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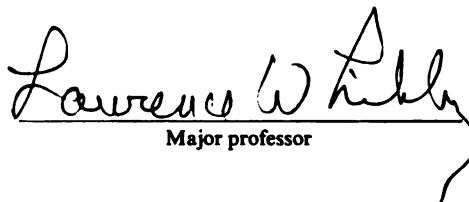
LABOR EARNINGS AND SUPPLY OF OFF-FARM LABOR
OF RURAL NICARAGUAN HOUSEHOLDS

presented by

Preston S. Pattie

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of the requirements for

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Major professor

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LABOR EARNINGS AND SUPPLY OF OFF-FARM LABOR
OF RURAL NICARAGUAN HOUSEHOLDS

By

Preston S. Pattie

A DISSERTATION

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ABSTRACT

LABOR EARNINGS AND SUPPLY OF OFF-FARM LABOR OF RURAL NICARAGUAN HOUSEHOLDS

By

Preston S. Pattie

A survey of rural households was conducted in the Central interior region of Nicaragua to focus on problems of employment and income. The methodology of this survey included visits to a large number of communities to gather information on social structure and establish the sample frame of households. Two samples of 331 and 176 households were selected. The household survey was conducted from May to July of 1978.

A major finding is related to the proportion of income obtained through wage employment, representing 65 percent of net family income on average. Land ownership is highly skewed, with half of land being held in large commercial farms and ranches having absentee owners. Another 30 percent of the land is held by only 10 percent of rural households. Tendencies to choose farming or off-farm employment over the life cycle of the family are examined.

Poorest households are those that own small quantities of land, and depend upon subsistence farming for the major proportion of earnings. Households operating small commercial farms have the highest levels of income among rural residents. Resettlement has occurred slowly toward areas where wage rates are higher and toward agricultural frontier areas where land is more readily available.

The bulk of wage employment available to rural workers is generated by large commercial farms where coffee is grown. Most workers perform

Preston S. Pattie

general field tasks for which no special skills are required. A large amount of seasonal migration takes place at time of coffee harvest. A model of off-farm labor supply is developed which points to a strong relationship between wage rates offered in the market and amount of labor supplied.

The results of the study suggest that improvements in the well-being of the rural population can be achieved by increasing educational services. Only a small proportion of heads of households have completed even one year of schooling. Land reform is essential for creating economic opportunities. Possibilities of colonization in the agricultural frontier are discussed and recommendations made. It is suggested that the most immediate policy measure needed to improve living standards is to promote participation of the population in local decision making. This would result in a change in emphasis toward basic needs such as drinking water and roads.

ACKNOWLEDGEMENTS

The completion of this dissertation would not have been possible without the full support of faculty members who served on my guidance committee. Their encouragement was crucial in reaching the decision to follow through with the Nicaraguan study under difficult conditions. Appreciation is extended for the comments and suggestions on earlier drafts of the dissertation to Dr. Peter Matlon, Dr. Robert Solo, Dr. Milton Steinmueller and Dr. Warren Vincent. I wish to express special thanks to my major professor, Dr. Lawrence Libby, and to the thesis supervisor, Dr. Harold Riley, for their patient cooperation. Their contribution was especially important in organizing material in the dissertation, clarifying ideas, and focusing on policy issues in the analysis. The very capable efforts of Mrs. Lois Pierson in editing, typing and proofing were of great value in preparation of the final draft under a tight time schedule.

Finally, it is appropriate to express my great esteem for the persons in the Ministry of Agriculture of Nicaragua. Great personal sacrifices were made to complete the rural household survey in Nicaragua on the belief that public policy can be reoriented to better serve the rural poor. It is hoped that this dissertation will help in these efforts.

TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES	vi
LIST OF FIGURES	ix
CHAPTER I: INTRODUCTION	1
Description of the Nicaraguan Economy	1
Agricultural Policy and Objectives of the Household Survey	5
Management and Procedures of the Survey	8
Research Objectives for the Dissertation	11
CHAPTER II: CONCEPTS APPLICABLE TO PROBLEMS OF RURAL EMPLOYMENT AND INCOME	14
Employment and Income Policy Issues	14
Unemployment and Poverty	16
Labor Absorption on Small Farms	19
Off-Farm Employment	22
Off-Farm Labor Supply	24
Education and Training	28
Social Services and Organization	30
Work and Leisure	31
Problems of Definition and Measurement	36
CHAPTER III: DESCRIPTION OF THE STUDY REGION	39
Geographical Variations Within the Study Region	41
Seasons of Agricultural Activity	42
Types of Enterprises	44
CHAPTER IV: SURVEY METHODOLOGY	46
Sampling of Communities	47
Interview Technique for the Community Survey	48
Size of Household Sample	49
First Stage of Sampling: Clustering and Stratification	51
Second Stage of Sampling	53
Instruments for Household Survey	55
Data Tabulation	57

	<u>Page</u>
CHAPTER V: TOTAL POTENTIAL MANPOWER OF THE LABOR FORCE	60
Strata of Communities for Analysis and Planning	60
Family Structure: The Extended Family	63
Estimate of Worker-Equivalents	67
Manpower by Area and Community	72
Family Formation and Resettlement	74
Geographical Directions of Resettlement	77
Summary	81
CHAPTER VI: ACCESS TO AGRICULTURAL RESOURCES AND SERVICES	82
Access to Land Resources	82
Agricultural Credit and Technical Inputs	91
Roads	98
Returns to Labor on Family Farms	103
Summary	106
CHAPTER VII: LABOR ABSORPTION IN HOME FARM AGRICULTURE	108
Participation in Farming	109
Area Cultivated	112
Utilization of Family Labor on the Home Farm	117
Summary	121
CHAPTER VIII: SOURCES OF EMPLOYMENT AND ACCESS TO JOBS	123
Sources and Types of Employment	123
Seasonality of Employment	130
Work Schedules and Remuneration	132
Educational Attainment and Services	139
Educational Attainment and Wage Rates	147
Importance of Wage Earnings	149
Summary	150
CHAPTER IX: ESTIMATION OF OFF-FARM LABOR SUPPLY	153
General Focus of the Model	153
Estimated Value of Time Off-Farm	156
Off-Farm Labor Supply of Male Heads of Household	161
Male Family Members Other than Heads of Household	174
Female Heads of Households	182

	<u>Page</u>
Female Family Members Other than Female Heads of Household	186
Labor Supply for Coffee Harvesting	192
Summary	198
CHAPTER X: SUMMARY AND CONCLUSIONS	199
Summary of Findings	199
Structure of the Rural Population	199
Rural Communities	200
Land Tenure and Participation in Farming	201
Use of Technical Inputs and Credit	203
Rural Roads	204
Educational Attainment and Services	205
Off-Farm Employment	206
Wage Rates	207
Response of Labor Supply to Wage Rates	209
Sources and Distribution of Income	212
Policy Implications	212
General Focus of Development Strategies	213
Increasing Productivity of Small Farms	216
Land Reform and Colonization of New Areas	219
Education and Training	221
Policy Toward the Labor Market	222
Applicability of Concepts and Methodology Applied	224
LIST OF REFERENCES	229

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1	Distribution of Selected Households by Strata of Communities	53
2	Households in Sample "A" by Strata Based on Local Land Tenure and Location	62
3	Position in Household by Age for Persons 17 to 22 Years of Age--Classifications as in Questionnaires . .	65
4	Persons in Sample "A" by Age, Sex, and Position in Household	66
5	Median Wage Rates for Sex and Age Groups	68
6	Average Worker-Equivalents per Household by Strata of Communities	72
7	Average Age of Head of Household by Strata of Communities	73
8	Percent of Households that Have Formed In or Moved to Communities in the Last Six Years by Strata of Communities	75
9	Probabilities of Resettlement of Households in a Single Year by Age of Head and Land Ownership	77
10	Intraregional Resettlement of Households During the Last Six Years	78
11	Destinations of Individuals Detaching Themselves from Families in the Region	79
12	Frequency of Type of Destination of Persons Detaching Themselves from the Main Family	80
13	Average Land Ownership per Household by Area, with Changes from 1971 to 1978	84
14	Total Land Possessed by Sample Households by Method of Acquisition, 1971, 1978, and Interim Changes, by Area	85
15	Changes in Land Ownership by Age of Head, 1971-1978 . . .	86
16	Average Purchase Prices and Sales Prices of Land by Area	87
17	Total <u>Manzanas</u> Received by Method of Occupancy and Source	89
18	Average Cost of Accessing Land by Renting and Share-cropping in Each Area of the Region	90
19	Area Planted, Number of Oxen Owned, and Value of Livestock of Farm Families	95

<u>Table</u>		<u>Page</u>
20	Net Family Income by Source and Indebtedness of INVIERNO and Banco Nacional Clients	97
21	Sample Families According to Type of Road Serving Community and Influence of <u>Haciendas</u> in Community . . .	102
22	Average Sale Price of Corn by Planting Time and Physical Access	103
23	Net Income of Farm Families by Source and Land Owned . . .	104
24	Net Income Derived from Agriculture and Livestock per Worker-Day by Family Members	105
25	Participation Rates in Farming by Physical Access, Area, and Land Ownership	110
26	Rates of Participation in Farming by Age of Household Head and Land Ownership	111
27	Participation Rates in Farming by Age and Education of Head of Household--Households that Own No Land	112
28	Land Ownership of Farm Families and Area Planted by Age of Head of Household	116
29	Regression Results of Labor Absorption on Family Farms . .	120
30	Off-Farm Employment Rates by Sex and Age	124
31	Participation in Occupational Categories by Sex	125
32	Average <u>Manzanas</u> of <u>Hacienda</u> Land and Number of Persons Working Exclusively for Wages and Agroclimatic Area . .	127
33	Number of Jobs Held per Household Worker-Days and Por- tion of Employment Outside of Community	128
34	Indicators of Employment Opportunities by Land Tenure Patterns of Communities	129
35	Average Hours per Day and Days per Week by Occupation . .	134
36	Average Wage per 8-Hour Period and per Normal Work Day . .	137
37	Average Wages of General Field Workers	138
38	Inhabitants per School in Each Area	143
39	Average Attendance per Student During the School Year . .	145
40	Reasons for Not Being Farther Advanced in School-- Persons Over Six Years Old Who Will Continue (or Begin) Their Studies	146
41	Wages of Educational Attainment and Length of Employ- ment for Both Sexes	147
42	Average Wage of Household Heads by Sex and Years of Schooling	148
43	Net Family Income by Source and Area	149

<u>Table</u>		<u>Page</u>
44	Analysis of Variance Estimating Wage of Head of Household	157
45	Analysis of Variance Estimating Wage of Family Members Other than Head of Household	159
46	Analysis of Variance Estimate of Hourly Wages of Coffee Pickers	160
47	Off-Farm Labor of Male Heads of Household for Farm and Non-Farm Families	163
48	Off-Farm Labor Supply of Male Heads of Household for Farm and Non-Farm Families by Land Tenure	171
49	Off-Farm Labor Supply of Adult Males Other than Heads of Household for Farm and Non-Farm Families	176
50	Off-Farm Labor Supply of Adult Males Other than Heads of Household for Farm and Non-Farm Families by Land Tenure	179
51	Off-Farm Labor Supply of Male Children, 9 to 16 Years of Age	181
52	Off-Farm Labor Supply of Female Heads of Household . . .	184
53	Off-Farm Labor Supply of Wives and Other Adult Females for Farm and Non-Farm Families	188
54	Off-Farm Labor Supply of Dependent Females 9 to 20 Years of Age	191
55	Labor Supplied in Coffee Harvesting, Adult Females . . .	193
56	Labor Supplied in Coffee Harvesting, Adult Males	194
57	Principal Communal Problem or Need Identified by Respondents	215
58	Communities with Selected Services and Infrastructure	215

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1	Derivation of Consumption Possibilities Curve from Time Constraint, Household Production Function, and Wage Rate	35
2	Eight Planning Regions of Nicaragua	40
3	Location of 154 Communities Surveyed in the First Phase of the Study	43
4	Strata of Communities for Selection of Households . . .	52
5	Overall Sampling Procedure for Communities and Households Combined	56
6	Family Size with Number of Persons in Subnuclei by Age of Head of Household	67
7a	Family Size and Worker-Equivalents per Household by Age of Head of Household	69
7b	Worker-Equivalents per Family Member	70
8	Worker-Equivalents per Household by Age of Head and Land Ownership	71
9	Percentage of Farmers Who Receive Land in Rental or Other Method by Amount of Land Owned	88
10	Lorenz Curves of Amounts of Land Owned and Amounts Operated Among Farm Families, Excluding Haciendas	91
11	Percent of Farm Families by Land Owned Who Receive Assistance from the Banco Nacional and INVIERNO . . .	94
12	Outstanding Debt per Client Family of INVIERNO and Banco Nacional by Land Ownership	96
13	Location of Paved Roads and Communities Studied by Type of Access Road	100
14	Inhabitants by Area and Type of Road	101
15	Area Planted per Farm Family and per Worker-Equivalent of Males by Land Owned	114
16	Total Worker-Days per Months of Salaried Employment by Sample Families	131
17	Total Worker-Days Supplied by Sample Families in Selected Occupations	133
18	Wages of Male General Field Workers per Eight-Hour Day by Age	139

<u>Figure</u>		<u>Page</u>
19	Percent of Persons Having Completed at Least One Year of Schooling by Age	140
20	Average Years of Schooling Completed by Age	141
21	Percent of Persons Having Completed at Least One Year of School by Age and Location	142
22	Rates of School Attendance by Age	144
23	Estimated Off-Farm Labor Supply of Male Heads of Household by Age, for Farm and Non-Farm Families . . .	168
24	Participation Rates of Heads of Household in Full- Time Employment for Households that Own No Land by Age and Educational Attainment	169

CHAPTER I

INTRODUCTION

During the early 1970s, concern over economic and social imbalances in Nicaragua began to grow stronger as revealed by social unrest and opposition to the government, which had been controlled by the Somoza family for over 40 years. Economic assistance policies of the United States shifted toward helping the less privileged portion of the population, with special emphasis on rural areas (8). During this period, the government of Nicaragua initiated efforts to improve the information base regarding the economic and social situation of the country in order to formulate policies that would improve the standard of living of the rural poor. This dissertation grew out of these efforts to obtain information on rural employment and income patterns through a survey of rural households in the Central interior region of the country conducted in 1977 and 1978.

Description of the Nicaraguan Economy

Nicaragua has the largest land surface of all Central American countries; it is comprised of three geographical regions: Pacific, Central and Atlantic. The Pacific region is the smallest in area and contains more than half the total population, which was estimated at 1,877,952 by the 1971 Census. At that time, average density of population was 61 inhabitants per square kilometer in the Pacific region, compared to 18 in the Central region and less than three inhabitants

per square kilometer in the Atlantic region. Just over half of the population was classified as rural in 1971, but in the Pacific region only about 37 percent resided in rural areas, while in the rest of the country the proportion rises to nearly three-quarters. The ratio of rural to urban residents has decreased in most areas since the 1963 Census of Population. Rate of population growth averaged 2.5 percent per year between 1963 and 1971, but has since increased to about 3.5 percent (11, p. 87).

Gross National Product (GNP) was estimated at about 1,466.2 million dollars in 1974, or about 703 dollars per capita (11, p. 471). Primary agricultural activities account for 328.8 million dollars, or about 24 percent of GNP; forestry, fishing and hunting¹ account for another 18.4 million. Manufacturing, construction and mining make up another 26 percent of GNP, and the remainder comes from commerce, government services, etc. The proportion of GNP derived from primary agriculture was nearly constant from 1965 through 1974, however, it is likely that agricultural production is underestimated due to methods of data collection which do not adequately capture consumption of farm products by the farm family. Also, over half of manufacturing consists of processing of agricultural products.

Growth of GNP measured in constant monetary units has been at 5.1 percent per year from 1965 through 1974, resulting in a growth rate per capita of 2.1 percent (11, p. 471).

The two most important agricultural products are cattle and coffee, which accounted for about 32 percent of the value of agricultural

¹About one-half million dollars is derived from hunting turtles in the Atlantic region of Nicaragua.

production in 1974. These are followed by cotton, sugar and corn, which together make up 35 percent of production. Then come rice and beans for another 12 percent of the value of agricultural products (11, pp. 395-438). Primary agricultural products made up about 206 million dollars in exports in 1974, and roughly another 72 million dollars was derived from processed agricultural products.

In total, agriculture accounts for nearly 73 percent of total exports. Principal agricultural exports in order of importance were: coffee, cotton fiber, processed meat, sugar, cotton seed cake, textiles, edible oil, bananas, and cotton seed.

Most cotton, rice and sugar are grown in the Pacific region where farms and ranches are typically large and modernized. Production of coffee, corn and beans is concentrated in the Central, mountainous region where land holdings range from large haciendas to small subsistence farms. Haciendas predominate in production of coffee, while corn and beans are subsistence crops of small farmers. Cattle are grown on large ranches and haciendas both in the Pacific and Central regions. The sparsely populated Atlantic region is not a leading producer of any of the principal crops.

The only existing information on employment patterns that includes rural areas is from the 1971 Census of Population. Out of the total population, over nine years of age, 27 percent are considered to be "economically active", defined as persons who work or who are actively looking for work. Nearly 47 percent of this group state agriculture as their primary area of activity. This reduces to only 30 percent in the Pacific region where more than half the work force resides, while in the Central and Atlantic regions, agriculture accounts for over 70 percent

of employment. Public services and personal services are the next most important areas of activity in each of the three regions, employing over 19 percent of the total work force. This is followed by manufacturing and commerce, which provide jobs to 12 and 9 percent of workers, respectively.

Whereas 60 percent of the total work force lives in the Pacific region, the largest portion of rural workers reside in the Central region. Over 80 percent of all rural workers state that their primary activity is agriculture; services account for 8 percent, manufacturing another 5 percent, and finally, 3 percent work in commerce. The proportion of rural workers dedicated to agricultural activities is lower in the Pacific region than in the Central and Atlantic regions. Interestingly, 11 percent of all urban workers list agriculture as their primary activity, and this figure rises to 23 percent in the Central region.

The results of the Census showed an unemployment rate of only 3.5 percent in 1971, but a rate of 5.0 percent in urban areas and 6.3 percent in the city of Managua. However, a more detailed study of seven major cities in Nicaragua done in 1975 showed urban unemployment to be 9.6 percent overall (54, p. 32). The rate was 12.2 percent among wage earners and 2.4 percent among the self-employed. In Managua, 13.4 percent of wage earners were unemployed, while the rate was 9.3 in the six remaining cities.

Data on income levels are very scarce, however, a 1973 survey done by the Office of Sector Planning of the Ministry of Agriculture estimated that wage earners make up 51 percent of the rural labor force, and earn less than one dollar per day in wages, giving them only 8 percent of agricultural income. Self-employed persons and unpaid family workers

comprise 46 percent of the rural work force and earn 29 percent of income, while owners of large farms and ranches, who make up only 3.5 percent of the work force, earn 63 percent of agricultural income (52, p. 99). Whatever errors are contained in the above information, it reflects concerns over wide social imbalances in Nicaragua.

Agricultural Policy and Objectives of the Household Survey

Agricultural sector policy in Nicaragua has traditionally emphasized production of the principal export crops on large farms or haciendas. Haciendas are differentiated from other rural enterprises in two ways: first, they have hired managers, rather than owner-operators; and second, they maintain a work force which resides on the hacienda. The first distinction implies that land owners reside in urban areas and do not form part of the rural population. The second implies that the rural worker who lives on the hacienda does more than just provide labor; he also depends on the hacienda for housing and other services, and frequently also occupies hacienda land for production of subsistence crops. Data on sizes of haciendas are not available, but generally land holdings range from about 100 hectares into many thousands. Probably between 25 to 50 percent of rural families in Nicaragua reside on haciendas. Small farms operated by rural families are not major producers of export crops, but instead are involved in production of subsistence crops (primarily corn and beans) on plots of land either owned, rented or sharecropped.

In the early 1970s efforts were initiated to reorganize the rural public sector with the overall goal of raising welfare of rural residents, especially those at the lowest end of the income scale. Authority

for this reorganization came from the "National Agricultural Committee" which set out explicit objectives for rural policy. The two highest priorities were:

1. Pursuit of an income distribution pattern which would insure the rural population of a greater share of the stream of goods and services, and
2. Widening of opportunities for productive employment as a means of raising incomes (43, pp. 2-3).

While the objectives of rural policy were to increase welfare of rural people, little was known about rural households that would permit the formulation of government policies and programs. As in most countries, the national census is designed more for urban situations where income can be reported as monthly wage earnings; labor force participation is a "yes" or "no" proposition; and hours worked and wages have little seasonal fluctuation. In an effort to develop a system for gathering and analyzing information on the agricultural sector and rural households, the Sector Analysis Unit (UNASEC) was created in the Ministry of Agriculture and became the technical planning body of the National Agricultural Committee. From 1972 to 1975, UNASEC was dedicated to the preparation of an Agricultural Sector Assessment, the first of its kind in Nicaragua. The Assessment was based mainly on secondary information except for a few surveys carried out under tight schedules without benefit of adequate theoretical preparation, sample frames or sampling procedures.

Tentative plans for developing a more formal system for gathering and analyzing data were underway in UNASEC as early as 1974 (32). A data collection system was conceived that was to follow a regional

approach, whereby household surveys would be conducted in each of eight regions, and would be repeated on a regular basis in order to provide planners with up-to-date information for cross-sectional analysis, and eventually for time series analysis.

The first rural household survey was initiated in September of 1976. Following political priorities established by the National Agricultural Committee, the study covered rural families in the Central interior region. The objectives of the survey were:

1. Stratify the rural population in terms of socio-economic characteristics in order to identify target groups for different kinds of policies.
2. Analyze the effects of environmental conditions affecting rural families.
3. Test for the influence of factors affecting off-farm supply of labor.
4. Infer implications of alternative policy scenarios on labor supply and income distribution.

The author was employed as a consultant by Robert R. Nathan Associates for 18 months to assist in developing a methodology for the survey, which was to serve as a model for subsequent surveys to be conducted in the remaining seven regions of the country. He worked closely with a five-person team assigned to the survey by the Sector Planning Office, now called Direction of Agriculture Sector Planning (DIPSA).

During the political turmoil in early 1978, all five members of the team resigned, but requested that the author continue with the study as leader of a new team made up of younger, inexperienced personnel hired

by DIPSA. Hence the author became team leader, adviser and trainer during the final stages of the survey, including field work and tabulation.

Management and Procedures of the Survey

The dearth of information made it impossible to obtain a suitable sample frame of families. Because of this, and because of special interests on the part of persons in DIPSA, it was decided to conduct a preliminary study of communities of the region, and then sample families from within these communities. However, it was found that the concept of community is difficult to define in rural Nicaragua because of external factors superimposed on the local social structure.

