGION

Input	Farm Size: Less Than 10 Manzanas, Food Crops	Less Than 10 Manzanas, Export Crops[b]	Greater Than 10 Manzanas, Food Crops	Greater Than 10 Manzanas, Export Crops[b]
Purchased Inputs	.135	.110	.170	.170
Seed	.042	.005	.031	.004
Chemicals & Other	.093	.105	.139	.166
Interest	.025	.010	.020	.030
Households[d]	.840	.880	.810	.800

TABLE 20: INPUT COEFFICIENTS[a] BY CROP GROUP AND SIZE OF FARM FOR THE LEON-CHINANDEGA REGION

Input	Farm Size: Less Than 10 Manzanas, Food Crops	Less Than 10 Manzanas, Export Crops[c]	Greater Than 10 Manzanas, Food Crops	Greater Than 10 Manzanas, Export Crops[c]
Purchased Inputs	.159	.332	.206	.372
Seed	.038	.015	.036	.013
Chemicals & Other	.121	.317	.170	.359
Interest	.024	.032	.029	.030
Households[d]	.817	.636	.765	.598

Source: Nicaraguan Production Costs and Returns Analysis, University of Missouri, 1974.

[a]Proportion of total gross output (will sum to one for each category of crop).

[b]Coefficients for coffee production are used here.

[c]Coefficients for cotton production are used here.

[d]Includes returns to land, labor, capital, and animal energy plus gross margin.

TABLE 21: INPUT COEFFICIENTS FOR BEEF/MILK PRODUCTION

Input	Input Coefficient
Animal Products	0.113
Feed Grains	0.008
Other Purchased Inputs	0.011
Services	0.030
Interest	0.025
Households	0.714

Source: Nicaraguan Production Costs and Returns Analysis, University of Missouri, 1974.

TABLE 22: FIRST ORDER CITIES PURCHASE OF INPUTS FOR MANUFACTURING

	Percent of Gross Output						
	Matagalpa Region Purchased from			Leon-Chinandega Region Purchased from			
Sector	First Order Cities	Second and Third Order Cities	Matagalpa	First Order Cities	Second and Third Order Cities	Leon-Chinandega	Outside Region
Agriculture	28.0	0.0	0.0	15.1	0.7	1.2	0.0
Animal Products	6.4	0.0	0.0	8.3	0.0	5.1	0.0
Manufacturing	11.4	0.0	0.0	2.7	4.7	7.5	0.0
Commerce	5.9	0.0	0.0	0.0	3.5	4.7	1.7

However, the same is true for commercial export crops although the magnitude of the differences is smaller (.25 and 0.0). INVIERNO does not service commercial export crops (i.e., coffee). Ninety-eight percent (98%) of the chemicals and seeds for food crops on traditional farms are purchased at the first order level while none are purchased at the first order level in the Leon-Chinandega region. According to the results, both commercial agriculture and traditional agriculture are much more dependent on the Regional Center in the Leon-Chinandega region than in the Matagalpa region.

Purchase of Inputs: Manufacturing

While the respondents were asked to list the major inputs and location of purchase for every sector, the data for the nonagricultural sectors other than manufacturing were unusable for our purposes. The respondents simply were not able to give this information for these other sectors. These data for both regions for manufacturing in first order cities and manufacturing in second and third order cities, respectively, are presented in Tables 22 and 23. Again as in the case of agriculture, rural manufacturing is much more dependent on the first order cities for its inputs in the Matagalpa region, while it is much more dependent on the regional center in the Leon-Chinandega region. This is also true for the urban commercial manufacturing sector while perhaps not to the same extent.

TABLE 23: SECOND AND THIRD ORDER CITIES PURCHASE OF INPUTS FOR MANUFACTURING

	Percent of Gross Output					
	Matagalpa Region Purchased from			Leon-Chinandega Region Purchased from		
Sector	First Order Cities	Second & Third Order Cities	Matagalpa	First Order Cities	Second & Third Order Cities	Leon-Chinandega
Agriculture	37.5	0.0	0.0	8.2[a]		0.0
Animal Products	0.0	1.5	0.0	0.0	2.1	0.0
Commerce	0.0	3.0	4.2	0.0	6.6	16.2
Manufacturing	0.0	2.0	1.2	0.0	18.7	0.0

[a]Food crops.

Calculation of Input-Output Coefficients

Input-output coefficients are given by the standard formula

(1) $$a_{ij} = \frac{X_{ij}}{X_j}$$

where

X_{ij} = flow of goods from sector i to sector j and

X_j = total gross output in sector j.

We will assume that the ratio of employment to gross output in sector i, ℓ_i, is a constant so that

(2) $$L_{ij} = \ell_i X_{ij}$$
$$L_j = \ell_j X_j .$$

We obtain the proportion of total sales going to each destination by tabulating the survey form and aggregating; therefore

(3) $$\beta_{ij} = \frac{X_{ij}}{X_i}.$$

Where β_{ij} is the proportion of total sales in sector i going to sector j.

From (3) we get

$$X_{ij} = \beta_{ij} X_i.$$

Substituting (2) and (3) into (1)

(4) $$a_{ij} = \beta_{ij} \frac{X_i}{X_j} = \beta_{ij} \frac{\ell_j}{\ell_i} \frac{L_i}{L_j}.$$

Let

$$\ell_i = \ell_i' \, v_i$$

where

$$\ell_i' = \frac{L_i}{VA_i},$$

$$v_i = \frac{VA_i}{X_i}, \text{ and}$$

VA_i = value added in sector i.

Substituting into (4) we get

(5) $$a_{ij} = \frac{\ell_j'}{\ell_i'} \frac{V_j}{V_i} \beta_{ij} \frac{L_i}{L_j}$$

Value added data are only available for the total Republic and only for four aggregated sectors. However, ℓ_i' were calculated using this data as a beginning point. Value added, labor force and the labor-value added ratios for the four aggregrated sectors for the year 1970/71 are presented in Table 24. The calculated labor-output ratios, ℓ_i, by economic sector for the Matagalpa and Chinandega regions are presented in Tables 25 and 26, respectively. Employment by sector, L_i, for 1971 is found in National Census data by municipio (urban and rural). Data for 1978 was obtained by applying the 1971-78 population growth rate for each municipio to the 1971 employment data. Employment by municipio was simply added by order of city to get regional totals. Given the β_{ij}'s from the survey it is a simple matter to calculate the input-output coefficients.

TABLE 24: VALUE ADDED, LABOR FORCE BY ECONOMIC SECTOR FOR 1970/71 FOR THE TOTAL REPUBLIC OF NICARAGUA

Sector	Value Added[a] (millions of cordobas) (1958 prices)	Labor Force[b] (millions)	Labor-Value Added Ratio
Agriculture	1246.0	0.237327	0.1904
Industry and Mining	1194.1	0.065431	0.0548
Construction	171.3	0.020252	0.0078
Tertiary Activities	2585.5	0.173511	0.0671

[a]Source: UNASEC in "Summary of the Situation and Analysis of the Agricultural Sector of Nicaragua," Chapter VIII, August 1974, p. 4.

[b]Census Nacionales, 1971.

TABLE 25: LABOR-OUTPUT AND VALUE ADDED RATIOS BY SECTOR FOR THE MATAGALPA REGION

Sector	ℓ_i'[a]	v_i[c]	$\ell_i' v_i = \ell_i$
1.1	.2218[b]	.800	.177
1.2	.1904	.810	.154
1.3	.1904	.714	.136
2.1	.1109[b]	.880	.098
2.2	.1904	.830	.158
3.1	.0548	.4199	.023
3.2	.0078	.4199	.003
3.3	.0671	.4199	.028
3.4	.0671	.3820[d]	.028
3.5	.0671	.4199	.028
3.6	.0671	.4199	.028
5.1	.0548	.4199	.028
5.2	.0078	.4199	.003
5.3	.0671	.4199	.028
5.4	.0671	.044[d]	.003
5.5	.0671	.4199	.028
5.6	.0671	.4199	.028
5.7	.0671	.4199	.028
5.8	.0671	.4199	.028

[a]Source: Table 24

[b]Production techniques are twice as labor intensive on commercial farms producing export crops as they are on traditional farms.

[c]Source: Tables 19 and 21 for agriculture sectors and Table 24 for the rest.

[d]Found by iteration is to be consistent with calculation of the I-O coefficient.

TABLE 26: LABOR-OUTPUT AND VALUE ADDED RATIOS BY SECTORS, FOR THE LEON-CHINANDEGA REGIONS

Sector	l_i'[a]	v_i[d]	$l_i'v_i = l_i$
1.1	.2284[b]	.598	.137
1.2	.2145[c]	.765	.167
1.3	.1904	.714	.136
2.1	.1520[b]	.636	.097
2.2	.1663[c]	.817	.136
3.1	.0548	.4199	.023
3.2	.0078	.4199	.003
3.3	.0671	.4199	.028
3.4	.0671	.3820	.026
3.5	.0671	.4199	.028
5.1	.0548	.4199	.028
5.2	.0078	.4199	.003
5.3	.0671	.4199	.028
5.4	.0671	.0440	.003
5.5	.0671	.4199	.028
5.6	.0671	.4199	.028
5.7	.0671	.4199	.028

[a]Source: Table 24.

[b]Production techniques are 1.5 times as labor intensive on commercial farms producing export crops as they are on traditional farms.

[c]Production techniques are 1.29 times as labor intensive on commercial farms producing food crops as they are on traditional farms.

[d]Source: Tables 20 and 21 for agricultural sectors and Table 24 for the rest.

Allocation of Total Household Expenditures by Sector

We assume that the proportion of expenditure by households on goods of type i is a constant proportion of total household expenditures. So that

(1) $$X_{ic} = h_i H$$

where

X_{ic} = household expenditures on goods classified under sector i

h_i = constant proportion, and

H = total household expenditures.

By definition

(2) $$\sum_i X_{ic} = H - M_c$$

where

M_c = total regional imports of consumer goods.

Also assume that

(3) $$M_c = m_c H$$

where

m_c = constant proportion.

Therefore substituting (2) and (3) into (1) we get the following:

(4)
$$h_i = \frac{X_{ic}}{\left(\frac{1}{1-m_c}\right) \sum_i X_{ic}}$$

From our sample we obtain

$$\varepsilon_i = \frac{X_{ic}}{X_i}$$

also

$$L_i = \ell_i X_i .$$

Substituting into (4) we get

(5)
$$h_i = \frac{(1-M_c)\left(\frac{\varepsilon_i}{\ell_i}\right) L_i}{\sum_i \frac{\varepsilon_i}{\ell_i} L_i} .$$

Total household expenditures can be disaggregated by economic sectors by multiplying total household expenditures by ℓ_i $i = i---n$.