Administrative areas have been established by the government in which a local person called a juez de mesta is designated to act as coordinator of community activities and interactions of local people with outsider. Since this official is appointed from within the political system, the juez de mesta naturally becomes the community's spokesman in contacting agencies for getting services improved. This person also maintains contact with the National Guard on security matters. The study team was obliged to obtain permission from the National Guard before entering each community, and initial contact was made with the juez de mesta. The areas of jurisdiction of this official is called the comarca, the boundaries of which are subject to change through higher officials of government and political institutions with no involvement of local residents. Over time, the comarca has come to dominate the local social structure.

The other major external influence over the community is the hacienda. A single hacienda is often large enough to encompass major portions of the land surface of one or more communities. The population residing on most large haciendas often have little social interaction with other residents of the community in which they are located. Little interdependence exists with regard to the establishment of public services, because families residing on haciendas rely on the landowner to represent them in matters involving public institutions.

Though community boundaries have diminishing significance, the study team found that certain local leaders could identify traditional boundaries, some of which are marked with obscure stone monuments. Hence the concept of community continued to be a useful part of the survey methodology. Preparation of the household survey included weekly field visits in the study region to test trial questionnaires. Some sections were revised two or three times, both in concept and in questioning procedure, before agreement was reached among project team members that relevant information was being accurately obtained. In the process, team members gained useful experience in enumeration, and became familiar with variations in the region.

Field work of the community survey was completed in February 1977; results were tabulated and prepared in published form in June.² Results of this study provided useful indicators of local conditions that could not have been obtained from a household survey, and a sample frame of 14,424 families located in 164 communities was established.

²"Informe Sobre el Estudio de Comunidades Rurales en la Región Interior Central," DIPSA, Ministerio de Agricultura y Ganadería, Junio 1977.

Besides interest in economic factors, persons in DIPSA wished to cover a wide range of sociological characteristics in the household survey. The volume of data sought became too great for a single interview, as had originally been intended. The ideal solution would have been to return to each family on two or more occasions; however, the idea of repetitive visits was rejected by DIPSA. It was felt that the uncertainties presented by conditions in the field and the general political environment made it unwise to utilize a methodology that requires more than a single interview. Further, the basic concept of the study was to generate timely information at a reasonable cost, a goal that could not be met if repetitive visits had been utilized. Hence it was decided to divide the sample into two groups, and apply separate questionnaires to each portion, one questionnaire dealing with income and employment and one covering sociological characteristics. Naturally, there was a great deal of intentional duplication between the two questionnaires.

A sample of 550 families was drawn from communities previously visited. The employment and income survey, upon which most of the results of this analysis are based, was applied to two-thirds of the sample, or 331 questionnaires actually tabulated. One-third of the total sample responded to the sociological questionnaire, resulting in 176 being tabulated. Some basic questions on migration, health, education, land tenure and off-farm employment appeared in both instruments in order to facilitate cross-sectional analysis.

Field work had to be postponed several times due to disturbances in Managua and the study region; only because of the high priority placed on the project by the Minister of Agriculture and the Director of DIPSA,

the study was not abandoned. Field work was carried out during May, June and July of 1978. Tabulation ran concurrently, reaching completion in August. Nearly all analysis was done by the author at Michigan State University due to the impossibility of working in Nicaragua after October of 1978.

Research Objectives for the Dissertation

As was seen earlier, goals of the National Agriculture Committee and objectives established by DIPSA for the Rural Household Survey point to a desire to redirect public action toward the disadvantaged portion of the rural population, with special emphasis on labor utilization both on-farm and off-farm. The overall objective of this dissertation is to assist Nicaraguan planners and decision makers in identifying the kinds of government policies that would best address the needs of different segments of the rural population in improving labor productivity and in raising incomes. It is also hoped that this effort will be useful in the formulation and implementation of foreign aid programs. Major emphasis is placed on estimation of returns to labor and the supply of off-farm labor as important components reflecting the economic situation of the rural household.

More specifically, the objectives of this research are to:

1. Identify the influence of factors affecting returns to labor utilized on- and off-farm;
2. Examine the extent to which the labor force adjusts over time to changing conditions, such as land tenure and employment opportunities;
3. Identify factors affecting the decision to participate in farming, and estimate the supply of off-farm labor;
4. Formulate policy recommendations that would improve income and employment patterns of rural households in Nicaragua, based on insights gained from the study region.

It is hoped that this analysis will help in making decisions regarding land tenure, transportation, production credit, extension services, colonization, marketing, labor standards, education, training and social services.

The following three chapters review the theory pertaining to labor utilization, and describe the study region and methodology used for the Rural Household Survey. Chapters V through IX present the analysis and findings of the dissertation, which begins with a description of the labor force. In Chapter V, communities are separated into strata according to their predominant land tenure pattern and agroclimatic situation; then the family structure is viewed and available manpower is related to type of community. Finally, family formation and resettlement patterns are related to community type to better understand how the work force adjusts to economic factors over time. Chapter VI deals with conditions affecting returns to labor utilized on-farm--land tenure, availability of credit and technical assistance, and impacts of roads on grain marketing. Chapter VII analyzes the decision to participate in farming and rates of labor utilization. Chapters VIII and IX provide a perspective regarding off-farm utilization of labor, beginning with employment conditions, wage rates, work schedules and educational services and attainment. A static model of off-farm labor supply is developed, concentrating first on parameters of the home-farm production function, then on off-farm employment opportunities.

The specification of the labor supply model draws on descriptive information presented in earlier chapters. This procedure weakens the capability of the model for testing hypotheses regarding the influence of various factors on labor supply, because the hypotheses are to some

extent drawn from the same data. The great paucity of knowledge of rural labor market in Nicaragua and of prior research in similar environments makes this approach more worthwhile than testing preconceived hypotheses derived from theory.

Chapter X presents a summary of findings and draws from the analysis to develop policy recommendations.

CHAPTER II

CONCEPTS APPLICABLE TO PROBLEMS OF RURAL EMPLOYMENT AND INCOME

This chapter establishes the foundation for the empirical study by identifying some of the areas of concern regarding employment and income in rural Nicaragua. Concepts and theoretical formulations of development processes are discussed with reference to policy issues in Nicaragua. Implications are drawn from the findings of other studies which have bearing on the orientation and approach of the Rural Household Survey. Methodologies applied in other areas are examined.

The chapter is divided into three parts. The first identifies policy issues relevant to Nicaragua with respect to rural employment and income. This part includes discussions of the concepts of unemployment and poverty, on-farm utilization of labor, generation of wage employment, off-farm labor supply, education and training and social services. The second part deals with the concepts of work and leisure and theories of time allocation. Conclusions are reached for the approach of the current study. Finally, problems of measurement and definition are discussed, and methods developed in previous studies are evaluated.

Employment and Income Policy Issues

Turnham and Jaeger pointed to five "disquieting trends" which reflect some of the most important concerns in less-developed countries:

1. Growth in labor force
2. Income distribution
3. Waste of human potential, especially among the young
4. Urbanization
5. Inadequate prospects for job creation (57, pp. 9-11)

The extent of unemployment and underemployment in Latin America has been estimated at around a fourth of the economically active population. A labor force growth rate of 3 percent per year in Latin America--the highest of any major region in the world--makes the alleviation of the employment problem especially difficult (7, 55).

Before the 1970s, economic growth was often seen by planners and policy makers in Latin America as necessary and sufficient for alleviation of employment problems and poverty. But with increased knowledge about these problems, attitudes began to focus more on employment as a separate goal of the development process, rather than as a by-product (46, 50, 57).

Public actions to provide the means of obtaining higher incomes and alleviating rural poverty in Nicaragua have been exceedingly limited. Land tenure is a widely recognized social and economic issue, but recent efforts at agrarian reform and colonization have had nearly no impact. Improvement of rural infrastructure, especially roads, has received some attention, but mostly in areas where large landholdings predominate. Only one rural development program exists in the country, and it only recently began operation with the help of U.S. financial aid. This is the Institute for Peasant Well-Being (INVIERNO) which began operations in 1975 in the Central interior region. Public actions toward improving conditions of employment or remuneration, or toward creating jobs, remain

virtually unknown in rural Nicaragua. Minimum wage laws exist, but are not applied to rural areas. Labor information services have yet to be provided in rural areas, and no labor organizations exist.

A series of actions considered by the government of Nicaragua as early as 1974 to increase employment opportunities include:

1. Resettlement of landless peasants onto public lands,
2. Introduction of modern methods of production to increase returns to labor in agriculture,
3. Assistance to small industry and handicraft enterprises in rural areas,
4. Establishment of labor offices in regions of seasonal migrations for harvesting of crops--coffee, cotton, and sugar cane,
5. Use of labor intensive methods in public works projects so far as feasible,
6. Improvement of services in training and formal education,
7. Improvement of wages and work conditions (43, p. 46).

The above shows a concern with returns to both on-farm utilization of time and off-farm employment. The importance of off-farm employment could only be postulated by planners. No studies existed that documented time worked off-farm or family wage earnings. Perhaps because of this, the INVIERNO program was designed to assist rural families as if farming was their only occupation, emphasizing agricultural credit and technical assistance.

This section explores some of the more important issues in relation to studies done previously in Nicaragua and other countries.

Unemployment and Poverty. Planners' views of employment are often based on experience in urban environments in which work effort is formalized through a labor market. A person holding a job is thought

of as having gained access to a property right, implying a future income stream. On the other hand, rural employment or unemployment are more difficult to define and measure, principally due to participation in family farming enterprises. The Census of Population in Nicaragua automatically classifies persons as being employed full-time if they state that their occupation is farming. The fact that rural unemployment is difficult to define seems to be one reason that public policy fails to focus on this problem in LDC's (23, 25, 30, 38, 51, 57).

Two approaches to measuring underemployment in less-developed countries have been developed. One is the income criterion based on the observation that the problem facing most rural people is not lack of employment, but poverty, often combined with long hours of work (35). Turnham and Jaeger develop this concept, arguing that this is not simply a poverty approach to the employment question. "Low income among full-employed people, like unemployment itself, may be just as indicative of wasted labour potential as of poverty." (57, p. 69) Wilfred Lewis (30) argued that this approach be adopted in employment planning in Nicaragua. Sen presents convincing arguments that mixing poverty and unemployment will "impoverish both notions."

Employment is an important means of generating and distributing income, but a person can be rich yet unemployed, if he has other sources of income, and also a person can work very hard and still be very poor. Poverty is a function of technology and productivity, of the means of production, and of exploitation and social arrangements for production and distribution. (49)

Though there is merit in the argument of Turnham and Jaeger that low income may be related to low productivity of labor, the two concepts are not synonymous. The income approach to unemployment and

underemployment implies defining poverty levels and explaining these with factors related to labor utilization and productivity.

The other method of measuring rural unemployment (or rather of testing to see if it exists) has come about as a result of the hypothesis of "surplus labor." (21, 33, 45, 58) Some empirical studies show the existence of surplus labor or disguised unemployment, while others refute the hypothesis for the same area. Drawing from studies in India, Schultz (48) and Paglin (42) concluded that there is no surplus labor in Indian agriculture, but Desai and Mazumdar (12) also use data from Indian farms and conclude that there are surplus labor villages that co-exist with scarce labor villages. Harberger (20) cites evidence from Krishna (26) and argues against surplus labor in Indian agriculture, and concludes:

If Indian agriculture is not characterized by zero (or negligible) marginal productivity of labour, it seems hardly likely that the phenomenon is widespread in the rest of the underdeveloped world, in which incomes tend to be substantially higher and population densities substantially less than India's. (20, p. 562)

Arcia and Warnken tested the hypothesis that the marginal value product of family labor on small Nicaraguan farms equals the wage rate.

These results suggest that there is indeed an excess of family labor over the entire production period. Thus the hypothesis that the MVP of family labor equals the wage rate was rejected. However, the marginal productivity of hired labor implies that the planting and harvesting seasons requires the hiring of labor even on these very small holdings. During these seasons of the production cycle, marginal productivity of family labor is also likely to be positive. Between these two peak points, however, little hired labor is utilized and family labor becomes excessive, yielding a low marginal productivity for the entire production period.

Given the above results, it is clear that the concept of "surplus labor" must be very carefully defined. Certainly surplus family labor exists during some seasons of the

production period, yet this labor could not be withdrawn from the small holdings without a concurrent reduction in crop output. (20, pp. 4-5)

They also note that the average value product of labor on family farms is twice the wage rate, and reach the conclusion that, because of seasonal variations in productivity, average value product is a more appropriate measure of opportunity cost of remaining on the farm than is marginal value product. However, this conclusion applies to "either/or" decisions of remaining in farming versus migrating to a city, rather than to short-run decisions involving off-farm employment.

The conclusion that labor is scarce in some seasons, while in others productivity is very low, seems reasonable, and has been the basic thesis of recent optimization models of small farms. The problem is less one of testing the hypothesis of surplus labor, than of measuring the degree of labor utilization and productivity.

Labor Absorption on Small Farms. In Nicaragua, production of important export crops is concentrated in large farming and ranching operations or haciendas. As shown in Chapter I, agricultural products comprise a majority of the exports of the country. However, the commercial sector and the rural household sector compete for scarce resources for use in agricultural production. If the commercial sector enjoys an advantage in access to land, capital and technical knowledge, less labor will be absorbed in productive activities on small farms. Public policy has been oriented toward increasing production on a commercial scale in the past.

The problem of adopting a strategy whereby agricultural production is concentrated in large farms is that it assumes that persons who do

not earn a living in such a farming system can find useful employment in other sectors of the economy. This assumption probably does not hold true for most Latin American countries (46). Consequently there is a growing concern regarding rural to urban migration which often creates new difficulties for policy makers (56). Census of Population data in Nicaragua currently show low rates of migration, especially to urban places, but the tendency to migrate could increase in the future.

It is not realistic to believe that large farms will generate employment opportunities in sufficient quantities. Labor utilization in commercial agriculture is less intensive per unit of land area in many Latin American countries (46). UNASEC estimated that small farms of less than five manzanas absorb more than one-half worker-years of labor per manzana. In contrast large farms of more than 50 manzanas utilize an average of only one-hundreth of a worker-year per manzana (52). Hence a strategy is needed whereby small farms improve levels of productivity and returns to labor which will require support of the public sector.

There is widespread agreement that land tenure is highly skewed in Nicaragua. A survey showed about 36 percent of rural households having no land and another 36 percent owning less than five manzanas, less than nine acres (28).¹ Emphasis of policy has been on construction of penetration roads into the unsettled eastern frontier areas, sometimes coupled with distribution of public land under a usufruct arrangement. This allows the occupant all rights of use of the land for an indefinite

¹The sample frame for this national survey was limited to families producing grains--corn, beans, sorghum, and upland rice. Families not engaged in farming were excluded.

period, but these rights cannot be transferred by the occupant to other individuals. An unpublished study by DIPSA of an area just outside the boundary of the Central interior region showed that holdings of public land ranged from small lots of one-fourth of a manzana (less than half an acre) to more than 100 manzanas (more than 174 acres), and many families engaged in farming in the area were landless. Other cases are known where persons received more than 1000 manzanas.² Undoubtedly political influence was a major factor in the above, but it is also evident that planners of the agrarian reform had failed to establish meaningful guidelines. It was not clear if the purpose of the agrarian reform should be to promote subsistence farming or if larger holdings for commercial purposes should be given.³ It was also not known what sizes of parcels were required for either of the above objectives.

Availability and adoption of technical inputs increase productivity and utilization of labor in agriculture. Two programs established by the government of Nicaragua are available to help small farmers with credit, technical assistance and input supply. The Banco Nacional de Nicaragua offers assistance to small commercial farmers who cannot qualify for commercial bank loans, and INVIERNO was created in the Central interior region to help the poorest of rural households increase home farm productivity and to provide a number of social services.

Hence the Banco Nacional small farmer program was developed in part to increase production among viable agricultural units, while INVIERNO was created around the concept of alleviation of poverty. An issue is

²Interviews with technicians of the Agrarian Reform Program, Managua, Nicaragua, 1977.

³Interviews with officials of the Ministry of Agriculture, Managua, Nicaragua, 1977.

where one clientele group stops and the other begins. The Banco Naccional's program carries a commercial orientation, but still reaches down to a part of the population that owns only five manzanas of land. INVIERNO serves some that own no land, but reaches all the way up to 100 manzanas. A second question arises as to the feasibility of making progress in agricultural production with the "poorest of the poor" farmers. Resource restrictions of this group would be the most severe of any in rural Nicaragua. Perhaps a program to alleviate poverty should focus on provision of social services and means of increasing capability of obtaining employment or more land resources.

Off-Farm Employment. As noted, planners and policy makers in Nicaragua were just beginning to recognize the importance of wage employment in the mid-1970s. Nicaragua is probably different from other Latin American countries because of the relatively importance of wage employment generated in commercial agriculture compared to the size of the rural population. As noted by Lewis (30), the implication for planning effective income and employment projects is that steps which succeed in increasing production in agriculture should lead to increased employment and wage earnings, and not merely to higher incomes of farm proprietors. Level of investment, selection of enterprises and technology applied in commercial agriculture are important determinants of the amount of wage employment generated. Cotton and coffee especially utilize large amounts of manual labor for their cultivation, whereas cattle ranching requires a minimum of labor. Cattle and coffee compete for the same land in mountainous regions. In the flat Pacific areas of Nicaragua, mechanization of cotton (harvesting) is quite feasible. Possibilities

exist for either increasing or greatly reducing demand for agricultural labor. These issues involving cropping patterns and mechanization have not received major attention among DIPSA planners or policy makers.

Another possibility for generation of employment is in public projects, such as road building. Virtually all road work is currently performed with heavy machinery. Much of this is probably necessary, since road repairs are often needed in rush order when roads are damaged at the first of the rainy season in May, and also later in the season when crops are being harvested. Some road work is done where population is sparse. Maintaining large crews could be more expensive than using machinery.

The labor market in rural areas might benefit from a system of employment information. Employment offices have operated in urban areas of Nicaragua for several years, but have yet to begin in rural places, despite the recognition of the usefulness of employment information to large numbers of migrants in search of work in certain seasons.

Although these can be relatively small and inexpensive operations, they can serve several very useful functions. Basically, they should be places where unemployed persons looking for work register the fact of their unemployment, and where employers, both public and private, come for assistance when they are hiring labor. As a byproduct of this activity, these offices should be able, over time, to assemble information about the local seasonal pattern of demand for labor, and about the characteristics of the unemployed and their possible need for services such as training, transportation to work, etc., which can be fed back into the employment planning process. (30, pp. 6-7)

Finally, wage rates and conditions of employment should be given attention. Nicaraguan wage laws specify maximum hours per day and minimum wages for industrial, agricultural, general, and domestic

workers for different regions of the country.⁴ Theory suggests that minimum wage regulations will cause employers to hire less labor. Persons continuing in their jobs will benefit from higher wages, but others will not find work available. Total output would decline. And certainly, if a blanket rate per person were imposed, without regard to standardizing units of labor in terms of worker-equivalents, women and children would be the disadvantaged group of workers, at least in field work requiring strenuous manual labor.

Off-Farm Labor Supply. A major question arising in other studies involves labor utilization of families at or near subsistence levels of consumption. Mellor (36) first expressed the idea that families with control over few productive resources would have to work to the point where marginal value product is close to zero just to produce enough to survive. But families with considerable resources would stop well short of zero marginal value product. Barzel and McDonald indicate that actual observations typically show decreases in time worked as wages increase in the range of subsistence. They argue that persons with large amounts of assets would have an upward sloping supply curve of labor, because subsistence considerations are negligible, but:

On the other hand, for an individual with no wealth whatsoever and no income source other than his own work, the very lowest wage would be insufficient for survival. As wages increase, a point will be reached where survival becomes possible if he supplies the highest physical possible amount of labor. For such an individual, as the wage rate continues to rise, the amount of labor supplied cannot increase; given that leisure is a commodity, the supply curve has to have a negative slope right from its very beginning. (4, p. 622)

⁴"Tabla de Salarios Mínicos de Nicaragua," Ministry of Labor, Novedades, May 9, 1977.

Barzel and McDonald's comments are made with respect to the poor of the United States, so that the family context does not predominate in their formulation of the theory.

Hart placed emphasis on total assets of Java families studied, finding that women in more wealthy households work less in household production and take more time for leisure. Total assets provide an indication of the family's economic position that goes beyond current income, relating to consumption patterns over the life cycle. When assets and income levels fall to levels near subsistence, families react by working more hours outside the home.

In examining the disparities among classes, I suggest that the most important considerations relate primarily to the ever-present threat of falling below the margin of subsistence which constantly confronts the landless. (22, p. 196)

The need to make allowance for disaster--which could take the form of anything from a sudden increase in the price of rice, to a reduction in income earning opportunities, to severe illness--is, I suggest, the driving force behind decision making processes in this class. While the need of heavy involvement (particularly of women and children) in income earning activities, together with restrictions on levels of consumption, involve severe immediate welfare costs they provide the household with a degree of protection against falling below subsistence. (22, p. 199)

Another important issue is that of specialization among household members. While some members earn cash income outside the home, others may tend to participate less in the labor market. Mincer's study of labor force participation of married women was aimed at reconciling results of cross-section analysis which show wives decreasing work when husband's earnings are higher with time series which indicate increasing participation of wives even though husband's wage levels and real income have risen. Mincer concludes that there is not real contradiction:

. . . two facts intervene which convert the negative income relation in cross-sections into a positive secular relation: (1) short-run transitory components of income are not relevant to long-run developments, and (2) the female wage rate has risen over time at least as fast as the male rate. (37, p. 92)

The implication is that for a point in time, family members tend to specialize--one works at home while the other works for wages. But through time, as home production methods become more capital intensive, and wages rise, both members will, on the average, work more outside the home.

Several studies suggest that the presence of young children in the household causes the wife to increase time spent at home, especially as opposed to wage employment (16, 29). Evenson (14) presented strong evidence that wives in rural Philippine households spend more time in housework when there are children under six years old present, but that children six and up evidently replace the wife in some household work, allowing her to devote more time to off-farm employment. The tendencies were similar among families that participate in farming, and those that do not. However, rural Brazilian families from Sao Paulo and Minas Geras studied by Lopes did not show the same tendencies.

. . . given the alternative available, for market work (farm and off-farm), grown up children and other relatives (ten years and up) possibly have a higher productivity in market work than in home production, as compared to wives. (32, p. 101)

Lopes explains that while a larger proportion of older children than wives actually worked off-farm, it is not clear that children have a comparative advantage in the labor market. If children have such an advantage, they might participate in more work to increase total utility

of the family. If they do not have a comparative advantage, their increased participation may be due to their own individual preferences for income, independent of preferences of the family.

Effects of education were shown in most studies to increase time used in labor market activity, with the exception of Lopes' study (32) of rural Brazilian households. Here, the impact of education was just opposite, and strongly significant. Unfortunately, no explanation was offered to explain this behavior.