Allocation of Total Exports by Sector

We assume that the proportion of exports of goods classified under sector i is a constant proportion of total exports. So that

(1) $$X_{ie} = e_i E$$

where

X_{ie} = exports of goods classified under sector i,

e_i = constant proportion, and

E = total exports.

By definition

(2) $$\Sigma X_{ie} = E$$

therefore substituting into (1) we get

(3) $$e_i = \frac{X_{ie}}{\sum_i X_{ie}}.$$

From our sample we obtain

$$\eta_i = \frac{X_{ie}}{X_i}$$

also

$$L_i = \ell_i X_i$$

so that

(4)
$$e_i = \frac{\left(\frac{\eta_i}{\ell_i}\right) L_i}{\sum_i \left(\frac{\eta_i}{\ell_i}\right) L_i}$$

As in the case of household expenditure exports by sector can be broken down into its sectoral component by multiplying total exports by ℓ_i $i = i---n$.

Summary of Results and Inter-Regional Comparisons

The Final Input-Output Tables

The final input-output table for each region is presented in Table 27. The coefficients for the Leon-Chinandega regions are presented in parenthesis ( ). The inter sectoral transactions matrix (the matrix A where A = (a_{ij})) can be partitioned into four quadrants. The lower left hand and upper right hand quadrants show clearly the linkages between lower and higher order cities. The last four columns represent the allocation coefficients for household expenditures (rural and urban) and exports (to regional cities, to outside region). The last four rows represent value added (according to rural households and urban households) and imports (from the regional center, from outside region). It is disappointing to note that the sample did not pick up any flows of factors of production between different order cities although there is certain to be significant flows of labor in particular.

Starting in the upper left hand quadrant and numbering from I to IV we note some differences in the linkages for each quadrant. In quadrant I the Matagalpa region has 16 elements while the Leon-Chinandega region has 12 elements. The total number of squares with an element from one of the sectors in it is 16. The number of squares with an element from both sectors is 9. We will define the "agreement ratio" as the number of squares with both elements divided by the total number of squares with at least one element. For the quadrant I, the agreement ratio is 0.47 (9/19). If the"agreement ratio" were equal to one, this would imply that while the

TABLE 27: INPUT-OUTPUT COEFFICIENT MATRIX FOR THE MATAGALPA REGION AND THE LEON-CHINANDEGA REGION[a]

Source of Supply \ Source of Demand		1.1	1.2	1.3	2.1	2.2	3.1	3.2	3.3	3.4	3.5	3.6	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	Rural Households[b] 4.0	Urban Households[b] 6.0	Exports[c] M (L-C)[d] 7.0	Exports[c] Regional 8.0
First Order Cities (Localidades)	1.1						(.004)			.131			(.018)			.032							(12.97) 27.99	(21.30)	
	1.2		(.036) .031				(.107)			.191			(.032) .375			(.002) .011					5.56		(1.76) 13.69	(19.8)	
	1.3			(.113) .117			(.053) .064			(.259)			(.021) .015			(.004)					(0.50)		(1.29)	(1.94)	
	2.1												(.024)			(.012) .052							(7.46) 31.31	(11.07)	
	2.2					(.058) .001	(.064) .293			(.075) .255			(.024)			(.009) .037					(0.37) 7.25	(.09)	(0.51) 10.88		
	3.1	.013					(.027) .114	(.020) .045		(.015) .041				.001		(.005) .010			.006		(14.97) 11.97	1.60	(3.20) 0.26		
	3.2																								
	3.3																								
	3.4	.034																			(2.48) 15.79				
	3.5																								
	3.6		.102		.110	.132																			
Second and Third Order Cities	5.1						(.047)	(.007) .082		(.138)			(.167) .030	(.010) .002		(.115) .005					(.065) 0.83	(5.88) 23.01	(20.46) 0.24	(33.55)	
	5.2																								
	5.3																					(0.77) 0.30			
	5.4	(.050) .050	(.068) .001	(.048) .021	(.148)	(.047) .002	(.042) .059						(.066) .030	.076		(.197) .740					(21.05) 24.91	(28.74)	(53.56) 26.83	(12.72)	
	5.5	.021	.010																						
	5.6	(.030) .070	(.029) .030	(.025) .025	(.032)	(.029)															(0.19)	(0.01)			
	5.7			(.030) .030																	15.99	(0.01) 92.60			
	5.8				.010	.025																			
Rural Households	4.0	(.597) .800	(.765) .810	(.714) .714	(.632) .530	(.517) .540	(.419) .436	(.420) .420		(.392) .382															
Urban Households	6.0												(.420) .420	(.420) .420		(.0440) .0430			.4199						
Imports M (L-C)[d]	7.0	(.271) .052	(.117) .031	(.048) .075	(.164)	(.077)	(.166)						(.161) .054								(60.35) 16.20	(59.23 22.00			
Regional Imports	8.0	(.021)		(.022) .022			(.017)															(5.22) 10.06			

[a] Figures for the Leon-Chinandega Region are presented in ( ).

[b] Percentage of total household expenditures for region and type of household.

[c] Percentage of total exports for region and destination.

[d] M--Matagalpa; L-C--Leon-Chinandega.

TABLE 28: "AGREEMENT RATIOS" FOR INPUT-OUTPUT COEFFICIENT MATRIX

Quadrant	No. of Elements		Total No. of Linkages	No. Agree	Agreement Ratios
	Matagalpa	Leon-Chinandega			
I	16	12	19	9	.47
II	9	10	13	6	.46
III	14	15	19	10	.53
IV	6	5	6	5	.83
Overall	45	42	57	30	.53

magnitudes may differ the types of linkages are identical. An agreement ratio equal to zero would imply that the regions are totally dissimilar. Results of these simple comparisons are presented in Table 28. While it is difficult to interpret the magnitude of the "agreement ratios" it appears that there is considerable difference between the regions as to the nature of the linkages.