Two recent studies of multiple job holding by Illinois farmers showed education to influence both farm productivity and off-farm wage. Barros (5) estimated an "asking wage" of farmers that do not work off-farm on the theory that the reason farmers do not work off-farm is that asking wage is higher than what they are offered. The asking wage is a function of parameters of the farm production function, including operator's schooling, health, age and farming experience. Schooling was positively related to the asking wage and offer wage, but had no direct impact on supply of off-farm labor. Barros suggests that neither hired labor nor family labor represent close substitutes for the operator's labor on the farm.

More experienced operators tended to ask higher wages to work off the farm. In consequence, they tended to have lower probabilities of working and to work less off the farm. (5, p. 72)

Farmers with more previous job experience tended to work more off the farm.

Sumner (53) estimated farm profit rather than the asking wage with similar (preliminary) results with respect to schooling--schooling did not increase labor market participation off-farm.

Finally, Bardhan (3) analyzed data from an employment survey in west Bengal, India, stressing that data from a widely dispersed random sample of families better serves the purpose of estimating labor supply than studies of small farmers because the former representatively included landless families that do not farm. His findings also show education has a negative influence on employment off-farm.

The provision of educational services in Nicaragua is the topic of the next section.

Education and Training. Some of the effects of education on labor supply and productivity were suggested in the previous section. Other effects of the educational system on society have been put forth by a team organized by the International Labour Office:

1. Time of children is usefully occupied.
 2. Teachers are productively employed.
 3. Education determines who has access to jobs, affecting social mobility of different groups.
 4. Attitudes are influenced, with resulting impacts on fertility, and population growth.
 5. Skills are gained and productivity of labor increases.
- (56, pp. 215-216)

In rural Nicaragua there are some very pressing questions related to provision of schooling. The first is the total investment that should be made in the educational system at different levels--elementary, high school, university, technical schools. Higher levels of education or technical training may have a more immediate impact on capacity of the labor force to carry out more complex tasks, but opportunities for participation would be limited to those having completed primary schooling.

If a principal goal was to provide a complete elementary education to all rural children, problems of physical access in sparsely populated areas would need to be addressed. More small schools could be dispersed evenly in rural areas. Providing instruction to students from grades one through six might become more difficult since only one teacher would be assigned in each school. Another problem is in reaching children in households situated on haciendas. This applies to over 25 percent of the rural population.

The National Agricultural Committee has created a separate agency to be responsible for research and training, called the Nicaraguan Institute of Agricultural Technology (INTA). This agency began operations in late 1977, but, as with other rural programs, has only paid attention to research in agricultural production and technical training. The rural sector is a low priority of the Ministries of Labor and Education. A recent paper outlining a new Commission on Human Resources and Employment prepared for the Ministry of Labor did not mention rural employment nor the Ministry of Agriculture.⁵

Lewis believes that on-the-job training is more effective than classroom instruction and suggests that the Ministry of Agriculture contract with private institutions to provide this service. "For example, some of the large commercial farmers are already training carpenters, plumbers, etc. for their own needs, and may be able to expand this activity under contract to the government." (28, pp. 8-9) Needs for training in specific activities must be identified before this program can be made operational.

⁵"Comision de Recursos Humanos y de Empleo" documento para discusion, preparado por el licenciado Friolan Fernandez, Ministerio de Trabajo, May, 1978.

Social Services and Organization. The importance of health services, potable water, electricity, and other social services needs to be better understood. Planners in Nicaragua often place a great deal of emphasis on the type of dwelling in which the family resides, but the importance of the dwelling unit to rural families is not clear. One of the most complete sections of the Census of Population forms is on type and size of dwelling unit. Electrical power is being provided in rural areas, but again, the demand for this service by rural people in different areas should be estimated. Demand may be greater for services such as improvement of roads and systems of providing water for household use.

Social organizations in rural areas are often influential in obtaining resources for public services and infrastructure. They also become important in determining the effectiveness of rural development projects aimed at increasing agricultural production. A handful of studies on farmers' adoption of new practices have found community factors to be at least as important as individual characteristics in determining adoption rates.

All these studies have shown that the type of community in which a farmer lives, the type of group to which he belongs, the nature of the local leaders to which he is a follower, the social structure, culture and locality groups, the degree of social differentiation, social solidarity and even social isolation of the community are all major factors influencing the adoption of new farm practices of farmers. (1)

Success and failure of most public programs in rural areas of LDC's varies with the place--in one community an idea catches on and obtains results, while in another the same program fails because of social or other constraints particular to that place.

The community not only defines the environment in which rural families are situated, it often becomes the level at which rural services are provided. For example, the question of which farmers receive INVIERNO production credit and technical assistance involved the following decisions:

1. Which of the eight regions should receive top priority?
2. Which communities should INVIERNO work in?
3. What qualification standards should be used to select families?⁶

Though it was scarcely conceived by plan, the community became an essential part in the formation of INVIERNO's working strategy. The success of many development programs in other countries hinges on the organization of farmer associations or other groups with common interests (56).

The following section deals with theories of time allocation and the work/leisure trade-off.

Work and Leisure

The concept of leisure, and how it is distinguished from household production has received attention in literature on time allocation or "new household economics" (6, 17, 18). Here, time and goods are consumed, not for their own enjoyment, but for the production of "commodities," which are final products from which utility is derived. Work is seen as an activity to produce goods, and leisure as an activity that consumes goods to produce commodities. Since utility is derived only from commodities, persons must be neutral about participation in work or leisure

⁶Interviews with technicians of INVIERNO, Managua, Nicaragua, 1976.

activities. Neither the "recognition aspect" of work discussed by Sen (49) nor any disutility of participating in drudgerous physical labor is considered to influence work/leisure decisions. Further, utility is not supposed to be derived directly from leisure activities, which is the point of attack by Pollak and Wachter:

Commodities which involve time as an input are a particular problem, since their production often involves joint production. Jointness is pervasive because time spent in many production activities is a direct source of utility as well as an input into a commodity. We suggest that the household production function model, with its concentration on commodity prices, provides a satisfactory account to the allocation of time only for households which are indifferent among alternative uses of their time. (44, p. 256)

A commodity can be anything at all that anyone wants to have, for increasing one's utility directly. But it is doubtful that more than a few such "desirables" can be identified and measured.

The household production function approach has been applied to cases in which the variable under study may be more appropriately viewed as a utility than as the output of a production process. If commodities are not being produced, it makes no sense to analyze the demand for them; but we can, however, examine the household's allocation of goods and time among activities as a function of goods prices and wage rate, provided only that these allocations are themselves observable (44, p. 276)

There is, perhaps, a fundamental difference between two groups of commodities--some can be enjoyed independently of production, whereas others require direct participation in production for their enjoyment. This gives rise to specialization among household members. For instance, if the commodity in question is children, one family member can stay at home tending children while the other produces the goods necessary for their well-being.

Gronau recognized this distinction in relation to household activities in his 1977 article which separates time used for production of goods and services in the home, and leisure.

An intuitive distinction between work at home (i.e., home production time) and leisure (i.e., home consumption time) is that work at home (like work in the market) is something one would rather have somebody else do for one (if the cost were low enough), while it would be almost impossible to enjoy leisure through a surrogate. (17, p. 1104)

But which activities produce commodities, and which ones produce services that are used for commodities production? Gronau admits the practical difficulties of distinguishing between home production of goods, and leisure (home production of commodities) for the Michigan families studied.

In less-developed countries, leisure and time spent on home production are even more difficult to separate, not only in practical estimation, but conceptually as well. Leisure takes on many forms, some well defined and some poorly distinguishable from other activities. The well defined forms are special, often involving intensive activity, and nearly always occur outside the home. These revolve around sports, alcohol consumption, and gambling. Participants are all male. Other leisure activities are not so well defined. Nicaraguan housewives probably extend activities over the full length of the day because of a lack of other kinds of activities--productive or leisure--that would occupy their time better (13). If more attractive alternatives were available, time might be put to use in more distinguishable ways, involving participation in some activity, preferred for the direct benefits derived, or for goods production. Sometimes leisure takes the form of rest, seemingly needed to restore energy after hard physical labor. This sort

of leisure more resembles a maintenance function--in this case, maintenance of human capacity--than it does a final consumptive use of time.

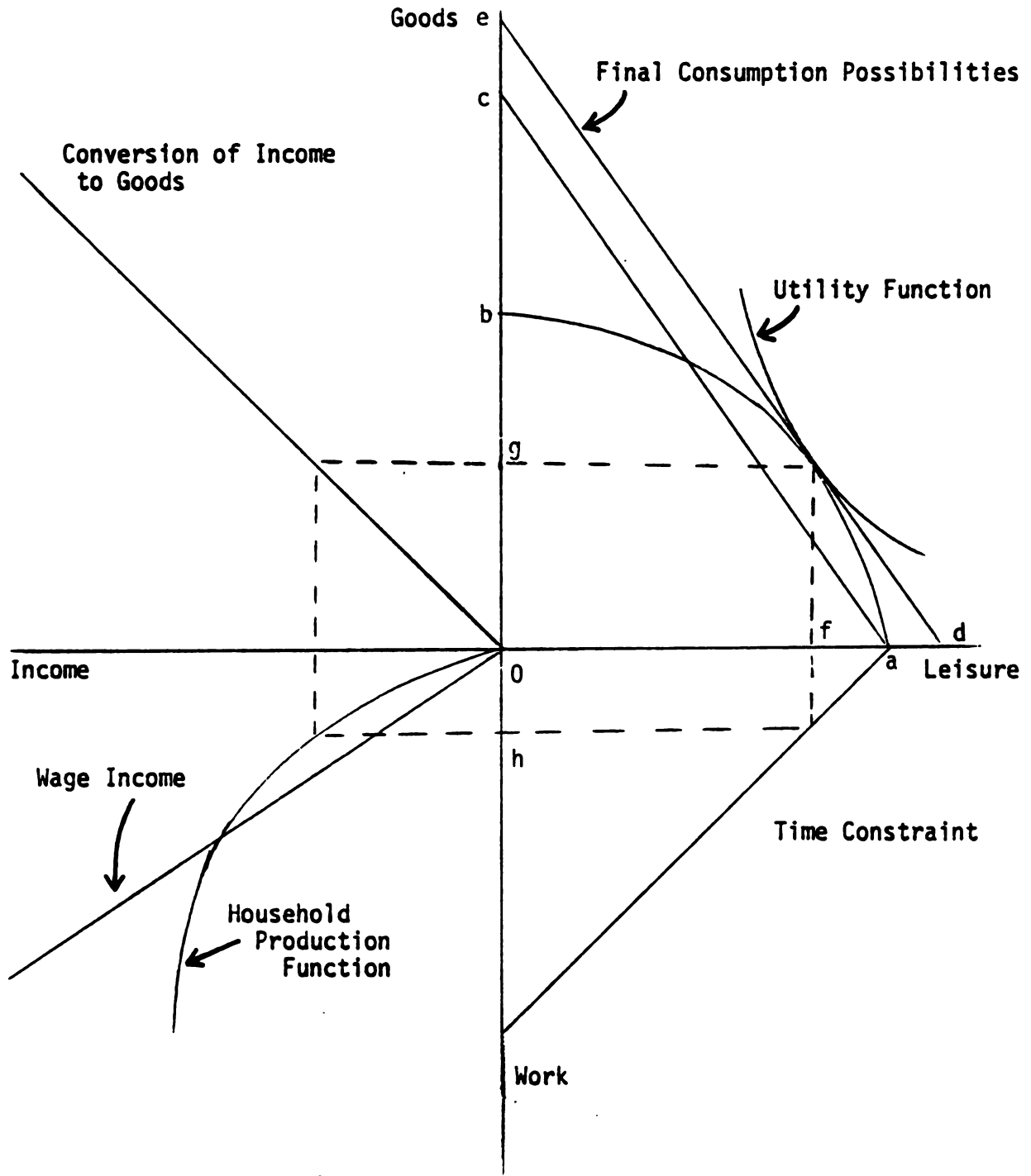
From the viewpoint of concerns about employment, utilization of time in household production and leisure are often less critical. This is especially true where labor force participation of females is low. Hence, most studies that focus on off-farm labor supply do not distinguish between the two. Instead, these activities become the residual of time spent working away from the house.⁷ The conceptual model, then, has utility being derived from inputs of leisure and goods. Leisure can be transformed into goods through household enterprises or through off-farm work for wages, leading to a "consumption possibilities" curve with leisure time on one axis and goods on the other. The household, as a unit, is assumed to express preferences that lead to an optimal allocation of time to work at home, off-farm employment, and leisure. Figure 1 graphically presents the principal relationships most frequently considered.

Total available time of family members in the southeast quadrant is converted into income, either along the household production function or along the wage line both in the southwest quadrant. Income is converted into goods by the identity in the northwest quadrant. If all family time is used in household production, curve a,b in the northeast quadrant would indicate consumption possibilities. If all time were used in off-farm labor, a,c would apply. But using a combination of the two obtains curve d,e, which represents the wage rate drawn tangent to the

⁷Notable exceptions are Gronau (17) and Hart (22).

Figure 1

Derivation of Consumption Possibilities Curve from Time Constraint,
Household Production Function, and Wage Rate



household production possibilities curve. The marginal value product of household activities would always equal the wage rate, no matter how much family labor is available, or what family preference for goods and leisure are. If members wish to work more than o,h , they would do so off-farm, and if they do not supply o,h of labor, workers from outside the family would be hired. The indifference curve shown is arbitrarily drawn from a family that neither prefers to buy nor sell labor, but would maximize utility supplying just o,h of labor to household production, producing o,g of goods and using o,f of time for leisure.

Problems of Definition and Measurement

A difficulty arises in reconciling the emphasis on the household as a labor-using enterprise with various aspects of supply, which ultimately rest with the individual. Variables such as age, sex, education, job experience and marital status often dominate labor supply equations; they do not, however, enter into the model formulated above. The overriding reason for using the household as the decision-making unit is not as its role as producer, but for its role as consumer. Income is assumed to be shared by all members.

A change in income of some family member will, in general, result in a changed consumption of leisure for the family as a whole. An increase in one individual's income may not result in a decrease in his hours of work, but in those of other family members. (37, p. 66)

This reconciliation is often accomplished by concentrating on time allocation of a single member of the family, such as the family head. Increasingly, however, models allow for the division of work among members.

While classical theory regarded 'household' as synonymous with 'individual', the new approach came to recognize that members of a family each play a different role in the production of utility. Various authors suggested that the classical dichotomy of 'work in the market' versus 'leisure' may serve as a good approximation of the role the husband plays in the production activity of the household but does gross injustice to the wife. (17, p. 643)

Hence, most models separately estimate labor supply of males and females, but with the inclusion of family characteristics, including parameters of the household production function. Variations of this were used by Bardhan (3) who used the household as the unit of analysis, and Lopes (34) who averaged over adult males, females, and children in the family.

Alternative specifications of the dependent variable are plentiful, beginning with the question of whether days or hours worked should be used. Many studies, such as Evenson (14), Lopes (34), and Bardhan (3) use hours per week, but the choice should depend on the alternative uses of time included in the model, and the nature of the labor market studied. For instance, some work decisions come in "all-or-nothing" packages. This is especially true when the person must consider employment far from the residence, which involves temporary migration. Housework frequently occupies short intervals throughout the day, making participation in some outside activities impossible due to incompatible location of the residence to work sites. Work schedules are sometimes also quite rigid. Even in general kinds of field work on Nicaraguan haciendas, work hours are often strictly enforced. Much work is performed in tightly supervised field teams. Though wages are set on a daily basis, payment is made by the week; failure to work the full six-day week can jeopardize the entire week's pay. Additionally, there is

a problem of comparing hours of different kinds of occupations which require varying amounts of physical energy to perform a "normal" day of work.

Finally a methodological question which has been addressed in previous studies deals with value of time. Persons who do not work in wage-earning occupations have no wage rate to report, though there is presumably a potential wage offered in the labor market. Bardhan (3) included several alternative measures of value of time off-farm, including a wage predicted from socio-economic characteristics of the individual (as is done in most studies), an "acceptable" wage stated by respondents divided by predicted wage, an average village-level wage, and the village wage level adjusted for unemployment in the village to indicate effective wage after job search. Though wage turned out to be significant in determining off-farm work, the choice of which measurement of wage to use did not make much difference in the estimates. Other variables had greater impacts than wage in determining off-farm labor supply.

An especially complete treatment by Hall (19) emphasized estimation of wages for persons not working. The wage equation included race, sex, age, education, metropolitan area, residence (U.S. or foreign) at age 16, union membership and health. Estimated wages were used in place of actual wages even for people who work. The approach suggested by Hall is utilized in this study.

The two chapters that follow describe the study region and methodology used in the survey. Analysis of survey results follow in Chapters V through IX.

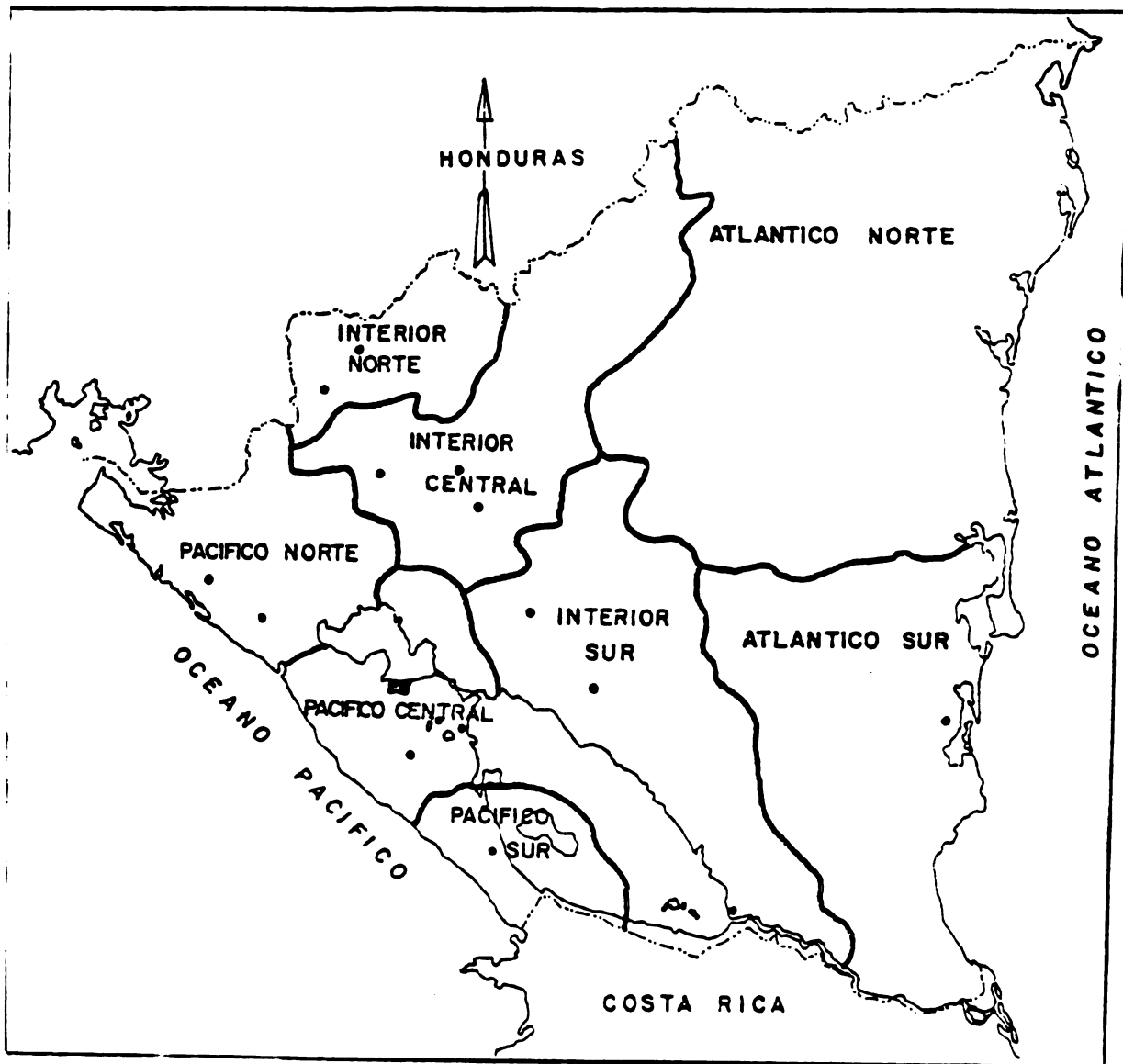
CHAPTER III

DESCRIPTION OF THE STUDY REGION

For purposes of administering a series of programs aimed at the rural population, Nicaragua was divided into eight regions, three on the Pacific, three in the Central mountains, and two on the Atlantic coast (see Figure 2). The Central interior region was chosen for this study because of political priorities established by the Government of Nicaragua. The region is comprised of three departments, each with a major city forming its hub. Each department is divided into municipalities, and each of these has a smaller town at its center. The Department of Matagalpa has 11 municipalities, Jinotega has four, and Esteli, five. Most industrial activity, such as coffee and tobacco processing, take place in the three departmental cities. The towns located in each municipality are local centers of commerce. Urban areas account for nearly 28 percent of the region's population according to recent census estimates. Nearly 40,000 families live in the rural portion of the region, representing about 25 percent of the rural population of the country.

There are about 700 rural "places" in the study region that constitute basic social units which can be called communities. They vary greatly in their size, make-up, accessibility, and availability of services, as well as employment opportunities. Population ranges from a low extreme of only three families (remaining in a community where out

Figure 2
Eight Planning Regions of Nicaragua



Legend:

—— Regional Boundary
 - - - - International Boundary

■ National Capital
 • Departmental Capital

Scale: 1:3,000,000

Source: DIPSA, Managua, Nicaragua

migration has been caused by several years of drought), to a maximum of about 700 families. The average size is less than 60 families, and the average family has over seven members. The geographical size of each community has never been accurately determined; however, from field experience it appears that they range from two or three square kilometers to more than 50.

Geographical Variations Within the Study Region

Variations within the region follow general physical and geographical variations throughout Nicaragua. Climatic conditions change as one travels from west to east across the region, going from a droughty area of lower, but rough, mountains, into a slightly more elevated area where rainfall increases markedly. The Department of Esteli, located in the western portion, reported 900 mm. of rainfall in 1974, whereas Matagalpa and Jinotega had 1254 and 1477, respectively, for the same year. As one moves from the centers of Matagalpa and Jinotega toward the eastern extremities, rainfall rises even more abruptly. The main cropping difference that corresponds to these climatic variations is the presence or absence of coffee, which is grown commercially where rainfall is higher.