Further examination of Table 27 reveals differences in the percentage of total household expenditure purchased from first order cities. Rural households in the Matagalpa region purchase 27.6% of these household goods in first order cities compared to 17.8% for the Leon-Chinandega region. Urban households in the Matagalpa region purchase 1.6% of their household goods in first order cities (which is what we would expect because urban households are in higher order cities) compared to 0.04% for the Leon-Chinandega region.

Further comparisons between the regions are presented in Table 29. The first comparison is the percentage of inputs purchased from first order cities by economic sector. This comparison reveals that in almost all cases producers in the Matagalpa region buy more of their inputs from first order cities than producers in the Leon-Chinandega region. The second comparison shows the percentage of inputs imported from the regional center and from outside the region by economic sector. This comparison shows that producers in the Leon-Chinandega region rely much more on purchasing imports in the regional center and outside the region than the producers in Matagalpa.

TABLE 29: SELECTED COMPARISONS BETWEEN REGIONS

Economic Sector	Percentage[a] of Inputs Purchased From First Order Cities by Economic Sector		Percentage[a] of Inputs Purchased From Regional Center[b] (Outside Region)[c] by Economic Sector	
	Matagalpa	Leon-Chinandega	Matagalpa	Leon-Chinandega
1.0 Commercial Agriculture				
1.1 Export Crops	84.7	59.8	5.2 (0.0)	27.1 (2.1)
1.2 Food Crops	94.3	80.1	2.6 (0.0)	11.7 (0.0)
1.3 Animal Products	82.7	82.7	7.5 (2.2)	4.8 (2.2)
2.0 Traditional Agriculture				
2.1 Export Crops	99.0	63.6	0.0 (0.0)	18.4 (0.0)
2.2 Food Crops	97.3	85.5	0.0 (0.0)	7.4 (0.0)
3.0 Rural Nonagriculture				
3.1 Manufacturing	88.6	70.9	0.0 (0.0)	18.5 (1.7)
3.2 Construction	46.5	49.0	0.0 (0.0)	0.0 (0.0)
3.3 Storage, Transport	--	--	-- --	-- --
3.4 Commerce	1.000	73.5	0.0 (0.0)	0.0 (0.0)
3.5 Services	--	--	-- --	-- --
3.6 INVIERNO	--	--	-- --	-- --
5.0 Urban Commercial				
5.1 Manufacturing	39.0	16.7	5.4 (0.0)	16.1 (0.0)
5.2 Construction	0.1	0.0	0.0 (0.0)	0.0 (0.0)
5.3 Utilities	--	--	-- --	-- --
5.4 Commerce	21.2	2.7	0.0 (0.0)	0.0 (0.0)
5.5 Storage, Transport	--	--	-- --	-- --
5.6 Finance	--	--	-- --	-- --
5.7 Services	0.6	0.0	0.0 (0.0)	0.0 (0.0)
5.8 INVIERNO	--	--	-- --	-- --

[a]Percentage of gross output by sector.

[b]The regional center for the Matagalpa region is Matagalpa. The regional center for the Leon-Chinandega region is the combined cities of Leon and Chinandega.

[c]Percentages of inputs purchased outside the two regions are in parentheses. In most cases "outside the region" means Managua.

SOME LEARNING EXPERIENCES FROM THIS STUDY

Some of the experiences gained from this study may be useful to other researchers planning to undertake similar type studies, and to policy makers in making decisions on government investment in infrastructure (public services including transportation networks) or to support location of agricultural-related enterprises.

Selection of Country

The initial selection of Nicaragua as the country to develop the research methodology study appeared to be a good choice in late 1976 and early 1977 when that decision was made. Preliminary visits with personnel in several of the Government Ministries seemed to indicate that sufficient employment, population, aggregate trade flow and related data would be available for control totals in developing the input-output model. However, after more in-depth visits to these Ministries in June and July 1977, we learned that much of the needed data had been lost or misplaced as a result of the December 1972 earthquake in Managua. Also, only limited employment surveys and census reports were being accomplished in 1977 and 1978. Thus, we would have to proxy or adapt our data needs from the limited data available.

The most serious problem in doing this study in Nicaragua was the political turmoil which became more evident in late 1977. It intensified with the assassination of Pedro Chamorro on January 10, 1978 while the two

principal investigators (Applegate and Badger) were in Managua. Delays in implementing another project in DIPSA due to strikes and resignations of key people caused the delay in our project due to the need to time-share on vehicles and chaffeurs for doing the field interviewing.

We did receive excellent cooperation of Government personnel in DIPSA and other Ministry of Agriculture agencies, INVIERNO, and also both U.S. and Nicaraguan personnel working in USAID in Nicaragua. Without their moral and logistical support, and knowledge of the two regions involved in the study, we would not have been able to develop as many of the methodological results as we did.

Data Needs for Developing the Input-Output Model

Both intra-regional and inter-regional trade flows are needed to develop coefficients showing interdependence among the various sectors (e.g., commercial agriculture, traditional agriculture). Very little market data on movement of production inputs (fertilizer, seed, insecticides), household consumption items (clothing, food, medicines, etc.) or for agricultural products sold are available for analysis purposes.