Population density is low, on the average, ranging from about 40 persons per square kilometer in the western area down to ten persons in the eastern area. The far eastern fringe of the region is sparsely settled "frontier" area, known as such because of its remoteness. Only about 15 years ago, there were very few roads or settlements in this area, but in the late 1970s penetration roads were extended to the outer extremity, and colonization is taking place. This phenomenon is not

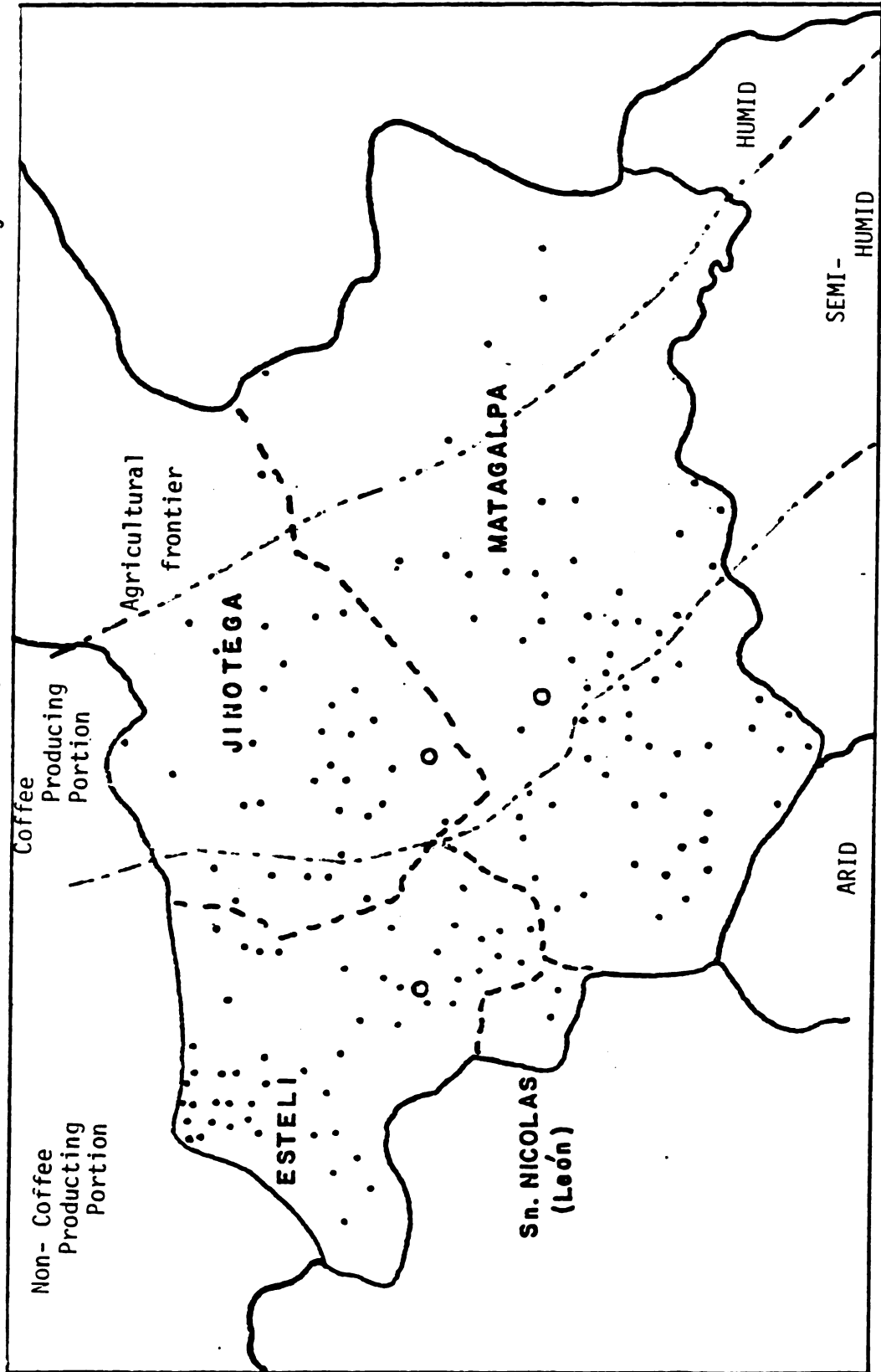
limited to the Central interior region, but can be witnessed in other areas of Nicaragua, both to the south and north of the region. In fact, the real "leading edge" of the agricultural frontier goes farther east than the boundary of the study region, and as a result, the portion included in the study is "frontier" that has had a few years to become established.

Figure 3 shows the location of 154 communities surveyed during the first phase of the study. Though communities in the west are much smaller than those in the east, the density of the dots in Figure 3 give a rough idea of population density. Areas with no dots, such as the area between the cities of Matagalpa and Jinotega are mountainous, and virtually unpopulated.

Seasons of Agricultural Activity

Patterns of population vary with the specific microclimate of each area and with local practices. A generalized pattern is described here for simplicity; only a very few use irrigation systems that allow some alteration of these basic patterns. The agricultural year begins in mid-April with preparation of land for annual crops, principally corn. After corn is harvested in September, a second planting, more often of beans, can be seeded, which is harvested around December. Major activities in coffee production begin in mid-November and continue over to the end of January, peaking at New Year's. The main part of this work is in harvesting, though there are some preharvest activities and clean-up picking performed. Most coffee is grown on larger farms and haciendas which attract large flows of migrant workers at this time of year.

Figure 3
Location of 154 Communities Surveyed in the First Phase of the Study



Source: DIPSA, Encuesta de Comunidades, 1977

The latter part of February, March and the first half of April are "dormant" periods for many persons who do not own land or livestock, or who do not have permanent jobs. This period is used by family farmers to repair fences, clear brush from pastures, and other general maintenance. It is the period of scarcity of feed for livestock and water for all purposes.

Types of Enterprises

Most prominent among rural enterprises are the haciendas. These are defined as farm businesses having full-time salaried managers, rather than owner-operators. In practice, they are institutions that provide the year-round work and residential environment for about one in five rural households, and many more temporarily during coffee harvest. Families living year-round on haciendas usually occupy a house provided by the hacienda, nearly always work for the hacienda during most of the year and may grow crops on a small amount of land provided by the hacienda (free, rented or sharecropped).

There are haciendas in nearly all (83 percent) of communities; however, it appears that local leaders usually underestimated hacienda size. Productive activities of haciendas in the Central interior region center around coffee and cattle. Most salaried employment in the region is provided by haciendas.

Another kind of institution is the owner-operated family farm; 76 percent of rural households are involved in farming. Most operate less than six manzanas (about 10 acres) of land, of which an average of four manzanas are cultivated. About 53 percent of households own land or occupy public land on a permanent basis. Holdings range from very small

plots to well over 100 manzanas (174 acres). Perhaps about 5 to 10 percent of rural households could be classed as medium-sized commercial farmers.

Corn and beans are grown for subsistence with surpluses being sold or deficiencies being purchased. Sorghum is grown as insurance against drought. When corn is plentiful, sorghum and corn are used as feed for chickens and pigs. Cattle are kept by 27 percent of households; numbers range from one to over 50 head. Of great significance to some rural households is coffee, which is grown by 16 percent of households. Vegetables are also grown commercially by some farmers (perhaps numbering 1,000 in the entire region), being concentrated in areas where irrigation is available. Home gardening is rarely practiced with any serious intent to provide for the family's nutritional needs. Most households raise chickens and pigs, frequently in numbers large enough to permit selling a few products.

Nearly one household in five is engaged in some kind of non-agricultural activity, and many of these participate in two or more such activities. Nearly half of these enterprises are small stores, followed in importance by preparation of food products for sale, commerce, carpentry, slaughter of animals, sewing, washing clothes, cantinas and more than a dozen other distinct activities. Most of these are year-round, but do not require full-time work. Few families live solely from these activities, however, they do form the hub of economic life in a few cases.

CHAPTER IV

SURVEY METHODOLOGY

The Rural Household Survey was carried out during a period of increasing political unrest and violent disturbances in Nicaragua. Some of the difficulties that this situation imposed upon the study team were mentioned in Chapter I. It bears repeating that the only reason that the survey could be completed was the determination of the Ministry of Agriculture and members of the study team of DIPSA. The methodology of any study must be adapted to local conditions. Indeed, the very concept of methodology is to find the most applicable practices to reach a goal, given a set of conditions or constraints. Though the study team working on this Rural Household Survey was confronted with extreme circumstances, the process of seeking out the most effective methods was similar to that used in other studies. It should be borne in mind throughout this chapter that many alternatives were considered and tried in the field before choosing the methods described herein.

The study design was hampered by inadequate background information on rural households, presenting serious obstacles in sampling as well as enumeration and tabulation. Existing information was inappropriate for developing a sample frame, and little knowledge existed as to variations throughout the region to guide decisions such as clustering of families and stratification. In questionnaire design, it was not clear what emphasis should be placed on off-farm employment, agricultural enterprises

other than subsistence crops, and non-agricultural enterprises. Additional doubts arose as to variations in land tenure arrangements, number of parcels of land occupied by a single family, number of crops, importance of summer (off-season) crops, and many other aspects of economic activity of the family.

To overcome these difficulties, the study team decided to make preliminary visits to rural communities before beginning the household survey. A group of local residents were interviewed in about one-fourth of the 700 rural communities in the region. This preliminary survey of communities served three purposes: first it established a sample frame of families; second it provided useful information on public infrastructure and services, as well as social organization; and finally a greater appreciation of rural enterprises was obtained which helped in the design of the household survey methodology.

Sampling of Communities

Establishing a sample frame of rural communities was, in itself, a difficult task. A list of places identified by respondents to the 1971 Census of Population having 25 families or more was first compiled and checked with persons working in public programs in rural areas, principally of the Institute of Peasant Well-Being (INVIERNO). Though this agency had only one year of experience in the field, it was the best source of information available in the study region.

The sample size for the community survey was not based on careful statistical evaluation. It was not known what kinds of variations to expect within or among communities. The first reaction of people in DIPSA was that all communities in the region should be visited. Though

such a large number was not necessary for the purposes of this study, such information would be helpful to persons responsible for currently operating programs. It was decided that at least 100 communities should be visited to insure a well-dispersed sample frame of families. However, since the costs of the community survey were relatively low compared with the quantity and quality of information obtained, it seemed advisable to expand the sample of communities to a larger number.

The final sample had 190 randomly selected communities of which 180 places were finally located in the field during survey work. Ten of the places in the sample turned out to be large haciendas from which community data could not be gathered. The final tabulation contained 154 questionnaires.

Interview Technique for the Community Survey

The central question faced was choosing the best respondents for the kind of information sought. Field tests and experience of others on the team had shown that women and young people are not shy about participating and are the best informants on certain subjects. With the experience of more than 20 field trials, the study team concluded that one group interview in each community was the best technique. Using two or more groups seems to spread respondents too thin and less group interaction takes place. It was group interaction that kept any one member from becoming too dominant. In groups that were well composed, people were helpful, and not at all afraid to correct each other when they felt the question had been misinterpreted by another member of the group.

First contact in each community was made with community leaders, including the juez de mesta. Leaders were usually eager to help, once

the nature of the study was explained. It was requested of leaders that they identify a few people (no more than ten), including some women and some younger people as well as older persons, that would be willing to cooperate. Information regarding interviewees revealed that ten people were present on the average, representing nine families.

The questionnaire contained 31 pages with 63 questions (some with several parts). Its six chapters were:

1. Spatial definition of the community
2. Infrastructure and services
3. Employment in the community
4. Land tenure and agricultural production
5. Migration and employment outside the community
6. Organization of the community

Two enumerators were assigned to a single community, one to conduct the interview and one to observe and intervene when clarifications were required. The interview was conducted in a low key fashion, and questions were stated in general terms, familiar to rural residents. No response was recorded until the entire group reached agreement. Since subject matter was of a substantive nature (how many families possess ovens, what portion of workers are employed outside the community, etc.), agreement was reached fairly quickly once the concepts became clear. Interviewers needed only a minimum of knowledge of group dynamics.

Size of Household Sample

The sample frame established in the community survey, which consists of 14,424 households located in 164 communities, was found to adequately represent the population of 40,000 households in approximately 700 rural

places. This was determined by expanding the number of households represented in the 164 places surveyed to estimate municipal and departmental populations. These were found to correspond reasonably well to the Census of Population data.

A special effort was made in determining size of the household sample to insure adequate representation of households in each type of community described in the next section. Particularly important factors which influence sampling procedures were land tenure, agroclimatic area, number of households residing on haciendas, prevalent types of employment, and technical assistance programs operating in the community. It was determined that the number of households in any particular strata should not fall below about 25 in order to insure reasonable statistical validity of results. This number is lower than that required in cases where the sample frame is not up to date and carefully stratified. The resulting sample size was 333 households.

Separate samples were used for each of two questionnaires, "A" and "B". Questionnaire "A" addressed variables related to income and employment, and instrument "B" related to social aspects of family life. A rigorous analysis of sample size for questionnaire "B" was not determined, instead it was felt that a sample about half as large as that for questionnaire "A" would be sufficient for most kinds of analysis. The result is a sample of 550 households to be selected, which includes 10 percent for attrition. The number of households responding to instrument "A" was to be roughly two-thirds of the total, and for questionnaire "B" one-third.

First Stage of Sampling: Clustering and Stratification

To reduce logistics costs and elapsed time of the survey, clusters of households were selected through the first stages of sampling. Interestingly, vehicle capacity seems to dominate the issue of the size of clusters. In this case, each enumerator conducted two interviews per day, and three interviewers plus one supervisor could be accommodated in one jeep. Thus convenient cluster size for this survey was six. Since this gives the required dispersion of the sample, it was decided to use 92 clusters of 6 households each, resulting in 552 families to be selected.

Before selecting clusters of households, eight strata of communities were developed based on climatic variations and land tenure conditions. Climate is especially critical in determining cropping patterns, especially growing of coffee which has great impacts on employment. Hence, presence of large amounts of coffee plantations in haciendas of a municipality was used to classify all communities in the municipality as being in the humid portion of the region. Regarding land tenure, a broader concept of access to land, rather than just ownership, was used to stratify communities. Land tenure arrangements are diverse, with a few communities being made up of a series of large haciendas and no small farmers exist. Other communities are made up largely of small farmers who own or otherwise legally occupy land. Finally, there are a few communities which are simply rural "subdivisions"--a place where families live, and from which they seek work in other places. In some communities where nearly all land is in haciendas, land resources are dedicated to raising cattle. Because of the lack of more labor intensive activities, very little employment exists in these communities.

Residents usually rent or sharecrop land of haciendas, and often work seasonally for wages in other places. Based on the above, four categories of communities were obtained as follows:

1. Places where most local people own land, and the influence of haciendas is minimal.
2. Places where many local people own land, and haciendas also operate.
3. Places where most land is owned by haciendas, but most local people farm by renting or sharecropping.
4. Places made up of a single hacienda, or series of them, where few local residents are farmers.

Dividing each category by climatic zone (coffee portion and the dry portion of the region) obtains the eight strata shown in Figure 4.

Figure 4

Strata of Communities for Selection of Households

	Coffee Areas	Non-Coffee Areas
Mostly owner-operators	I	V
Owner-operators mixed with <u>haciendas</u>	II	VI
Sharecroppers or renters mixed with <u>haciendas</u>	III	VII
Mostly day-laborers living on <u>haciendas</u>	IV	VIII

The sample of households was made in direct proportion to the number of households contained in the sample frame in each strata. Random numbers corresponding to clusters of households were used to determine from which community each cluster should be selected. Naturally, more

than one cluster of households may be selected in any one community, or a community may have no clusters in the sample. The resulting sample contains 92 clusters dispersed among 63 communities, as can be seen in Table 1.

Table 1
Distribution of Selected Households
by Strata of Communities

Strata	Number of Households in Frame	Number of Households in Sample	Number of Clusters ^a	Number of Communities Represented
I	1110	42	7	4
II	5693	216	36	19
III	1097	42	7	7
IV	1477	60	10	7
V	1624	60	10	9
VI	1314	48	8	8
VII	1358	54	9	6
VIII	751	30	5	3
Total	14,424	552	92	63

^aThere are six households per cluster.

Second Stage of Sampling

The household sample frame was also stratified within each community according to type of location (central place, hacienda, isolated location or separate group of dwellings). Systematization was used to choose houses in order to take advantage of this stratification. The

groups of households were listed in the order mentioned above and assigned numbers. Then a random starting point was obtained, and an interval calculated. If the community contains 96 households and two clusters of six households each are to be selected, then the interval is eight, or every eighth household is selected.

The critical aspect is applying this procedure in the field. To obtain the most representative sample possible, a supervisor and two enumerators spent a full day to select each cluster of six households in each community and obtain the family's permission to conduct the interview the following day.

Accurate maps of communities were not available, and few of the reference points, such as haciendas or even community centers, were indicated on municipal maps. The procedure used was to ask for the locations of these places upon arriving in the community. For instance, if the interviewer needed to find house number 11 in a hacienda owned by Enrique Oliu (an actual case) then he would first identify the center of the hacienda, and begin counting with the house following the owner's house. In this case, three houses were counted in the center of the hacienda, and continuing about two kilometers up a mountain road past coffee plantings, houses 4 through 14 were found. House number 11 was used for the interview.

Because this method was based on local residents' knowledge and recall regarding numbers of households in the community, it did not insure a complete enumeration of every existing household. It did ensure, however, that supervisors make every effort to seek out isolated houses when necessary, rather than selecting according to ease of access or receptivity of the family.

Figure 5 summarizes the overall sampling procedure including the establishment of the sample frame and the two stages of selection of households. The overall sampling percentage is 1.473 percent of the entire population of the region. It is worth noting that communities carry equal weight when communities were sampled in Phase I, but were weighted according to their population in selecting clusters.

Instruments for Household Survey

Use of a single questionnaire would have been preferable had it been possible to reduce the interview to less than 2½ hours. Few rural families are willing or able to attend an interview for a longer time. As a result it became necessary to divide the topics into two subject matter areas--those related to production, income and employment; and those dealing with social well-being. Each of the resulting questionnaires required an interview of about 2 hours. Ideally each household would have responded to both questionnaires; however, the concept of multiple interviews with a single family had to be discarded because of practical limitations. The solution was to divide the sample such that out of every cluster of six households, four would respond to questionnaire "A" on income and employment, and two would respond to questionnaire "B" covering social well-being. Hence it was necessary that each questionnaire be self-contained, repeating some of the material of the other questionnaire. For instance, both instruments contained sections on use of credit, technical assistance and marketing. Further, questionnaire "A" briefly covered education and health, and instrument "B" contained a brief section on land tenure, production and income. The contents of each are described below:

Figure 5

Overall Sampling Procedure for Communities and Households Combined

PHASE I Community Survey		PHASE II Household Survey	
First Stage		Second Stage	
UNIT	Community	Cluster of Households	Household
FRAME	426 communities of 25 homes or more	14,424 households in 164 communities studied	Total of households in each of 63 communities
SAMPLE	164 communities	92 clusters in 63 communities	552 households in 92 clusters
PROBABILITY OF SELECTION ON A SINGLE PICK ^a	$\frac{1}{426}$	$\frac{\text{Total households incorresponding community}}{14,424}$	$\frac{1}{\text{Total households incorresponding community}}$
RESULTING PRO- BABILITY OF SE- LECTING A SINGLE HOUSEHOLD	$= \frac{164}{426}$	$\times \frac{522}{14,424}$	
	$= .01473$		
	$= 1.473 \text{ percent}$		

^aWith pick of one community, one cluster and one household. Note the population of households of the particular community cancels out leaving an equal probability for all families, regardless of the community.

Questionnaire "A": Income General and Employment

- | | |
|--------------------------------|--|
| -- General Characteristics | -- Employment |
| -- Education and Health | -- Occupational Experience |
| -- Structures and Equipment | -- Use of Time: Days per Year |
| -- Land Tenure | -- Credit, Technical Assistance
and Marketing |
| -- Crop Production | -- Other Income and Transfers |
| -- Livestock Production | -- Participation in Formal
Organizations |
| -- Non-Agricultural Production | |

Questionnaire "B": Use of Income, Public Services, Well-Being

- | | |
|----------------------------|--|
| -- General Characteristics | -- Use of Time: Hours per Day |
| -- Education | -- Production and Employment |
| -- Health | -- Credit, Technical Assistance
and Marketing |
| -- Nutrition | -- Values and Attitudes about
Well-Being |
| -- Housing and Possessions | |
| -- Household Expenditures | |

Instrument "A" covered 4 households out of every cluster, resulting in a sample of 333, and questionnaire "B" covered 2 of 6 households for 167 out of the total sample of 500.

Data Tabulation

Questionnaires were designed so that data could be entered directly on computer cards, eliminating the laborious process of transferring data to coding sheets. Tabulation was carried out simultaneously with field work, and was completed only about seven weeks after the last interview was conducted.

Upon completing a questionnaire in the field, the enumerator would do the first review with the supervisor before leaving the community. If the need arose and conditions permitted, the supervisor returned to the household for clarifications. At the end of each day, questionnaires were turned over to leaders of the study team.¹ A recheck of coding was

¹The Nicaraguan team leader from DIPSA and the adviser.

made to see that all values were filled in and within required minimum and maximum values. Information was checked for consistency from one section of the questionnaire to another. If questions arose, they were written in the margin in colored pencil and taken up later with supervisors and enumerators, who, in most cases could clarify the information. In cases where serious doubts about the consistency of the information persisted, the questionnaire was temporarily set aside. Repeat visits were made to these families by supervisors other than the ones who had first visited the household. Roughly 40 percent of questionnaires were approved with no questions arising. Another 30 percent were approved after clarifications were made in discussions with enumerators and supervisors, and 20 percent of households required repeat visits. Ten percent of questionnaires were discarded due to inconsistencies or lack of information that could not be clarified with respondents.

The study team was housed in departmental capitol cities during field work, and one member received questionnaires in the DIPSA offices where he supervised the entry of data onto computer cards. Verification was performed by entering data twice and comparing the two entries. Programs were previously prepared by DIPSA programmers to check for inconsistencies in entered data. Results from these programs were received by study team members after field work was completed. When all corrections were made, data was passed from cards to magnetic tape.

Finally, analysis required that a series of calculations be performed for each household and that the results be entered in the magnetic tape containing basic data. This included calculation of gross and net income, cash and non-cash, for each economic activity--agriculture, livestock, other home enterprises, wage earnings and others. In

addition, another data set was created for individuals with data describing personal and family characteristics and information related to labor force participation.

CHAPTER V

TOTAL POTENTIAL MANPOWER OF THE LABOR FORCE

This chapter provides a focus for the analysis of following chapters in the sense that it describes the amount of manpower potentially available from different groups of rural populations of the Central interior region. In defining these groups, and in identifying manpower potential, emphasis is placed on the following:

1. Stratification of rural communities according to pre-dominant land tenure pattern and agroclimatic situation.
2. Relationship between community type and family size and structure over the life cycle.
3. Estimation of worker-equivalents for interfamily comparisons of manpower.
4. Examination of resettlement patterns and new family formation in different areas and different types of communities.

Current manpower potential is summarized by area and type of community. It is generally believed by sector planners that rural families in Nicaragua are geographically mobile, quickly cutting family and community ties to pursue employment opportunities. Information presented here on new family formation and resettlement does not provide a strong basis for this belief.

Strata of Communities for Analysis and Planning

The previous chapter presented eight strata of communities based on land tenure patterns and location which were used in selection of

sample households. The strata reflect the importance of varying local environmental factors in determining opportunities of rural households for employment and income. For purposes of the analysis in this and subsequent chapters, similar strata were used, however, a further disaggregation was made according to location of the community.

In the early stages of analysis, a question was raised concerning the few large communities on the eastern frontier of the coffee producing area of the study region. These places are typified by sparse population, greater availability of land, and few roads, hence it seemed as if a further disaggregation by location of community would be appropriate in order to adequately account for these observed differences in the analysis.

Table 2 shows the new strata for sample "A", i.e., those responding to the income and employment questionnaire, which is the basis of most of the analysis contained in subsequent chapters. As can be seen, communities on the eastern frontier correspond to only two of the four land tenure categories, because owner-operators tend to be prevalent.

Since these strata were used for analysis of impacts of services and for deriving policy implications, it was important to evaluate their validity. This was done by testing the degree to which the strata separate households according to land ownership and amount of off-farm employment. The latter was measured in total man-days per family employed off-farm divided by worker-equivalents in the family. Separate analysis of variance tests were run for both of these dependent variables, using four strata of land tenure as one factor and the three areas as the other factor. A large "F" statistic would imply two things:

Table 2
Households in Sample "A" by Strata Based on
Local Land Tenure and Location

Predominant Land Tenure Pattern	-----Area-----			Total
	West (Arid)	Central (Semi-humid)	Eastern (Humid frontier)	
Mostly owner-operators	27	17	19	63
Owner-operators mixed with <u>haciendas</u>	46	80	41	167
Share-croppers or renters mixed with <u>haciendas</u>	23	14	--	37
Mostly day-laborers living on <u>haciendas</u>	27	37	--	64
Total	123	148	60	331

1. Communities are internally homogeneous with respect to each dependent variable, and
2. The stratification of communities by area and by influence of haciendas (land tenure) successfully groups communities into homogeneous strata.

It should be clear that this analysis of variance is only a recheck on the stratification--an attempt to evaluate the extent to which strata are differentiated from each other. The dependent variables used are the same ones used to define the strata, hence there is no test being made of any causal effects of community factors on economic position of households. Strata should be considered descriptive, and should provide the means for segmenting the population into meaningful target groups which are concentrated enough for cost-effective operation of

public programs. Given this orientation, the critical value of the "F" statistic would depend on the specific policy measures at issue. The larger the value, the more concentrated one can expect to find households with similar ownership and employment conditions.

The total explained variation of land ownership is reflected by an "F" of 4.702, significant at the .001 level. "Area" accounts for more of the variation in land ownership of local residents than does community type, which is surprising since strata of communities is based on influence of haciendas. The "F" statistic for off-farm employment was even higher, 11,617. Here, community type explains more of the variation than does area.

Family Structure: The Extended Family

The terms household and family are used interchangeably in this dissertation to refer to a group of people who reside in the same dwelling and prepare food in the same kitchen, whether or not parental relationships exist among the members. Households in rural Nicaragua frequently include more than one nucleus, defined as one person or a married couple with their corresponding dependents. More than half of households are made up of two or more nuclei that live under the same roof, share the same kitchen, and work together. A large number of subnuclei are formed from persons not directly related to the family head.

Understanding relationships internal to the household is important in explaining supply of off-farm labor and other aspects affecting the household's well being. Position in the family reflects a person's influence or role in family decisions. For instance, a young person who

lives with his/her parents and holds a job may keep wage earnings for personal use. This would encourage this person to search for employment outside the family, even if family-operated enterprises offer more productive opportunities. However, one who lacks the independence to use wage earnings as desired, but who instead, turns them over to the head of the household, might choose to work at home, even when family activities do not offer productive alternatives.

In order to determine the internal structure of the family, each person was categorized as either: 1) family head or spouse; 2) independent subhead; or 3) dependent. The family head is identified by family members at the beginning of the interview. He/she is often the person who owns the house and land, if any, pertaining to the household unit. If both husband and wife reside together, the title of "head" is applied to the male, in accordance with tradition in rural Nicaragua. Subheads are individuals considered not to be dependent on others in a parent-child relationship. Naturally, anyone who has dependents, such as a young woman with a child, is considered to be an independent subhead, regardless of age or marital status. If an individual has no dependent, but is married, the person is considered to be independent. Sometimes in the interview, older siblings were considered to be dependent according to their parents. Here, the criterion of age was applied based on the majority of responses from all families by using the data contained in Table 3. As can be seen, for the majority of respondents the "turning point" from dependent to independent occurs after 20 years of age. Respondents seemed to favor even numbers when estimating ages from 13 to 24. Table 3 accounts for this by using two-year intervals.

Table 3

Position in Household by Age for Persons 17 to 22 Years of Age--
 Classifications as in Questionnaires
 (Percent of Individuals in Each Age Group)

Age	Main Nucleus Head or Spouse	Sub Nucleus Head or Spouse	Dependent	Total ^a
17, 19	9	22	70	100
19, 20	17	26	56	100
21, 22	18	48	34	100

^aMay not add due to rounding.

Table 4 registers all persons in sample households according to the classification applied to them in the analysis. No person over 20 years of age is regarded as dependent. The distribution of subnucleus heads and spouses show them to be concentrated in the 21 to 34 age categories, which is only six to ten years below the concentration of main nucleus heads and spouses. There is also a larger group in the category over 64 years of age. Subnucleus heads and spouses are, for the most part, independent of the head of household, in the sense that they are capable of forming new households by themselves. But they have not done so, presumably because opportunities with the "parent" family are more attractive than other alternatives. Some of the older subnucleus heads and spouses are persons living in the households of their own children.

Figure 6 further reflects these processes through the life cycle of the family by showing total persons in the family by age of the head of household, and the number of persons in subnuclei. The latter includes heads and spouses of subnuclei plus their corresponding dependents. A large number of persons in subnuclei indicates the formation of new

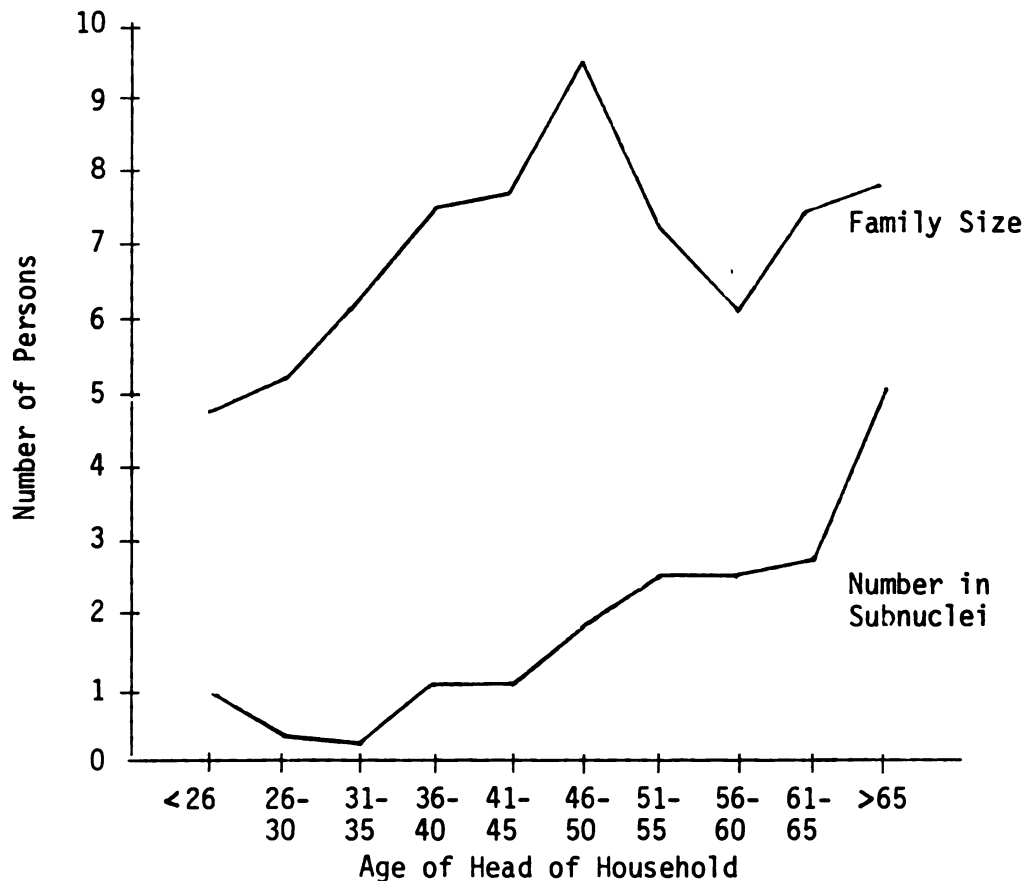
Table 4
Persons in Sample "A" by Age, Sex, and
Position in Household

Age	-----Position in Household-----					
	Main Nucleus Head or Spouse		Subnucleus Head or Spouse		Dependent	
	Males	Females	Males	Females	Males	Females
0- 8	0	0	0	0	363	398
9-12	0	0	0	0	135	145
13-16	0	1	3	5	112	119
17-20	3	21	15	30	86	38
21-24	18	29	62	34	0	0
25-34	76	77	51	35	0	0
35-44	69	98	15	16	0	0
45-54	60	40	3	10	0	0
55-64	33	33	5	5	0	0
> 65	30	17	8	15	0	0
Total	289	316	162	150	696	700

family units "under the roof" of an existing family, a phenomenon especially frequent among families with heads over 50 years of age. Among families with heads over 65, subnuclei have more members, on the average, than the main nucleus of the family--five members versus 2.7, respectively.

Figure 6

Family Size with Number of Persons in Subnuclei
by Age of Head of Household



Estimate of Worker-Equivalents

Comparisons of manpower across families requires that persons of both sexes and all ages be placed on an equal basis in terms of their productivity in farming activities. Wage rates in the central area of the region for persons doing general field work (mostly machete work) were selected for this purpose because activities performed by each worker are virtually the same; that is, there is little separation of tasks.

Male workers 17 and over receive about the same wage when doing general field work, though very few work past 60 years of age. For males 16 years of age and lower, wage rates begin dropping. Earnings of women were considerably lower than those of men. Table 5 shows median wages in Córdoba per day. (At the time of the study, the exchange rate was 7.026 Córdoba per U.S. dollar.)

Table 5
Median Wage Rates for Sex and Age Groups
(Córdoba per Eight Hour Day)

Sex	-----Age-----		Difference (older minus younger)
	11 - 16	17 - 65	
Male	14.0	18.0	4.0
Female	10.0	13.5	3.5
Difference (male minus female)	4.0	4.5	

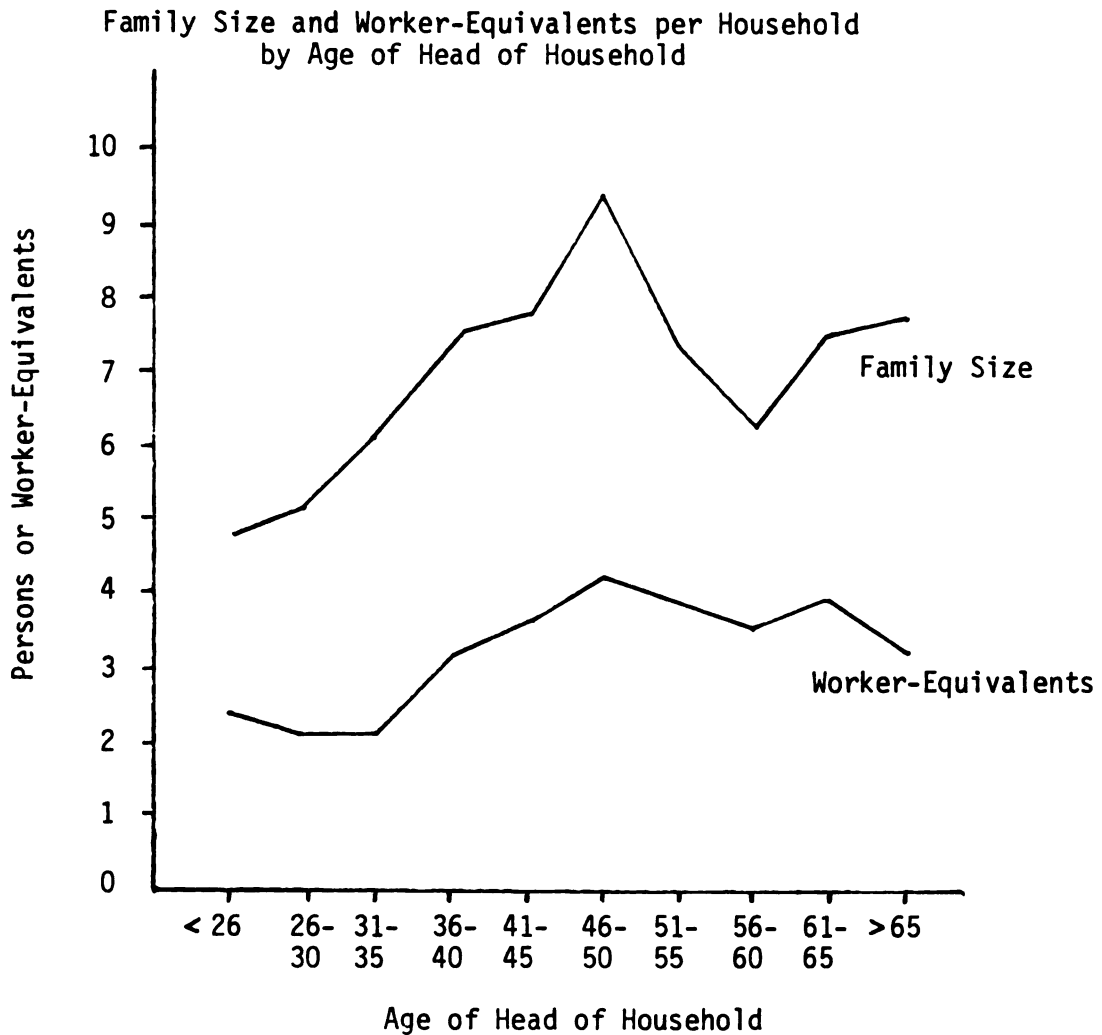
Based on the above information, worker-equivalents were calculated for each individual as:

$$\text{Worker-equivalents} = 1 - 0.22 \text{ AGE} - 0.25 \text{ SEX}$$

where AGE equals one when the individual is from 11 to 16, and SEX equals one when the individual is female. Worker-equivalents is zero for persons less than 11 or greater than 65 years of age.

Figure 7a relates worker-equivalents to total number of persons in the household over the life cycle of the family. Family size increases steadily from less than five persons when the age of the head of household is in the low twenties, to over nine persons for heads between

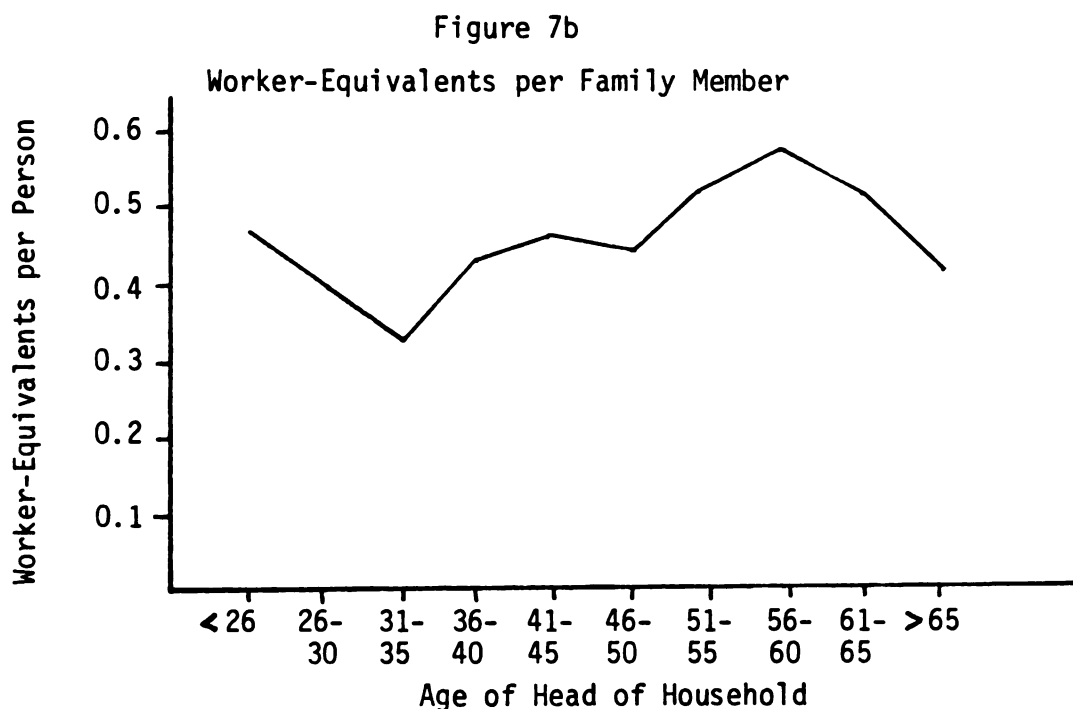
Figure 7a



46 and 50 years old. Then family size drops, but recovers to over seven persons when the household head is over 60. The latter rise is a reflection that a nucleus is being formed by younger siblings within the household which has an older head. The lower curve in Figure 7a shows that in households with young heads, worker-equivalents are very close to two. This indicates a minimum of manpower available beyond the husband and wife. When the head's age crosses 35, worker-equivalents rise to over three, marking the presence of children who have attained

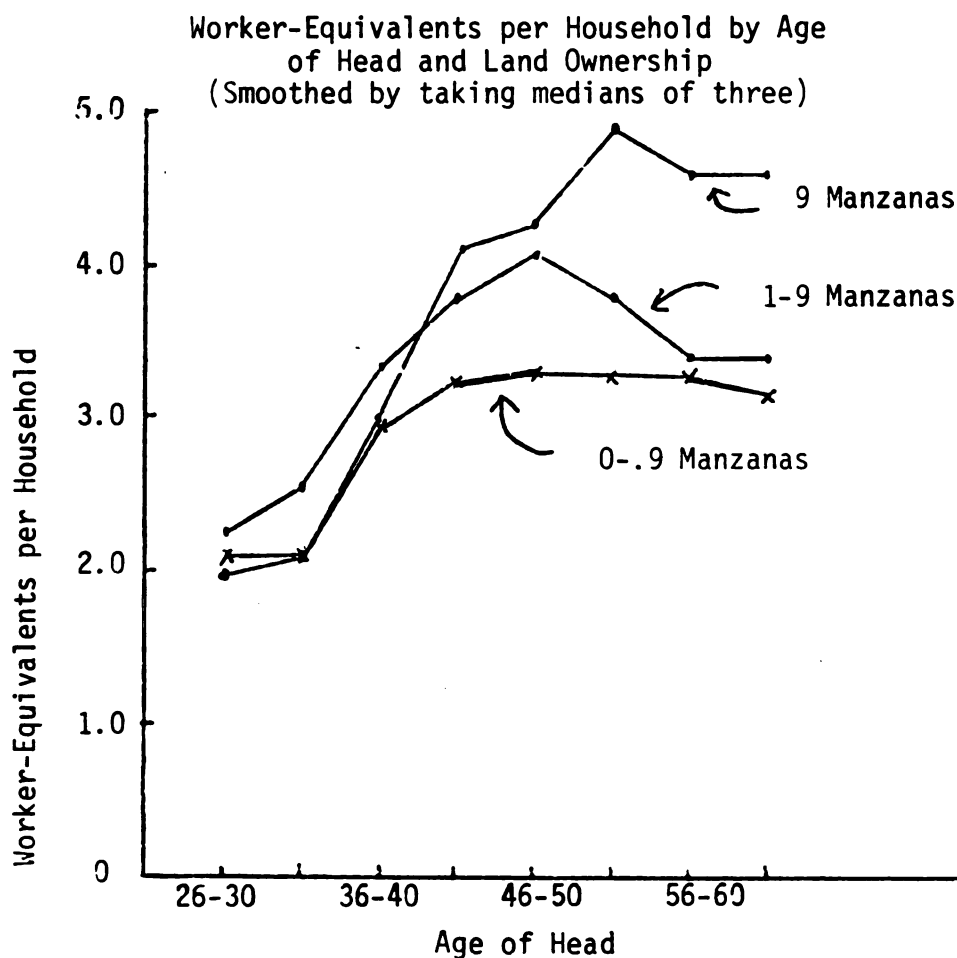
an age of ten years or more. Worker-equivalents peak at just over four per household at the 46 to 50 age group, and then drop, but not in proportion to the decrease in family size.

Figure 7b summarizes average worker-equivalents per family member, which is an inverse index of number of dependents per worker. Worker-equivalents per member begins at .47 among the youngest family heads and begins to decline as the head gets older and number of children increases, reaching a low of .33 when heads are between 31 and 35 years old. Then it rises again, but does not peak at .57 until the head is much older, between 56 and 60 years old. But after that worker-equivalents per member declines, again reflecting the development of a new nucleus of younger persons forming a family while living with a parent, a phenomenon which occurs over other age groups of family heads as well. It should be mentioned that males account for nearly 60 percent of worker-equivalents in all age groups of heads of household, and females account for about 40 percent.



It is reasonable to expect that the amount of land owned influences the tendency of adult family members to remain with the family, or stated another way, land ownership should be associated with a lower rate of new family formation. Figure 8 examines amounts of worker-equivalents across age groups for households owning less than one manzana, those with one to nine and households with more than nine manzanas. Average worker-equivalents per household are 2.73, 3.41, and 3.74, respectively. However, retention of members, or extension of the family and new family formation are also a function of alternatives available outside the parent family. The above results should be regarded in the light of comparisons of areas and communities, which follow in the next sections.

Figure 8



Manpower by Area and Community

Earlier it was shown that worker-equivalents per household increase when land ownership is higher. Land ownership is one measure of the viability of work alternatives within family enterprises, while area and community type indicate local alternatives away from the household. It would be expected that where jobs and land are more readily available, new family formation would be more attractive, making families smaller with younger heads of household. Table 6 summarizes worker-equivalents per family in each type of community and area.