To obtain needed information for the control data totals in the input-output models, we utilized employment data and attempted to "proxy" the other data on the basis of value of inputs or outputs per worker. Fairly accurate employment and output figures were available for some sectors, or for businesses within sectors. However, for other sectors or businesses, we had to develop estimates of economic values per worker from related data reported in other studies.

Useful employment data were available from a household living study done in INVIERNO Region V, which included the Matagalpa Department.

These employment data were valuable in constructing control totals by sector for that more traditional agriculture region. However, no similar studies had been done in the Leon-Chinandega Region. Thus, we had to "proxy" employment data for the localidades in that region based on the distribution of the labor force in the municipios. Therefore, differences in the patterns of employment among localidades within the same municipio are ignored.

The questionnaire was designed to estimate the linkages using the "rows only" technique. For example, the question asked relates to what percent of each product is self-consumed, what percent goes to market and is consumed in urban centers of a higher or lower order, and what percent is regionally exported. If the survey is complete it will be possible to complete the entire input-output matrix. In retrospect, it appears that more emphasis should be given to determining the linkages on a column basis. In some cases informants would be more knowledgable about their inputs than where their product goes. It is likely this is particularly true for the commercial service sector.

Survey Instruments

We revised the questionnaires several times after field testing in the two Regions. However, despite our best efforts at developing a series of questions which were clearly understood, we still were not able to obtain the information needed in many cases. Since the respondents had no actual statistics on quantities of goods and services moving among sectors and among regions, we attempted to obtain estimates of these movements in percentage terms. By interviewing five individuals or groups in each first order community (localidad), we were able to develop a fairly useful "average" statistic for each category. However, we did have significant variation in estimates; in some cases, the standard deviation was as great as the mean or average developed.

The survey data obtained would have been more consistent, and possibly more useful if one or both of the principal investigators had been in country for the interviewing, and/or if a U.S. trained MS type Agricultural Economist had been available to do the interviewing. The major difficulty with some of the results (or lack of results) obtained on the survey forms was that the interviewers would ask a specific question and the respondent(s) would give a vague or inconclusive answer. Rather than trying to probe and/ or to ask a series of related questions in an attempt to obtain a valid answer, the interviewer would "give-up" and go on to the next question. In retrospect, more attention should have been given to training the two interviewers to be more persuasive or aggressive in probing for answers. Lack of familiarity with data needs for input-output models was a hindrance for the interviewers.

However, the interviewers did an excellent job in obtaining the interviews under difficult travel conditions and in a remarkably short period of time. We are proud of their efforts. If the research budget had been larger, one of the principal investigators could have arranged to stay in country during the two and one-half to three months period needed for the interviewing. The uncertainties of when highway travel was open or restricted would have been a major factor in the opportunity cost of the principal investigator's time in any event.

Interviewing Techniques

The two interviewers traveled to the localidades ("first order" towns) and municipios ("second order" and "third order" towns) and attempted to visit an informed leader of the community. In a few cases they asked extension specialists or other agricultural related personnel who would be a

logical person or group of persons to interview. If no advance information on community leaders was available, the interviewers just began asking local residents who was the recognized leader of the community. Then the interviewer arranged to interview that person (or group of persons, in a few cases).

The major difficulty in attempting to obtain trade flow information in this manner is that no one individual or small group of individuals can be knowledgeable about the broad grouping of goods and services which flow into the rural areas and which move out of the rural areas. Thus, the interviewers were unable to obtain complete entries for the various sectors of the input-output table, even though they talked to several individuals in each community. The principal weakness in the data gathered was for the non-agricultural sectors, especially services.

Marketing Systems for Goods and Services

Lack of an organized marketing system for inputs and outputs hampers the ability to obtain data on flow of goods and services. For agricultural inputs and food and related products moving into the rural communities, there are relatively few suppliers and handlers; thus, by judicious visiting, it is possible to get a handle on the trade flow of insecticides, purchased fertilizers, beverages (from soft drinks to beer), and household items like lard.

The movement of agricultural products both within the local area and out of the area is much more difficult to trace. A high proportion of selected food items such as corn, beans, and in some cases, rice, which are produced on the farm, is used for family consumption. Some may be bartered or traded to neighboring families for other goods or for services rendered, such as for field work,etc. Some of the product may be saved for seed for producing a subsequent crop.

Wholesale brokers, many of whom are truckers, travel through the rural area and buy produce, consolidating loads of the same products, or sometimes, even mixed products. Often the farm family selling a few sacks of beans, corn, rice, or boxes of lettuce, does not know the market destination of the product.

In the rural areas there is no market news reporting system which indicates movement of agricultural products. Thus, there was no way to compare data obtained by personal interview with any community or regional data.

The data available on trade flows of non-agricultural and non-food related goods and services are even more limited. It is most difficult to determine the origin and final destination of such movements, and the partial and full employment generated in the wholesale and retail businesses.

Conclusions

The results of applying the methodology to two dissimilar regions in Nicaragua indicate that it is possible to discern important differences in the nature of linkages. While there are serious gaps in the data, some useful results have been obtained. On the basis of the results obtained it is possible to conclude that rural households in the region where traditional agriculture is most common are more dependent on the localidad in which they reside. Urban households are also more dependent on first order cities for their household expenditures. This same conclusion holds for produced inputs. Producers (agriculture and non-agriculture) in the Matagalpa region buy more of their inputs from first order cities. Producers in the Leon-Chinandega region rely much more on purchasing inputs in the regional center and outside the region than the producer in Matagalpa.