Table 6
Average Worker-Equivalents per Household
by Strata of Communities

Predominant Land Tenure Pattern	West	Central	East	Total
Mostly owner-operators	3.5	2.5	3.0	3.1
Owner-operators mixed with <u>haciendas</u>	3.3	3.3	3.0	3.2
Share-croppers or renters mixed with <u>haciendas</u>	3.7	3.0	--	3.4
Mostly day-laborers living on <u>haciendas</u>	3.0	2.6	--	2.8
Total Region	3.3	3.0	3.0	3.1

Households in the arid western side of the region appear to have more worker-equivalents than those in the other areas. This is consistent with the prior observation that productive alternatives close by, but outside the main household, are lacking. As a result of being more

extended, families in the arid portion of the region have slightly more worker-equivalents per member, averaging 0.46 compared to 0.45 and 0.41 for the central and eastern areas, respectively.

Among types of communities, opportunities for employment and for obtaining land are lowest in communities where sharecroppers and renters predominate. Here worker-equivalents are at a high of 3.4 per household, and households average 7.8 members, compared to the regional average of 7.0. Households are smallest in communities where most workers are day-laborers on haciendas, averaging 6.4 members and 2.8 worker-equivalents.

Average age of family heads varies in the same way, being lower in the frontier area and in places where workers are day-laborers, and highest where sharecroppers and renters predominate (see Table 7).

Table 7

Average Age of Head of Household by Strata of Communities

Predominant Land Tenure Pattern	West	Central	East	Total
Mostly owner-operators	42.4	43.2	39.3	41.7
Owner-operators mixed with <u>haciendas</u>	45.6	45.9	41.4	44.7
Sharecroppers or renters mixed with <u>haciendas</u>	48.3	46.6	--	47.7
Mostly day-laborers living on <u>haciendas</u>	42.4	40.7	--	41.4

Family Formation and Resettlement

Resettlement of families and individuals is one way that the labor force adjusts to different employment and other conditions. Though this study is based on cross-sectional analysis at a point in time, it is feasible to consider conditions that cause gradual change over time.

Resettlement occurs in three ways: 1) whole families resettle, 2) some members leave a family to form a new family elsewhere, or 3) some members leave to incorporate themselves into another existing family. Subnuclei are usually formed from adult siblings of the head(s) of the main nucleus of the family. The choice of remaining with the main family or moving on to form a new family unit must depend on the opportunities provided by the main family in comparison to alternatives. Within an area, families that utilize larger amounts of labor in farming activities would tend to retain young members and become more extended than families that can absorb less labor. Yet in areas where land is more dear, and alternatives for newly forming families are more limited, subnuclei would likely remain with the main family for a longer period, before forming a new family unit. In contrast, in areas where land and jobs are more readily attainable, new family formation becomes easier.

Persons wishing to obtain wage employment are often able to incorporate themselves into a related family located conveniently to work opportunities. Since these incoming members (or subnuclei) often have more potential manpower than the main nucleus in comparison to the number of dependents, the family unit improves its relation of potential manpower to dependents. Incoming members gain access to the consumption stream of the household and avoid the investment of setting up a separate household. They provide themselves with increased mobility by

not tying up assets in fixed real estate, such as a dwelling. The mobility of individuals in this way is evident when one considers that nearly half (45 percent) of households contain subnuclei formed of persons other than siblings of the household head.

The survey recorded the last move made by households during the previous six years. Nearly one-fourth (23 percent) of households have relocated at least once in this time. Families most likely to move are those that do not own land and those with a young head of household.

Data on resettlement of families is combined with that pertaining to formation of new families by strata of communities to obtain Table 8. Values shown are percentages of households that have been newly formed in the last six years in the community, or have moved to the community in the same period.

Table 8

Percent of Households that Have Formed In or Moved To
Communities in the Last Six Years by Strata of Communities

Predominant Land Tenure Pattern	West	Central	East	Total
Mostly owner-operators	22	24	21	22
Owner-operators mixed with <u>haciendas</u>	24	26	54	33
Sharecroppers or renters mixed with <u>haciendas</u>	9	29	--	16
Mostly day-laborers living on <u>haciendas</u>	21	54	--	40
Total Region	20	33	43	31

In total, 31 percent of all families have moved, or have been formed in the last six years. The rate reaches a high of 43 percent in the eastern agricultural frontier, and a low of 20 percent in the arid western area. Places where haciendas control most of the land, but local families are mainly sharecroppers or renters, average the lowest rate of family formation and resettlement. Communities where all land is owned by local farmers also have low rates. In many of these places, holdings are more evenly distributed, but total land resources are limited. This suggests that people move largely in response to employment opportunities, but availability of land also influences decisions.

Only a few of the households that moved increased landholdings. However, if they owned land before moving, they were likely to own land afterwards. Whereas 57 percent of all families cultivated more than one manzana (1.74 acres) in the first planting of 1977, 46 percent of those who moved cultivated this amount--though farming was not necessarily their primary occupation. This explains the low attractiveness of communities where land is not generally available.

The average age of household heads that resettle (at the time they relocated) was nine years below that of families that have not moved--36 versus 45 years old, respectively. Table 9 demonstrates the mutual effects of age and land ownership on rates of resettlement. Rates for the six-year period were divided by six to estimate probabilities of resettlement in a single year. It should be borne in mind that only the last move was recorded, so resettlement rates are slightly underestimated. Households without land maintain fairly uniform probabilities of resettling over age groups. Those with land are less likely to resettle, and much less likely to do so as age increases.

Table 9
Probabilities of Resettlement of Households
in a Single Year by Age of Head and Land Ownership

Land Ownership	-----Age of Head-----					Total Region
	Less than 31	31-40	41-50	51-60	Greater than 60	
Without Land	.07	.04	.06	.04	.04	.05
With Land	.03	.04	.02	.01	.01	.02
Total Region	.06	.04	.03	.02	.02	.04

Geographical Directions of Resettlement

From the community survey an estimate of number of families leaving communities was obtained. This general indicator of mobility suggests that families in the arid western portion of the region are more likely to resettle in other areas. Because of the geographical position of the western area, destinations of families that leave that part of the region could as easily be Managua, León or the agricultural frontier to the north, as it could be the eastern frontier area of the Central interior region.

Since the household survey recorded the last move made by households residing in the region at the time of enumeration, movements of families away from the study region to other regions of the country, or to urban areas, are not reflected. Hence data on movements of families are limited to moves within the region or to the region from other regions. The results contained in Table 10 are based on the full sample

of 506 households from samples "A" and "B". The few families that have moved to the region from other regions have mostly come from Boaco and the city of Managua. Of all moves within the region and from outside, 34 were from urban locations to rural communities.

Table 10
Intraregional Resettlement of Households
During the Last Six Years
(Number of Households Resettling)

From	-----To-----			Total
	West	Central	East	
West	24	9	3	36
Central	1	45	11	57
East	0	3	10	13
Other and Unknown	4	8	2	14
Total	29	65	26	120

Most movements of families are over short distances, often within the same municipality. However, 23 of the 106 moves made within the region were in an easterly direction, whereas only four went the opposite way. Only one family in the sample had moved into the arid western area from another part of the region.

A more specific view of the destinations of those that move was obtained for family members who detach themselves from the main family to relocate elsewhere. Here destinations of persons leaving the region are revealed; again, responses cover a six-year period for 506 families.

Table 11 shows destinations in terms of area of the country and Table 12 breaks these down by type of place--same community, other rural place and urban places. Much of the same pattern as was seen before develops for intraregional moves, but it is interesting to note the popularity of destinations outside of the Central interior region. Of the 38 persons leaving the region, 17 went to Managua, 8 went to agricultural frontier areas outside the region (Nueva Segovia and Zelaya), three resettled in León and Chinandega, and two went to Boaco. Table 12 gives a breakdown of these people by type of destination, rural or urban, and displays them by the type of strata of communities which they left.

Table 11

Destinations of Individuals Detaching
Themselves from Families in the Region

From	-----To-----				Total
	Western Area	Central	Eastern Frontier	Other Regions	
Western Area	66	13	0	19	98
Central	7	127	6	11	151
Eastern Frontier	0	3	53	8	64
Total	73	143	59	38	313

Table 12

Frequency of Type of Destination of Persons Detaching
Themselves from the Main Family
(Percent of Persons that Leave Households)

Predominant Land Tenure Pattern	Destination			
	Same Community	Other Rural Place	Urban	Total
Mostly owner- operators	65	12	23	100
Owner-operators mixed with <u>haciendas</u>	45	26	39	100
Sharecroppers or renters mixed with <u>haciendas</u>	30	30	40	100
Mostly day-laborers living on <u>haciendas</u>	41	12	47	100
Totals	47	22	31	100

Nearly half the people who detach themselves from a family stay in the same community to begin forming a new household. Greater numbers of these cases are found in the first two strata where land ownership is more predominant. When individuals leave the community, they go mainly to urban areas, this proportion being higher in places where day-laborers on haciendas predominate. This seems to indicate that as families are more oriented toward salaried employment, members who leave are more disposed to resettling in cities. Percent of moves to urban places is highest in the western area and lowest in the agricultural frontier.

Summary

Though the direction of resettlement patterns seem to point toward adjustment from places where jobs are scarce to where they are more plentiful, the rate of movement does not. Only about 4 percent of families move each year, and most moves are for very short distances. Movements of single individuals leaving families is even smaller in terms of total movement of persons.

It is widely believed among planners in Nicaragua that the rural population is highly mobile, making rapid adjustments to varying conditions. However, the evidence from this study does not suggest that families resettle frequently, nor that large numbers of persons break ties with families to migrate to other regions. The results of the 1971 census, which explored migrations in the five-year period previous to 1971 showed much the same result. Perhaps part of the reason for this misconception is the movement of family residences within communities, such as from an isolated location to a site near a road; or perhaps it is due to the few families and individuals who are highly mobile, moving every year or two with changing employment conditions. The great majority of families is surprisingly immobile, in fact, almost stubbornly so in the face of adverse climate, land tenure, and employment conditions encountered in some communities. The opening of penetration roads in the east, and the expansion of the "agricultural frontier" have been some mild effects on the direction of migration. But the number of persons who resettle has been very small compared to the total population of the region.

CHAPTER VI

ACCESS TO AGRICULTURAL RESOURCES AND SERVICES

The purpose of this chapter is to show the current (and in some instances, historical) access by rural households to agricultural resources and services, namely:

1. Land,
2. Agricultural credit and technical inputs, and
3. Roads (access to markets).

Variations across the agroclimatic areas of the study region will be stressed. In the last part of the chapter, these factors are related to returns to labor on family farms. A better understanding of the constraints on access to resources and productivity of rural households will help anticipate problems in implementing rural development programs. Resulting impacts of these and other factors on employment patterns are treated in following chapters.

Access to Land Resources

The study region is highly mountainous, creating a great deal of heterogeneity in quality of land and climatic resources available in each local community. Some land not suitable for cultivation of annual crops is good for coffee production, or for grazing, which can both attain high gross earning per manzana. Some land currently grazed is well suited to more intensive cultivation, and some cultivated land is too steep and rocky for use of oxen. Hence, with the exception of

parts of the western area where rainfall is low and population density is high, a reasonable assumption is that some currently uncultivated land could be at least as productive as much of that under cultivation. Indeed, survey work by the planning office of the Ministry of Agriculture (DIPSA) showed this to be the case through an area sampling procedure.¹

About 53 percent of sample households in the region own land, averaging 19.7 manzanas or 34.3 acres. Average ownership among all households (including those that do not own) is 10.5 manzanas, or about 18.3 acres. (There are 1.74 acres in a manzana.) Average holdings are much greater in the eastern agricultural frontier than in the rest of the region.

Land distribution does not improve in the frontier compared to other areas; however, since only 45 percent of the 60 sample households in that area own no land, the frontier seems to provide an advantage for those who can afford to purchase land, often made possible by the sale of land elsewhere.

Table 13, based on families' responses about their current and previous tenure situations, shows holdings per household in 1971, net changes to 1978, and average holdings in 1978. Since some households (56 out of 331 sampled) were formed after 1971, no tenure history applies to them. Other households may have existed in 1971 that are not now in the region, for example, households that have moved to cities and towns and to other regions in recent years. If these families held

¹Rough draft of findings on utilization of land resources by area, DIPSA, 1978.

more land or less land than the region-wide average, then estimates of 1971 holdings in Table 13 would be biased.

Table 13
Average Land Ownership^a per Household by Area,
with Changes from 1971 to 1978
(Manzanas per Household)

Area of Current Residence	Owned 1971	Net Change 1978-1971	Owned 1978
Arid (West)	10.0	(2.6)	7.4
Semi-Humid (Central belt)	6.0	(0.6)	5.4
Humid (Eastern frontier)	35.8	(6.6)	29.2

^aIncluding usufruct of public land.

It is difficult to say in which direction this bias, if any, might be. Since there have been no major movements of people into or out of the region, or between urban and rural places, one would hope the bias is small. Further, many families with older heads of households do not actually disband; instead the family unit continues simply by changing leadership to a younger head, and consequently the 1971 data would not be lost.

Of the total amount of land owned by all families, 78 percent has been purchased and 26 percent inherited. Table 14 shows total amounts of land by method of acquisition before 1971, and from 1971 to 1978. The proportion of land currently owned that has been purchased becomes larger as one goes from west to east across the region (down the table), and inheritance becomes correspondingly less important. The relative

Table 14

Total Land Possessed by Sample Households by Method
of Acquisition, 1971, 1978, and Interim Changes, by Area
(Manzanas)

Area of Current Residence	Method of Acquisition	Acquired Before 1971	1971 to 1978		Owned in 1978
			Acquired	Disposed of	
Arid (West)	Purchased	556.5	98.0	161.2	493.3
	Inherited	428.8	16.1	27.0	417.9
	Other ^a	31.5	0.1	0.0	31.6
	Total	1016.8	114.2	188.2	915.1 ^b
Semi-humid (Central belt)	Purchased	450.8	164.5	92.5	522.8
	Inherited	301.0	45.2	45.0	301.2
	Other ^a	0.0	0.1	0.0	0.1
	Total	751.8	209.8	137.5	799.9 ^b
Humid (Eastern frontier)	Purchased	1446.6	364.5	407.0	1404.1
	Inherited	174.6	12.0	0.0	186.6
	Other ^a	160.0	5.0	0.0	165.0
	Total	1781.2	381.5	407.0	1753.5 ^b
Total Region	Purchased	2453.9	627.0	660.7	2420.2
	Inherited	904.4	73.3	72.0	905.7
	Other ^a	191.5	5.2	0.0	196.7
	Total	3549.8	705.5	732.7	3468.5 ^b

^aMostly usufruct of public land.

^bTotals shown are 1978 holdings reported by respondents. Columns and rows may not add exactly due to minor discrepancies in reporting changes from 1971 to 1978.

unimportance of usufruct of public land is apparent, contributing less than 6 percent to overall holdings, and most of this, in the agricultural frontier where land is least costly.

The net reduction in total amount of land held in the arid western area appears to be caused by households selling land to haciendas for

cattle raising.² Some families move east to purchase a similar amount of land as that sold, but as new families form, especially in the agricultural frontier, average holdings per family decrease in all areas. As the frontier area becomes more populated, average holdings would be expected to decrease toward the overall regional average.

Ownership varied sharply with age of family head. Younger heads have acquired land in the last six years, while families with older heads have, for the most part, reduced land holdings. Table 15 shows net changes in average manzanas per family by age of head. Families with heads under 45 years of age have added to average land holdings, while those with heads over 45 have reduced.

Table 15
Changes in Land Ownership by Age of Head, 1971-1978
(Manzanas per Household)

Year	Age of Head in 1978						Number of Families
	Less than 26	26-35	36-45	46-55	56-65	More than 65	
1971	0	5.1	10.3	15.9	18.6	24.7	275
1978	0.7	4.8	11.0	13.0	15.1	23.0	331
Net Change	+0.7	-0.3	+0.7	-2.9	-3.5	-1.7	

²In one dramatic case a community in the western area was visited where empty dwellings still existed, but all local residents had sold their land to an hacienda. According to workers there, the hacienda owner had gained control of the only source of drinking water, and therefore local residents were forced to move. The land was to be used for raising cattle.

Purchase prices of land in Table 16 correspond to population densities reported in a previous chapter, which may reflect the amount of improvements, such as fences and improved pasture, made on land in areas where population densities are higher. Sales prices of land are much lower than purchase prices for residents in the arid western area. Land sold by one rural family is not always purchased by other rural residents. Buyers are frequently hacienda owners who live in cities. Also, many rural households that purchase land obtain it from hacienda owners. The reason for this is that small farmers are generally selling land in the droughty western areas and moving toward the east. More sales are being made in the western area where land is expensive, while purchases are made in sparsely populated eastern areas where prices per manzana are lower. Some sales were made under stress of drought, and of violence due to guerrilla activities. Fear was expressed by respondents both of guerrillas and of the National Guard as a motive for emergency sales at low prices.

Table 16
Average Purchase Prices and Sales Prices of Land by Area
(Córdoba/Manzana)

Area of Current Residence	Average Purchase Price ^a	Average Sales Price ^a
Arid (West)	1238	432
Semi-humid (Central belt)	1032	849
Humid (Eastern frontier)	300	374
Total Region	638	566

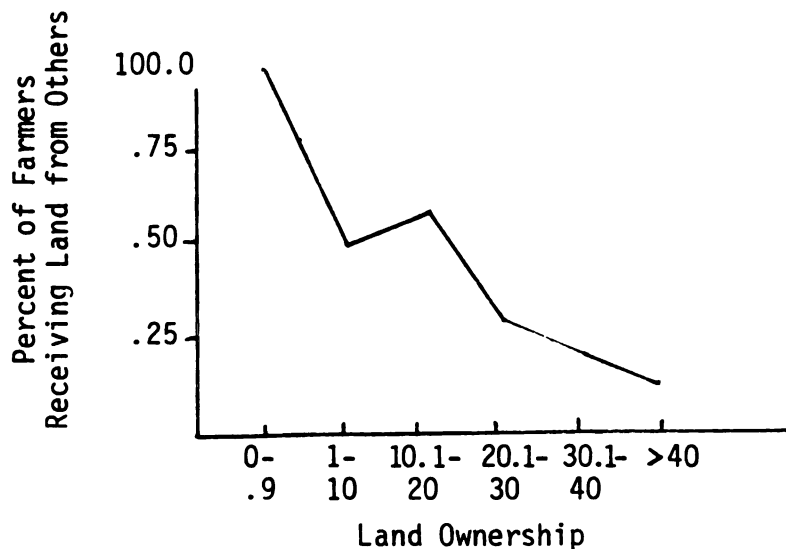
^aPurchase prices and sales prices are for area where land is located, rather than for place of household residence.

Besides direct ownership and usufruct of public land, three other methods are used to gain access to land for annual crops: 1) sharecropping, 2) renting, and 3) occupying land of relatives without charge. Of the 250 sample families that participate in farming, 60 percent own some land, but only 39 percent of farmers rely solely on their own holdings to provide themselves with sufficient quantity and quality of this resource. An additional 20 percent rent land, which may or may not be combined with owned land; 15 percent sharecrop, and 22 percent use land received free from relatives. The remaining 4 percent combine two or more of these methods.

As evident in Figure 9, the portion of farmers owning fairly large amounts of land and still operating additional amounts received from others is quite large. Not surprisingly, the average amount received is greater for those that do not own land than for those that do.

Figure 9

Percentage of Farmers Who Receive Land in Rental or Other Method by Amount of Land Owned



On the average, farmers add 1.34 manzanas to their land base through these methods. But some of this land received is from other families that live in the region (see Table 17). Subtracting the amount ceded by families through these same three methods lowers the net amount received to 0.74 manzanas, which represents the amount received from sources other than sampling units, namely haciendas. Average amounts received per farmer are nearly identical among the three areas.

Table 17

Total Manzanas Received^a by Method of Occupancy and Source

Method of Occupancy	Total Received	From Other Families	From <u>Haciendas</u>	Average Cost per <u>Manzana</u>
	(Monzanas)	(Monzanas)	(Monzanas)	(Córdobas/Monzana)
Renting	101.2	30.0	72.2	120
Sharecrop- ping	120.8	42.5	78.3	268
Without charge	112.3	77.0	35.3	--
Total	335.3	149.5	185.8	--

^aFirst planting period, May through August.

Most land received without charge is from other related families. The remaining portion occupied without charge is lent to hacienda workers by owners, but this is much less than is generally believed. Most land from haciendas (occupied by rural households) is sharecropped or rented.

Sharecropping is a more expensive way of accessing land (see Table 17), though it also has some advantages, such as sharing risk of crop failure and gaining access to use of tools and oxen of the landowner. The proportion of land rented and sharecropped vary among areas.

None of the sample households sharecrop or occupy land of relatives in the agricultural frontier. Instead, renting is predominant, resulting in a lower average cost of accessing land than in other areas (see Table 18).

Table 18
Average Cost of Accessing Land by Renting
and Sharecropping in Each Area of the Region

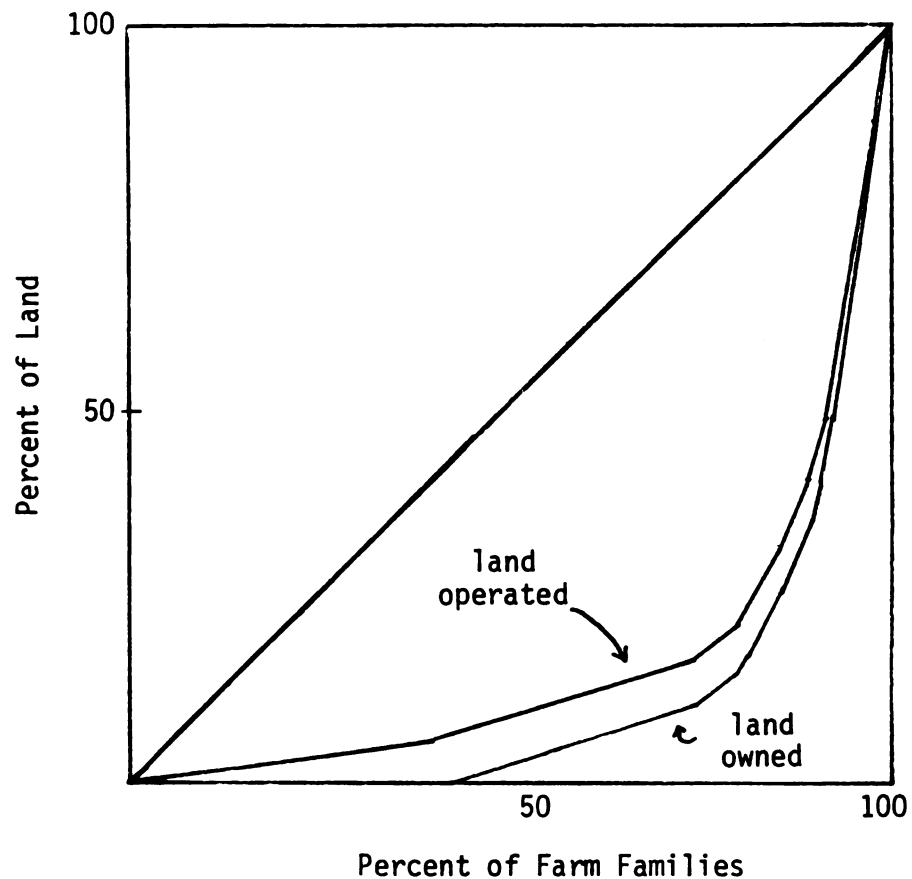
Area	Average Cost (Córdobas) per <u>Manzana</u>
Western	230.86
Central	206.50
Eastern	109.12

Total costs of rented and sharecropped land represent nearly 11 percent of net farm income (excluding livestock income), and 36 percent of net cash farm income of all families.