While these results have to be interpreted cautiously, the implication is that government programs such as construction of infrastructure will have

a greater positive indirect impact on rural regions and reducing poverty if carried out in the Matagalpa region. This is because the linkages to the large regional center or outside the region are greater in the Leon-Chinandega region. However this would be a valid conclusion in a relatively short run. Over a long period of time, the nature of the linkage between different orders of cities may change because of long run impact of such government programs on the structure of the economy. It would be interesting to determine to what extent linkages change over time and as economic growth take place.

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I. B.) Cuales son los insumos mas importantes usados en estas fincas incluyendo empleo?

_____

_____

_____

_____

_____

_____

_____

_____

C.) Lugar de compra de insumos y por ciento del valor total de cada insumo por clase de insumo.

Insumo	Lugar donde se compra	Porciento del valor total de todos los insumos.

APPENDIX A

DESARROLLO RURAL: CENSO DE VINCULOS
EN NICARAGUA
POR
LA UNIVERSIDAD DEL ESTADO DE OKLAHOMA
CON
DIPSA Y USAID

Fecha _____

Localidad _____ Municipio _____ Departamento _____

I. AGRICULTURA COMERCIAL

A.) Cual es la produccion en fincas que tienen mas de _____ mazanas?

Producto[a)]	El porciento del valor total de la produccion de todas las fincas en esta categoria:	Lugar donde se vende[b)]	El porciento del valor de le la produccion bruta para cada lugar	Para que se usa este producto? (si se sabe)	Por cada uso, el porciento del valor de produccion que va a cada lugar

a.) Repita el mismo producto tantas veces como necesario para cubrir las distintas localidades donde se vende.

b.) Nombre el sitio incluyendo el uso domestico (casa)

II. B.) Cuales son los insumos mas importantes usados en estas fincas incluyendo empleo?

_____
_____
_____
_____
_____
_____
_____
_____

C.) Lugar de compra de insumos y por ciento del valor total de cada insumo por clase de insumo.

Insumo	Lugar donde se compra	Porciento del valor total de todos los insumos

II. AGRICULTURA TRADICIONAL

A.) Cual es la produccion de fincas que tienen menos de _____ Manzanas?

Producto[a)]	El porciento del valor total de la produccion de todas las fincas en esta categoria:	Lugar donde se vende[b)]	El porciento del valor de la producction bruta para cada lugar	Para que se usa este producto? (si se sabe)	Por cada uso, el porciento del valor de produccion que va a cada lugar

a.) Repita el mismo producto tantas veces como necesario para cubrir las distintas localidades donde se vende.
b.) Nombre el sitio incluyendo el uso domestico (casa)

Producto o servicio	Lugar de ventas incluyendo usos de casa (Nombre del pueblo)	Porciento del valor de produccion que va a cada lugar	Usos por cada	Porciento del valor de ventas para el sitio por cada uso	Insumo Mayor	Lugar de venta y porciento total del valor de insumos por cada clase de insumo
Ropa y Almacenes de ropa						
Cuero y Productos de cuero						
Vagon y Ruedas de Vagon						
Hamacas						
Carpinterias						
Talleres de Gabinetes						

III.- RURAL - EXCLUYENDO EL SECTOR AGRICOLA

Para los siguientes productos que se puedan producir en este lugar llene las columnas abajo por pregunta.

Producto o servicio	Lugar de ventas incluyendo usos de casa (Nombre del pueblo)	Porciento del valor de produccion que va a cada lugar	Usos por cada lugar	Porciento del valor de ventas para el lugar por cada uso	Insumo Mayor	Lugar de venta y porciento total del valor de insumos por cada clase de insumo
Azucar						
Produccion de fibra						
Ladrillos y Azulejos						
Barro y Productos de barro						

Producto o servicio	Lugar de ventas incluyendo usos de casa (Nombre del pueblo)	Porciento del valor de produccion que va a cada lugar	Usos por cada lugar	Porciento del valor de ventas para el lugar por cada uso	Insumo Mayor	Lugar de venta y porciento total del valor de insumos por cada clase de insumo
Otros						

Producto o servicio	Lugar de ventas incluyendo usos de casa (Nombre del pueblo)	Porciento del valor de produccion que va a cada lugar	Usos por cada lugar	Porciento del valor de ventas para el lugar por cado uso	Insumo Mayor	Lugar de venta y porciento total del valor de insumos por cada clase de insumo
Compra y Venta de Productos Agriculas						
Almacenes Pequenos						
Herraduras de Caballos						
Mecanicos						
Transporte						

IV. IMPORTACIONES DOMESTICAS Y REGIONALES

1. Que porcentaje de familias en esta localidad tienen tierra? _____

2. Que porcentaje de ingresos domesticos se gasta fuera de este departamento?

   Familia con tierra _____

   Familia sin tierra _____

3. Cuales son las compras domesticas mas importantes?

Producto	Lugar de compra y el porciento del valor total por lugar
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

APPENDIX B
Segundo-Tercer Orden

DESARROLLO RURAL: CENSO DE VINCULOS RURALES EN NICARAGUA
POR
LA UNIVERSIDAD DEL ESTADO DE OKLAHOMA
CON LA COLABORACION DE
DIPSA Y USAID

_____

Localidad_____ Municipio_____ Departamento_____

I. ACTIVIDAD URBANA

Servicios Públicos	Localidades que cubre cada servicio	Porciento que cada localidad representa en el volumen total del servicio	OBSERVACIONES
Educación			
Publ._____	_____	_____	_____
Priv._____	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
Electricidad			
Publ._____	_____	_____	_____
Priv._____	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
Agua-desague			
Publ:_____	_____	_____	_____
Priv._____	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
Teléfonos			
_____	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
Hospitales,			
Clinicas ,	_____	_____	_____
Centros de salud	_____	_____	_____
Publ._____	_____	_____	_____
Priv._____	_____	_____	_____
	_____	_____	_____
Serv. Financieros			
Bco. Nacional____			
Bco. Nicarag.____	_____	_____	_____
Bco. America____	_____	_____	_____
Bco. de C.Am.____	_____	_____	_____
Invierno ____	_____	_____	_____
Ahorro/credito____	_____	_____	_____
Coop.Agrop. ____			

Considerar el servicio financiero como una unidad, sin tomar en cuenta cada entidad financiera individualmente.

Almacenes de			
granos. (granero)	_____	_____	_____
Publ. _____	_____	_____	_____
Priv. _____	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____

En "obervaciones" indicar quien provee al granero (Incei,.....etc.) y si es posible, indicar el nombre de las localides que vendieron los granos al almacen.

Servicio de Transporte

Microbuses		Buses		Camionetas		Camiones		Traylers		Taxis	
Rutas	%	Rutas	%	Rutas	%	Rutas	%	Rutas	%	Rutas	%

Rutas.- Entiendase las localidades a las cuales los vehiculos prestan servicio
%.- Entiendase el porcentaje que cada localidad (ruta) representa dentro del total de localidades (rutas) a las que se presta el servicio de transporte.

Responder lo siguiente: ¿Existe alguna cooperativa de transporte en este lugar?
Si_____ No_____ . Si es asi, ¿cuantas?_____ Numero de vehiculos _____

Servicios Generales		Indicar en forma general las localidades que se benefician con cada uno de estos servicios					
Serv.	Cant.						
Restaurante							
Comedores							
Hoteles							
Pensiones							
Cines							
Iglesia							
Peluquerias							
Abogados							
Medicos							
Dentistas							
Costureria							
Zapateros							
Mecanicos							
		%	%	%	%	%	%
Porcentaje - - - - - -							

Si es posible, determinar el porcentaje que cada localidad representa en el vo lumen total de los servicios.(

Observaciones _____

_____

II. IMPORTACIONES DOMESTICAS Y REGIONALES

1.- ¿Que porcentaje de los ingresos domesticos de esta comunidad se gasta fuera de este municipio?

_____ %

2.- ¿Cuáles son las compras domesticas mas importantes?

Producto o servicio	Lugares donde se compra (nombrar)			Porcentaje que se gasta en cada lugar.		
Alimentos						
Ropa/zapatos						
Medicinas						
Educacion						
Entretenimiento						
Bebidas alcohol.						

III. PRODUCCION RURAL - EXCLUYENDO EL SECTOR AGRICOLA

Para los siguientes productos que se puedan producir en este lugar llene las columnas abajo por pregunta:

Produccion	Lugar donde se vende a)	Porciento del producto que se vende en cada lugar	Usos que se le da al producto en cada lugar donde se vende	Porcentaje del producto que va a cada lugar - por usos -	Insumos mas importantes que constituyen cada producto	Lugar donde se compran los insumos	Porciento que cada insumo representa en la compra total de los insumos
Fabricacion de dulce (trapiche)							
Queso, cuajada mantequilla cajetas, etc.							
Artesanias							
Hamacas							
Alfombras							
Palma: sombreros, carteras, otros.							
Mecates, bolsas, alforjas, etc. (de mecate)							

a) Si es necesario incluyase el nombre del lugar donde se origino el producto

XII. PRODUCCION RURAL - EXCLUYENDO EL SECTOR AGRICOLA

Para los siguientes productos que se puedan producir en este lugar llene las columnas abajo por pregunta:

Produccion	Lugar donde se vende a)	Porciento del producto que se vende en cada lugar	Usos que se le da al producto en cada lugar donde se vende	Porcentaje del producto que va a cada lugar - por usos -	Insumos mas importantes que constituyen cada producto	Lugar donde se compran los insumos	Porciento que cada insumo representa en la compra total de los insumos
Cuero: Albardas, fajas, Carteras, zapatos, alforjas, etc.							
Ladrillos, bloques y tejas de barro							
Ladrillos, bloques y adoquines de cemento							
Madera: muebles para casa, gabinetes, carretas, ataudes							
Hierro: verjas, herraduras, faroles, ruedas para carreta.							
Ropa: pantalones, vestidos, camisas.							

a) Si es necesario incluyase el nombre del lugar donde se origino el producto

III. PRODUCCION RURAL - EXCLUYENDO EL SECTOR AGRICOLA

Para los siguientes productos que se puedan producir en este lugar llene las columnas abajo por pregunta:

Produccion	Lugar donde se vende [a]	Porciento del producto que se vende en cada lugar	Usos que se le da al producto en cada lugar donde se vende	Porcentaje del producto que va a cada lugar - por usos -	Insumos mas importantes que constituyen cada producto	Lugar donde se compran los insumos	Porciento que cada insumo representa en la compra total de los insumos
Harina: panaderias, reposteria, etc.							
Produccion familiar: tamales, nacatamales, tortillas, etc.							
Otros							
Otros							

[a] Si es necesario incluyase el nombre del lugar donde se origino el producto

IV. OPERACIONES DE COMPRA-VENTA

Tipo de Operacion	Cant.	Lugar donde se vende el (los) productos	% que cada lugar de venta representa en el volumen total de la operacion	Lugar donde se compra el (los) productos	% que cada lugar de compra representa en el volumen total de la operacion
Almacenes de ropa y zapatos					
Almacenes de productos agropecuarios					
Pulperias y Miscelaneas					
Compra-venta de ganado					
Compra-venta ambulante (camionetas)					
Otros					

V.- Nombrar las comunidades con las cuales existe mayor actividad economica por orden de importancia.