The final effect on land distribution of occupancy by all three methods is given in two Lorenz curves in Figure 10. Only families that farm some amount of land, however small, are included. Hacienda land, which is more than half the total, is not included. One curve gives the amount of land owned, while the other gives amounts of land operated after renting, sharecropping, and other transfers are considered. Nearly 40 percent of farm families own no land, but operate 6 percent of all land operated by rural households. Over 90 percent of rural households own 40 percent of the land and occupy 45 percent of it, leaving 10 percent of households which operate 55 percent of the land, and own

Figure 10

Lorenz Curves of Amounts of Land Owned and Amounts Operated
Among Farm Families, Excluding Haciendas



60 percent. Gini ratios for land operated is .68, and for land owned is .77, which again, are for land distribution only among households that participate in farming, and with haciendas excluded. Again, it is estimated that haciendas control over 50 percent of the land.

Agricultural Credit and Technical Inputs

Many farm families in Nicaragua have utilized credit and technical assistance for several years. Fertilizers, improved seeds, and other practices are well known in some areas, if only partially accepted. But

emphasis of policy has, in the past, been on increasing production by providing credit to farm families who are prepared to utilize it on a commercial basis. Many who are prepared to utilize credit, and many who are not, do not seek loans for fear of defaulting and placing themselves in jeopardy of losing assets.

Two programs have been set up for the purpose of making inputs and credit available to farm families, the small farmer credit program of the Banco Nacional de Nicaragua (BNN) and the Institute for Well-Being of Peasants (INVIERNO), each having approximately the same number of clients in the Central interior region. The program of the Banco Nacional was set up to extend agricultural credit to qualifying farm families not reached by the commercial banking system. Under this program loans are made available for annual crops, livestock, and for farm structures. The original concept of INVIERNO was to integrate a broad range of services to rural families and communities including improvement of access roads, leadership development, community organization, technical assistance to farm families and production credit. Its principal clientele was to be the poorest of farm families that are not in a position to qualify for loans of the BNN. In practice, INVIERNO concentrated efforts on agricultural credit and extension during its first few years of work.

The BNN and INVIERNO projects supplied about 61 and 34 percent of outstanding credit, respectively, to sample families in the year prior to the survey. Of 331 sample families, 74 had outstanding debt at the end of 1977, and another 26 had repaid loans during the year. The most popular use of credit is for purchase of animals, either oxen or breeding stock, accounting for 46 percent of borrowings in 1977. Agricultural

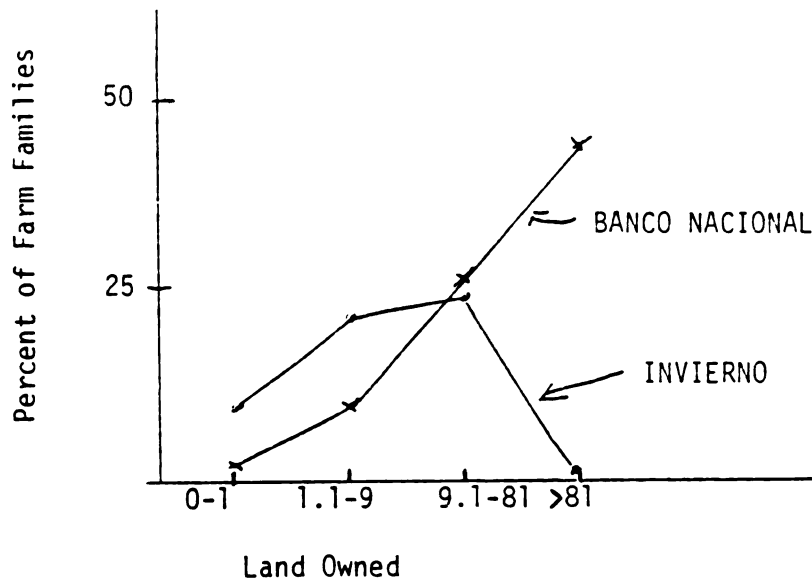
inputs made up 37 percent, another 11 percent went to household uses, and the rest for miscellaneous purposes. Nearly all credit for purchase of livestock is from the BNN, much of which is two-to five-year periods.

The INVIERNO and BNN programs offer many of the same services in the same places, but since INVIERNO lends only for production of annual crops, its program is more narrow than that of the BNN. This seems contrary to the original concept of the INVIERNO project which was to offer a broad range of services to farm and non-farm families, as well as communities. INVIERNO's operating procedures differ little from that of the BNN, except qualification standards were slackened somewhat and repayment schedules are more flexible. INVIERNO has been criticized for encroaching upon the target population of the BNN and actually taking some of the BNN's clients away. A comparison of the clients of each institution shows that there is some overlap in amount of land owned (Figure 11). However, INVIERNO does work with a greater proportion of farm families that own less than nine manzanas in comparison to the BNN, and INVIERNO assists very few families that own larger amounts of land. It is worth noting that other sources of credit (friends, relatives, and money lenders), which serve few families in total, still serve more of the landless families than do INVIERNO and the BNN put together.

A more detailed picture of the clientele of each institution further develops the notion that there is actually a great deal of difference between the two groups served. Table 19 gives area planted per client, number of oxen owned, and value of livestock, except oxen, all by amount of land owned. Area planted to perennial and annual crops is higher in all ownership categories for Banco Nacional clients. Numbers of oxen are also higher, along with value of other livestock.

Figure 11

Percent of Farm Families by Land Owned Who Receive Assistance from the Banco Nacional and INVIERNO



Interestingly, INVIERNO clients tend to surpass other farm families (who are not clients of the BNN or of INVIERNO) in area planted and oxen owned. The inference seems to be that the Banco Nacional has the most active and able farm families as its clientele, and INVIERNO has the next group right under that of the BNN. But the remainder, which is the largest number of farm families, average still lower in terms of their activity in agriculture. Many of these are "part-time farmers" who rely more on wage earnings for their income.

Since the BNN offers credit for a wider range of uses, and for longer periods, outstanding debts of BNN clients would be expected to be larger. Sadly, sample families could not report how much they owe, or how much interest they pay. These figures had to be obtained

Table 19

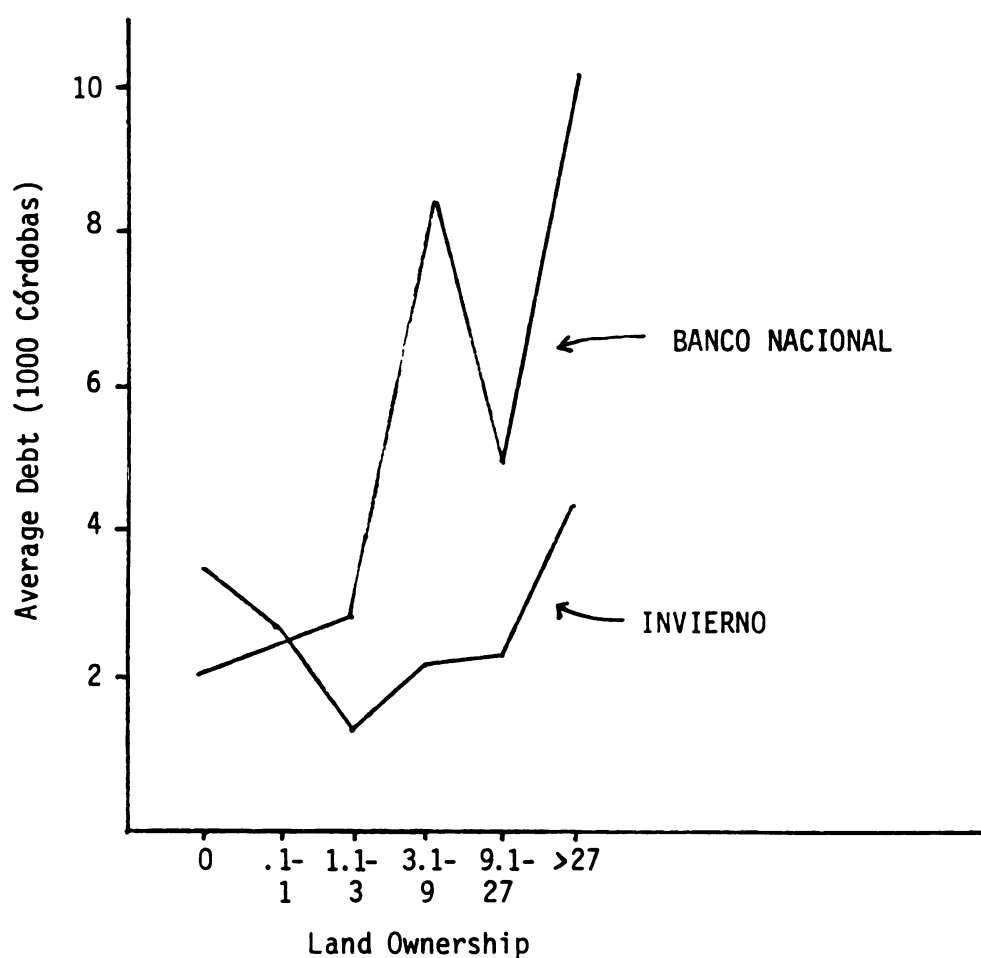
Area Planted, Number of Oxen Owned, and Value
of Livestock of Farm Families

A. Area planted per farm family (<u>Manzanas</u> in perenial crops plus average of <u>manzanas</u> in first and second plantings of annual crops)							
	<u>Land Owned (manzanas)</u>						
	0-1	1.1-3	3.1-9	9.1-27	27.1-81	>81	Total
INVIERNO	2.5	2.0	2.9	4.5	4.4	--	3.2
BANCO NACIONAL	3.0	2.9	3.5	4.8	4.4	8.8	4.9
ALL OTHER FARM FAMILIES	1.3	2.0	2.4	3.5	4.1	7.6	2.1
B. Number of oxen per farm family							
	<u>Land Owned (manzanas)</u>						
	0-1	1.1-3	3.1-9	9.1-27	27.1-81	>81	Total
INVIERNO	0	0	.55	1.5	1.78	--	.72
BANCO NACIONAL	0	1.25	2.00	1.50	2.00	2.00	1.63
ALL OTHER FARM FAMILIES	.02	0	.20	.45	.73	1.40	.17
C. Value of livestock other than oxen per farm family (Córdobas)							
	<u>Land Owned (manzanas)</u>						
	0-1	1.1-3	3.1-9	9.1-27	27.1-81	>81	Total
INVIERNO	640	1358	1875	3409	11,202	--	3969
BANCO NACIONAL	1315	1916	6350	6563	14,196	71,055	14,448
ALL OTHER FARM FAMILIES	816	1900	1811	3659	7,473	21,713	2,323

from INVIERNO and Banco Nacional, with the cooperation of field offices (see Figure 12).

Figure 12

Outstanding Debt per Client Family of INVIERNO
and Banco Nacional by Land Ownership



There is reason for concern that net cash incomes from agriculture of INVIERNO clients was only 515 Córdobas in 1977--not even 20 percent of current indebtedness. Cash incomes from agriculture and livestock among Banco Nacional clients is close to 5,000 Córdobas, nearly

three-fourths of their debt. Table 20 shows average indebtedness, along with average family income by source for the 40 INVIERNO clients and 28 Banco Nacional clients in the sample. Not all debt is actually owed to the corresponding office; a small portion represents loans from relatives and local money lenders.

Table 20
Net Family Income by Source and Indebtedness of
INVIERNO and Banco Nacional Clients

Source of Income ^a	Clients of INVIERNO	Clients of Banco Nacional	All Other Families
	(Córdobas ^b per Household)		
Agriculture	2548	5615	1533
Livestock	1399	4647	537
Non-agri Production	462	175	369
Wage earnings	1826	1834	6574
Transfers and Other	-716	-1275	135
Net Family Income	5521	10,999	9148
Debt	2720	6968	61

^aCash and non-cash; includes value of production consumed by family.

^b7.026 Córdobas = one dollar.

Income derived from agriculture is twice as large among BNN clients compared to INVIERNO clients, and income derived from livestock is three times as large. Again from this sample, it appears that the BNN and INVIERNO programs reach distinct clientele, and, it appears that INVIERNO

is working with some of the poorer families of the region. The factor that makes INVIERNO clients different from other families that do not participate in either program is the low level of wage earnings of BNN and INVIERNO clients. INVIERNO clients seem to represent the more disadvantaged group of farmers who either are not able to find work off the farm or who prefer to be self-employed.

Roads

Vehicular access to a community influences many aspects of social and economic activity. Currently, over half (58 percent) of the rural population of the region is served by all-weather roads.

The arid western side of the region is typified by small communities, closely located to municipal towns. The communities are linked to towns by short, but very poor, dry-weather roads, which often lead to the main paved highway running north to Honduras and south to Managua. Though rainfall is lower in this area, it is sometimes torrential, causing severe damage to roads. A few of the smaller communities in very mountainous terrain have no roads.

Much of the central area is served with all-weather gravel roads which spread for long distances out from the cities of Matagalpa and Jinotega. Two reasons were used in the past to justify these investments:

1. Part of the area forms a milk shed for the Nestlé powdered milk plant in Matagalpa.
2. The National Guard needed vehicular access to combat guerrilla activities.

Guerillas had been in control of some areas of the region as recently as 1976. Areas of especially good access are east of the city at Matagalpa (municipality San Ramón), and around Lake Apanás, north of the city of Jinotega.

Most of the humid agricultural frontier, lying to the east is not yet served by roads. Some road improvement has taken place in recent years, but most of the population lives beyond where roads end. Coupled with still longer distances to urban places, this area is fairly remote. It requires a full day to reach some communities at the extremity of the region, using a combination of vehicular and animal modes.

Figure 13 gives a geographical perspective by showing locations of communities studied by type of road access. Communities get larger as one goes from west to east on the map. The six communities lying farthest to the east, in the agricultural frontier area, contain about one-tenth of the region's population. The few of these places that have roads tend to be smaller, and lie farther out at the extreme edge of the region. They are on all-weather penetration roads, fairly recently constructed. Most land along these roads going out to these distant communities is in cattle ranches. Figure 14 gives percentages of population in each area that are served by different types of roads.

Generally, where haciendas are active, roads are good, whereas places without roads are usually made up of small- and medium-sized farms. Several explanations for this situation can be postulated. Hacienda owners are probably more influential than local leaders in getting roads improved where they own land. Past emphasis on production may have caused policy makers to place higher priority on areas where haciendas predominate. Persons with influence who wish to invest in land may gain

Figure 13
Location of Paved Roads and Communities Studied by Type of Access Road

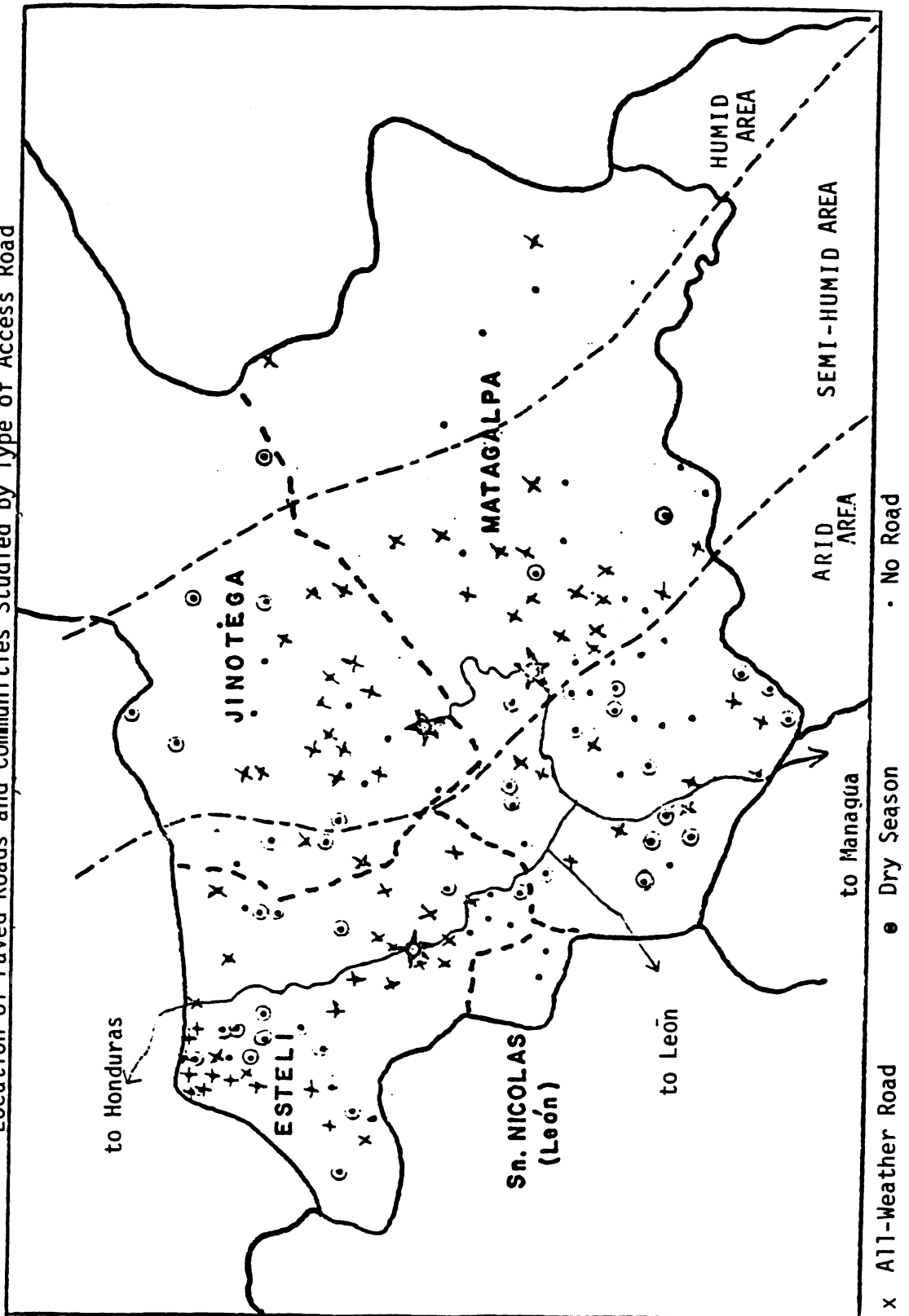
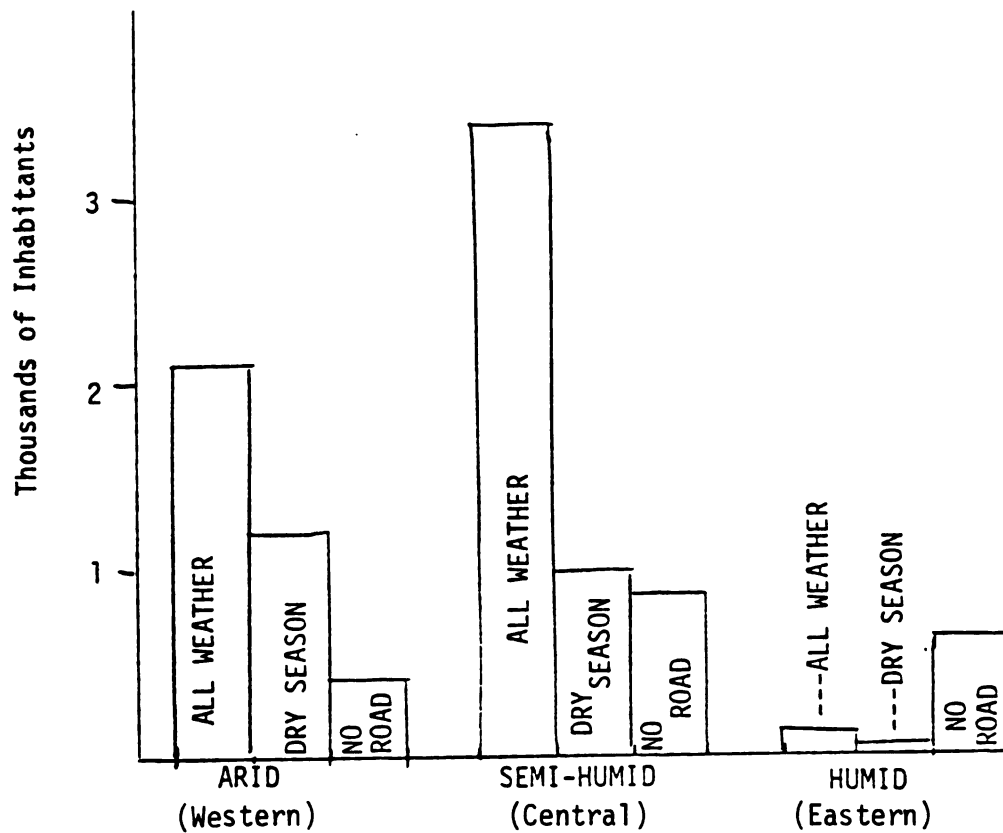


Figure 14
Inhabitants by Area and Type of Road^a



^aSource is the community survey which covered about 40 percent of the population of the region.

access to privileged information about timing and routing of road building projects. And, it is also possible that persons more financially secure and more commercially oriented in their production buy out the small farmer who prefers to move toward areas where land is cheaper.

Though there is probably some truth to each of these statements, the information gained in this study does not support the conclusion that small farmers prefer to sell land where road access is improved and move to areas where land is cheaper. The reason is that sample families pay much more per manzana when they purchase land than they receive when selling.

Table 21

Sample Families According to Type of Road Serving Community
and Influence of Haciendas in Community

Type of Road	Where <u>Haciendas</u> Predominate	All Others
All-Weather	63	120
Dry Season	8	66
No Road	0	74

The greatest impact of roads on the economy of each community is through its impact on local grain prices. The expense of transporting by mule or horse into places not served by roads raises the purchase price, and depresses the sale price of grains. Table 22 gives average sale prices for first and second plantings in communities with and without roads. Prices are about 50 percent higher in communities that have roads compared with those that do not. Sale prices of beans and other products, including cheese and eggs, are similarly affected.