	Nombre de la comunidad	No. de habitantes ano 1978
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		

Observaciones generales _____

Leon-Chinandega Region
Agriculture: Destination of Sales by
Order of City and Economic Sector

Proportion of Total Sales
Sector of Destination

Sector of Origin	Order of City of Destination	Food Crops: Commerce	Food Crops: Export	Food Crops: Processing (Man.)	Food Crops: Households	Export Crops: Commerce	Export Crops: Export	Export Crops: Processing (Man.)	Export Crops: Households	Livestock Products: Commerce	Livestock Products: Export	Livestock Products: Processing (Man.)	Livestock Products: Households
Commercial Agriculture													
	1		.032				.003	.015		.250			.195
	2,3	.063		.242			.095	.053		.150			
	Leon-Chinandega	.302	.022		.061	.012	.542	.277		.342	.008	.014	.003
	Managua	.176		.078	.024		.003				.024	.006	.008
Traditional Agriculture													
	1	.125		.226	.207	.155	.078	.095					
	2,3	.206			.014	.222	.314	.136					
	Leon-Chinandega	.185			.037								
	Managua												

Matagalpa Region
Agriculture: Destination of Sales by
Order of City and Economic Sector

Proportion of Total Sales
Sector of Destination

Sector of Origin	Order of City of Destination	Food Crops		Export Crops		Livestock Products	
		Commerce	Households	Commerce	Households	Processing (Man.)	Households
Commercial Agriculture	1	.15	.36	.03			
	2	.01					
	3	.37		.30		.73	
	Matagalpa	.116	.004	.67		.09	
	Managua					.16	.02
Traditional Agriculture	1	.22	.17				
	2	.10	.02				
	3	.42		.27			
	Matagalpa	.04	.04	.73			

Matagalpa Region
Rural Manufacturing (First Order Cities)
Destination of Sales by Order of City
and Economic Sector

Proportion of Total Sales

Order of City of Destination	Sector of Destination: Agriculture	Construction	Commerce	Households
1	.023	.260	.030	.470
2	.006	.012	.016	.012
3	.005	.006	.100	.040
Matagalpa			.020	

Leon-Chinandega Region
Rural Manufacturing (First Order Cities)
Destination of Sales by Order of City
and Economic Sector

Proportion of Total Sales

Order of City of Destination	Sector of Destination: Agriculture	Construction	Commerce	Households
1	.032	.050	.002	.805
2,3			.024	.028
Leon-Chinandega		.015	.044	

Matagalpa Region
Second Order Cities[1] Destination of Sales
by Order of City and Economic Sector

Sector of Origin	Order of City of Destination	Proportion of Total Sales Sector of Destination: Commerce	Traditional Agriculture	Commercial Agriculture	Construction	Households
Manufacturing	1				.01	
	2,3				.09	.90
	Matagalpa					
Utilities	1					
	2,3					1.00
	Matagalpa					
Commerce, Restaurants, Hotels	1					
	2,3					.99
	Matagalpa					.01
Transport, Storage, Communications	1			.90		
	2,3			.10		
	Matagalpa					
Finance[2]	1		.90			
	2,3		.10			
	Matagalpa					
Services	1					
	2,3					1.00
	Matagalpa					
Public Service	1					.24
	2,3					.76
	Matagalpa					

[1]San Ramon and San Dionisio.

[2]Includes INVIERNO.

Matagalpa Region
Third Order Cities Destination of Sales
by Order of City and Economic Sector

Sector of Origin	Order of City of Destination	Proportion of Total Sales Sector of Destination: Commerce	Traditional Agriculture	Commercial Agriculture	Construction	Households	Exports
Manufacturing	1					.03	
	2,3	.06		.06	.19	.61	
	Matagalpa						.05
Utilities	1						
	2,3					1.00	
	Matagalpa						
Commerce, Restaurants, Hotels	1					.09	
	2,3					.74	
	Matagalpa						.17
Transport, Storage, Communications	1						
	2,3			1.00			
	Matagalpa						
Finance	1			1.00			
	2,3						
	Matagalpa						
Services	1						
	2,3						
	Matagalpa						
Public Service	1					.21	
	2,3					.79	
	Matagalpa						

Leon Chinandega Region
Second and Third Order Cities: Destination
of Sales by Order of City and Economic Sector

Sector of Origin		Sector of Destination: Commerce	Traditional Agriculture	Commercial Agriculture	Construction	Households
Manufacturing	1	.011			.003	.022
	2,3	.348			.009	.103
	Leon-Chinandega	.416			.033	
	Managua and Other	.023			.016	.016
Utilities	1					
	2,3					1.000
	Leon-Chinandega					
	Managua and Other					
Commerce, Restaurants, Hotels	1					.230
	2,3	.194				.171
	Leon-Chinandega	.065				.333
	Managua and Other					.007
Transport, Storage, Communications	1			.500		
	2,3			.500		
	Leon-Chinandega					
	Managua and Other					
Finance	1			.346		
	2,3					
	Leon-Chinandega			.551		.103
	Managua and Other					
Services	1					.364
	2,3					.636
	Leon-Chinandega					
	Managua and Other					