Purchase prices of corn are more difficult to compare because where there are no roads some families purchase locally for low prices--25 to 40 Córdobas--while others pay more than 90 Córdobas, presumably for corn

Table 22
Average Sale Price of Corn by Planting
Time and Physical Access

Access	First Planting	Second Planting	Difference (second minus first)
	(Córdobas per hundredweight)		
With Road	48.67	51.60	2.93
Without Road	33.00	36.00	3.00
Difference (With Road minus Without Road)	15.67	15.60	

brought in from outside the community. In areas with roads, the median purchase price is 70 Córdobas per hundredweight.

Returns to Labor on Family Farms

Gross income of family enterprises was calculated by adding cash receipts from sales to the value of production consumed by the family. Products consumed were assigned their sales price for families that had made sales during the year. Purchase prices of grains were used among households reporting purchases. Otherwise, the respondents were requested to place a value on grains consumed, and also on animals, such as chickens and pigs rendered. Eggs, milk, and cheese were given values on the basis of sales prices according to area averages and physical access to the community. Gains in livestock values due to growth of young animals are included along with losses due to death of livestock. In proceeding toward net income, only direct costs were charged against gross income, namely, costs of renting or sharecropping land, interest payments, costs of purchased inputs, hired labor (including meals given),

and purchased feed. Agricultural enterprises were credited with the value of grains produced that are fed to animals, and livestock enterprises had these charged against them as costs. Other costs not directly charged to the family during the year, such as imputed interest on investment or depreciation, have not been accounted for.

A brief sketch of income levels and distribution is given in Table 23, by land tenure. Only households participating in farming are included.

Table 23
Net Income of Farm Families by Source and Land Owned
(Cash and Non-Cash)

Land Owned (manzanas)	Córdobas/Family ^a			Total	Number of Farm Families
	From Agriculture	From Livestock	Other Sources ^b		
0	1380	306	7113	8799	90
.1- 1	196	266	6641	7103	28
1.1- 3	1784	466	4333	6583	32
3.1- 9	3259	420	2668	6347	38
9.1-27	5207	403	2734	8344	31
27.1-81	4026	4124	576	8726	28
>81	7529	12524	-1557	18496	9
Total	2549	1197	4504	8250	256

^a7.026 Córdobas = dollar

^bMostly wage income, also non-agricultural home enterprises and transfers.

It can be seen that agricultural income does not become very important to the household until ownership of land rises above three manzanas (more than five acres), and livestock income only takes on importance for households with over 27 manzanas (nearly 50 acres). Interestingly, agricultural income does not rise very much as land ownership increases from nine manzanas to over 81, while livestock takes on a greater importance. Naturally, other sources of income, mainly wage earnings, decrease as land ownership rises.

As outlined above, net income figures in Table 23 are net returns to all owned resources, not just to family labor. Net income from agriculture and livestock are summed and divided by total days worked on-farm by family members to produce Table 24. (No adjustment is made for differential productivities between sexes and among age groups in this table.) The breakdown by area stresses the importance of agroclimatic conditions. Though the survey period was not one of severe drought in the arid western area, returns to home farm agriculture per day of work are much lower on the average, than the other two areas.

Table 24
Net Income Derived from Agriculture and Livestock
per Worker-Day by Family Members

Land Owned (<u>manzanas</u>)	-----Area-----			
	West	Central	East	Total
	(Córdobas per worker-day)			
0	10.89	30.92	20.37	18.30
.1- 1	- 6.66	14.65	34.64	5.53
1.1- 3	8.41	17.76	20.45	14.82
3.1- 9	19.74	34.33	12.25	26.28
9.1-27	11.55	25.54	17.32	20.12
27.1-81	25.27	17.85	38.37	27.10
>81	30.36	--	38.48	37.26
Total	14.54	24.25	30.89	22.45

Farm income per worker-day is higher among households that own no land than for households that own up to three monzanas, a result consistent with the figures shown in Table 23. The larger return per worker-day used in home farm agriculture for households owning over three monzanas probably results from a greater emphasis on farming operations as opposed to wage employment, implying greater use of modern inputs and more intensive cropping patterns. This conclusion is supported by the reduction in other sources of income shown in Table 23 for households that own more than three monzanas.

Summary

Land tenure in the study region is highly concentrated with over half under control of haciendas and 60 percent of the remainder owned by only 10 percent of rural families. Due to the mountainous nature of the region it was not possible to assess soil quality; however, it appears that more intensive cultivation is possible in areas where rainfall is adequate. Other methods of gaining access to land are highly varied and frequently utilized. Many households that do not own land, or that own small parcels, grow crops for home consumption through renting, share-cropping or usufruct. The proportion of landless families growing crops for home consumption is greater in areas where access by roads is limited, a factor particularly prevalent in the eastern frontier area. It is not known how many more households would grow crops for home consumption if land were available to them at lower cost.

Income from agricultural and livestock enterprises is very low among households that own less than nine monzanas, and rises above 10,000 Córdoba per year only for those that own more than 81 monzanas.

However, households that own from three to nine monzanas appear to place more emphasis on home farm production than other activities, resulting in a marked decrease in income from other sources compared with households that own less land.

The two programs established to assist rural families, INVIERNO and the small farmer credit program of the BNN, reach only about 10 percent of landless families that participate in farming. The programs operate in similar manners, both concentrating on providing credit. This has resulted in neglect of social services and infrastructure so badly needed in rural Nicaragua.

The following chapter addresses the issue of labor absorption in home farm agriculture, including an analysis of factors related to rates of participation in farming. In Chapters VIII and IX, the analysis will turn to off-farm employment.

CHAPTER VII

LABOR ABSORPTION IN HOME FARM AGRICULTURE

This chapter begins the analysis of factors affecting the family's decision to allocate time to different activities--in this case, to home farm agriculture. First, the decision to cultivate land and the extent of area cultivated are explored. Absorption of family manpower is then explained on the basis of factors outlined in Chapter VI--land tenure, credit and technical inputs and physical access--plus, variations in agroclimatic conditions among areas.

The analysis here is simplified in several ways. First, consideration of off-farm opportunities for each family member are postponed to the next two chapters which deal directly with labor supply off-farm. Second, the household is used as the unit of analysis, hence the possibility of independence of some family members to work off-farm and earn separate wages is not included. Third, since males supply around 90 percent of labor to home farm agriculture, use of males' time receives major emphasis. Because of data limitations, home farm agricultural work is limited to field work. Time spent husking and shelling corn and threshing beans was not effectively included in enumeration because of the problems of measuring labor inputs in these activities, i.e., work is often done intermittently with other activities and mixed with rest or with informal socializing among family members. Livestock activities are included as a part of the family farm enterprise.

Participation in Farming

For most households, the decision to cultivate land is made with regard to nutritional needs of the family and costs of purchasing basic foods--corn and beans. Incentives to plant at least a small amount of land to provide for a portion of home consumption are fairly great, since the purchase price of corn can go over 70 Córdobas (ten dollars) per hundredweight during some times of the year. A hundredweight will last the average-size family (seven members) only about two weeks. Among the 20 percent of families that own more than nine manzanas, farming can potentially be taken up for commercial purposes.

Incentives to grow subsistence crops are greater in isolated communities with poor road access. The expense of transporting grains by mule into areas without roads greatly raises purchase price at times when local supplies are low. Investigating effects of physical access also requires accounting for the effects of land ownership, because places dominated by haciendas are nearly always served by all-weather roads. Remote places tend to have more land available to small farmers, especially in the agricultural frontier area. Table 25 gives rates of participation in farming separating the agricultural frontier area from the rest of the region. Participation rates are calculated by dividing the number of families that cultivate land as a home farm enterprise by all families in the same cell of the table. Rates are naturally higher among families that own land, but even among those not owning land, participation in farming is high--80 percent in the frontier and 55 percent in the rest of the region. Fewer families cultivate land where roads are improved, particularly among households that do not own land.

Table 25

Participation Rates in Farming by Physical Access,
Area, and Land Ownership
(Percent of Households in Farming)

	Agricultural Frontier			Rest of Region		
	No Land	Owns Land	Total	No Land	Owns Land	Total
With Road	.50	1.00	.80	.49	.90	.70
Without Road	.87	1.00	.94	.80	.93	.88
Total	.81	1.00	.92	.55	.90	.72

Participation rates in the frontier area are higher than those in the rest of the region on an overall basis, but when effects of road and land ownership are accounted for, the difference reduces considerably. This suggests that cost of renting land is not as influential in the household's decision to cultivate as are other factors.

Though land ownership is positively related to age of household head, rates of participation in farming do not vary with age of head. Around three-fourths of families from all age groups of head of household farm some quantity, however small, of land. Table 26 shows that the participation rate increases with land ownership going from 57 percent among households with no land to 97 percent among those with more than nine manzanas.

Among households that own no land, educational attainment of the head has a great influence on probability of participation in farming, especially as age increases. Heads of household with some education (at least one year of school completed) get jobs in more desirable

Table 26

Rates of Participation in Farming by Age of
Household Head and Land Ownership

Land Owned	Age of Head					Total
	≤30	31-40	41-50	51-60	>60	
0	.68	.56	.47	.48	.56	.57
0.1-3.0	.81	.87	1.00	1.00	.55	.87
3.1-9	1.00	.91	.90	1.00	.86	.93
> 9	1.00	1.00	1.00	.89	.94	.97
Total	.75	.74	.79	.73	.76	.76

occupational categories having higher wages. Location of residence among families holding these jobs may limit access of the household to land, and availability of family labor would be reduced. Further, with higher income there would be less incentive to spend extra hours cultivating a home farm plot.

The relationship between participation in farming and education of the head of household as age of head increases can be seen in Table 27 for families that own no land. When the head of a landless family has had some education, the probability of farming remains close to 50 percent until the head crosses 40 years of age. Beyond that point, farming activity decreases abruptly.

The greatest probability of participation in farming among landless families is when the head is 30 years of age or younger, and has no education. Interestingly, this is the same group that is highly represented as full-time workers on haciendas. If families on haciendas were removed from the table, probability of a landless family with a young,

Table 27

Participation Rates in Farming by Age and Education of
Head of Household--Households that Own No Land

Education of Head (Years)	Age of Head					Total
	≤30	31-40	41-50	51-60	>60	
	(Proportion of Households that Own No Land)					
0	.74	.56	.54	.52	.56	.60
1 or more	.50	.56	.17	--	--	.41
Total	.68	.56	.47	.48	.56	.47

uneducated head participating in farming would rise even more, from 74 percent to 95 percent, which is equivalent to participation rates of families that own land.

Area Cultivated

Area cultivated per family or per worker provides an index of extent of agricultural activities of farm families, and intensity of resource utilization. In this section, area in permanent crops is added to amount in first and second plantings to obtain area cultivated, so some land is added twice. Extent of farm activity might be expected to change with access to resources, and with family life cycle. Most variation is due to the former, as was seen in Table 25. Area cultivated rises from two or three manzanas among farm families that own little or no land to over 12 manzanas for the few that own large amounts of land.

The distinction between commercial and peasant farming is not exact. But, as a useful guide, ownership of nine manzanas or more seems

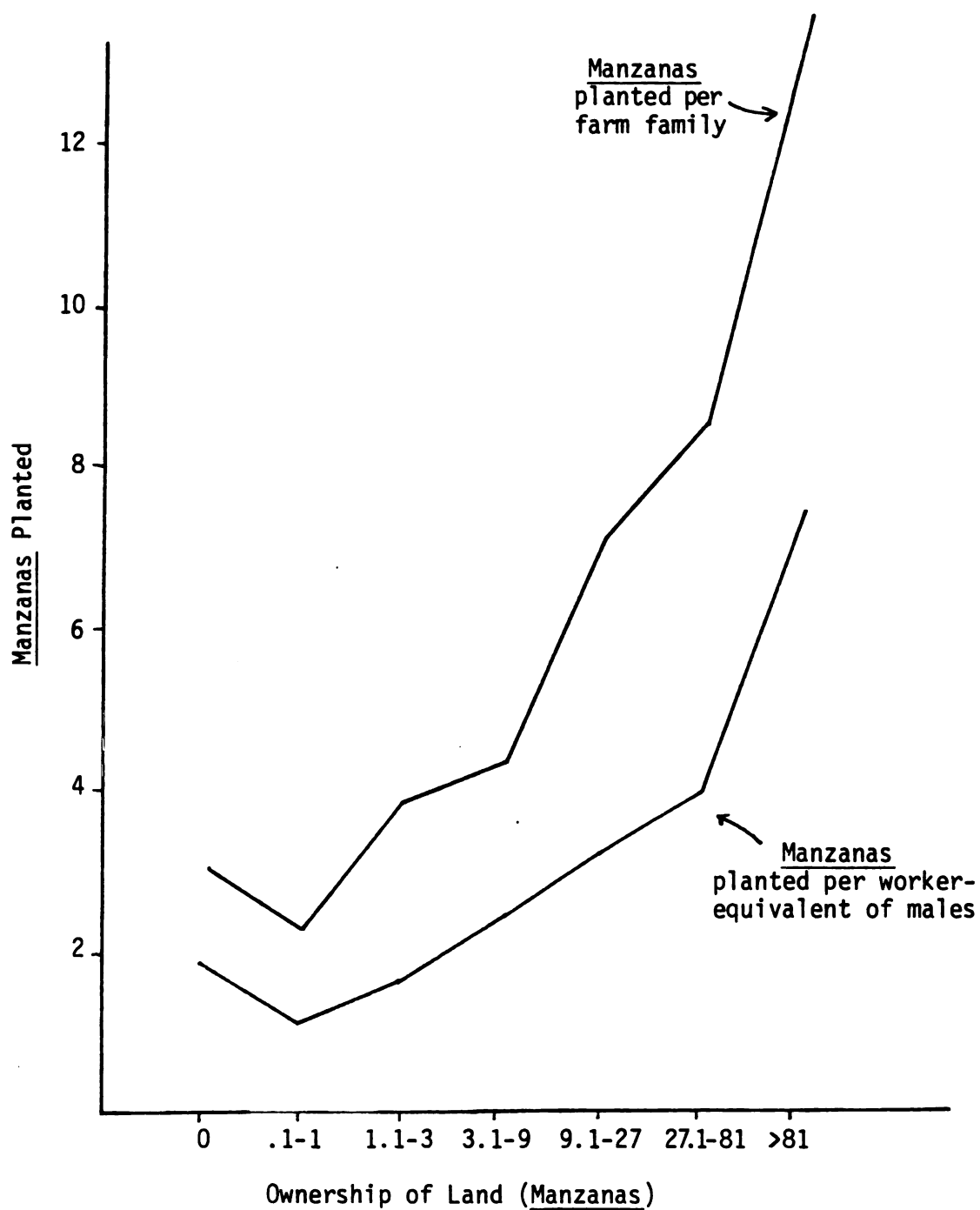
to divide families among those that cultivate only enough to provide for home consumption and those that would normally produce enough to sell. Households owning from nine to 27 manzanas cultivate around seven manzanas on the average, one of which might be in perennial crops, four planted to grains in the first planting period and two more in grains during the second period. Ownership of less than nine manzanas implies planting five manzanas or less in total.

The lower line of Figure 15 gives area planted per worker-equivalent of males in the family. Worker-equivalents of males, rather than total worker-equivalents in the family, is used here because most field work on family farms is performed by males. Although women provide some labor in certain seasons, it is felt that most households would plan their agricultural activities around the male manpower available.

Interestingly, households that own no land plant more per male worker-equivalent, on the average, than families that own three manzanas or less. This general pattern holds true across all areas, and in all types of communities. Further, age distribution of heads of household owning small plots of land is about the same as for all farm families. An hypothesis emerging from this observation is that ownership of a small amount of land, perhaps with a house, fruit trees, and other improvements, reduces mobility of these families to search for better opportunities elsewhere. Hacienda owners, who are potential buyers of land, would seldom place a value on improvements made by peasant farmers. For owners of small amounts of land, improvements associated with the household would form a larger proportion of total property

Figure 15

Area Planted per Farm Family and per Worker-Equivalent
of Males by Land Owned



value. Hence, the percentage of value lost from selling would be larger as the amount of land owned is smaller.

Variation of area planted over the life cycle of the family is mostly a function of land and labor available. Table 28 shows manzanas owned by age of head, area planted per farm family, area planted per manzana owned, and per worker-equivalent of male family members. As land ownership increases with age, area planted per manzana owned decreases. Some of the area planted is, of course, rented or share-cropped. Younger heads of household especially rely on these methods of accessing land, since they own little land. Area planted per farm family increases rapidly until the head crosses 35 years of age, then rises more gradually, peaking when the head is in the 46 to 55 age range. From there it reduces mildly. Area planted per worker-equivalent of male family members peaks when the head is fairly young, less than 35 years old. After that, children begin to contribute more to the work force, and intensity of cultivation per worker-equivalent declines. It rises again later, which may be due to hiring labor on the part of families with older heads that own more land and have more accumulated wealth.

What is, perhaps, most interesting in Table 28 is not the variation but the relative uniformity in area planted per family and per worker-equivalent after the head reached 36 years of age. While land ownership increases, it is cultivated less intensively, but intensity of use of the family work force and of "entrepreneurial capacity" do not seem to change as the head gets older. Land left uncultivated can be used for pasture, improved or natural, and has some value as woodland. Value of livestock owned increases proportionately with land ownership.

Table 28

Land Ownership of Farm Families and Area Planted
by Age of Head of Household

Age of Head of Household	Manzanas Owned per Farm Family	Area Planted per Farm Family	Area Planted per <u>Manzana</u> Owned	Area Planted per Worker-Equivalent of Males
≤ 25	0.95	2.21	2.32	1.77
26-35	6.38	3.80	0.60	3.10
36-45	15.05	5.43	0.36	2.51
46-55	16.44	5.79	0.35	2.18
56-65	18.18	5.28	0.29	2.48
> 65	34.43	5.07	0.15	2.84

It was seen earlier that educational attainment of family head guides families who own no land toward salaried employment as they grow older. Interestingly, education seems to also cause families that participate in farming to cultivate more actively. Of families that cultivate but own no land, average area planted per worker-equivalent is 2.66 among family heads that have completed at least one year of school, and 1.84 for all others.

Again, the relationships discussed here generally hold true for the various areas within the region. Where precipitation is higher, more emphasis is on perennial crops, such as coffee and bananas, and where it is lower more annual crops are grown, mainly corn and beans.

Utilization of Family Labor on the Home Farm

This section summarizes the effects of various factors on family labor utilized on the home farm. The model developed here is incomplete since off-farm opportunities are not fully accounted for. It is meant to be a prelude to the more formal approach of the chapters that follow. Further, since nearly all field work and most livestock activities are performed by males, inputs of labor by females are ignored in this portion. Labor input is measured by days, weighted by worker-equivalents of each male family member as calculated in Chapter V. Only families participating in farming are included.

Utilization of labor on the home farm is hypothesized to be a function of access to land resources, agroclimatic conditions, technology applied, previous investment in establishing perennial crops, and of physical access to the community, which affects local grain prices. Area planted is not included as an independent variable; doing so would assume that the family's decision of how much to plant is limited within strict bounds by some exogenous factor, such as availability of cultivable land. Such an approach might apply to regions where population density is high and cultivation practices and cropping patterns utilize the land resource very intensively. In Nicaragua, families generally seem to find a sufficient quantity of land available that is in some way acceptable for growing corn, beans, or sorghum. The problem is not so much one of land area, but of productivity, cost and other terms of access. The decision of how much area to plant is thought to depend on access the family has to land, labor and managerial resources of the family. The decisions of how much to plant and how much of available family labor to utilize on home farms are made simultaneously. Hence,

the model starts with area planted as a function of land owned and days of male worker-equivalents available:

$$PLT = f_1(OWN, EQMDAYS)$$

where PLT is area planted in first and second planting periods plus permanent crops, OWN is land owned plus usufruct of public land or land received without charge from relatives, and EQMDAYS is total worker-equivalent days of able-bodied male family members available during the agricultural season--eight months, from May through December. EQMDAYS is calculated at six days per week for eight months, less average time losses due to illness¹ and time occupied in "superior" off-farm occupations with relatively high salaries and rigid work schedules. OWN and EQMDAYS replace PLT, or area planted, as arguments in the model that explains days worked in home farm agriculture. Further, families are placed on a comparative basis by dividing both sides of the equation by total worker-equivalents of male family members. Thus, the dependent variable becomes average worker-days utilized on the home farm per worker-equivalent in the family. After adding the other factors mentioned earlier, the regression equation becomes:

$$\frac{FAMN}{EQM} = a + b_1 \frac{OWN}{EQM} + b_2 \frac{EQMDAYS}{EQM} + b_3 FPM + b_4 CF + b_5 ROAD$$

Here, FAMN/EQM is average days worked per male family member (in worker-equivalents), OWN/EQM is land owned or occupied without charge per male family member, EQMDAYS/EQM is average days available per member, FPM is fertilizer mer manzana in pounds, CF is manzanas established in coffee, and ROAD equals 1 if the community is served with a road, and 0, if not.

¹Based on responses for the month previous to the survey, "normal" activities cannot be performed about 25 days per year due to illness.

Separate models were run on each of the three areas as a way of accounting for agroclimatic conditions. This also avoids multicollinearity of several factors such as land ownership and physical access with agroclimatic area.

The regressions were run separately for the first and second cropping periods, but since results over the two seasons were so similar (except that the constant for the second season is lower), regressions were repeated for the entire agricultural year, in order to make exposition of results more concise. Regression results in Table 29 show average amounts of time absorbed per worker-equivalent increasing modestly from the western area to the eastern. Values of the coefficients of the first independent variable, days available per male worker-equivalent, are related to off-farm opportunities for general field workers. Since off-farm employment opportunities are greatest in the central area, there is less tendency to use man days available (not taken up in high paying, steady jobs) on the family farm. The low coefficient in the western area partially reflects low productivity of family farms, compared with the other areas. Land has only a modest impact on labor utilization, being largest in the central area, where holdings are smaller and a larger portion of land owned is cultivated. The coefficient in the eastern frontier is not significantly different from zero. This reflects the general availability of land, even to families that do not own, and also the shift in orientation toward less labor intensive enterprises, namely cattle, among families that own larger amounts of land in the frontier area. Increases in time utilized with inputs of fertilizer per manzana are fairly great in the central area, however, average amount of fertilizer applied is much less

Table 29

Regression Results of Labor Absorption on Family Farms

	Agroclimatic Area		
	West	Central	East
Dependent Variable:	(mean and standard deviation)		
Average worker days of male family members in home farm agriculture	54.7 (42.3)	60.3 (56.7)	69.0 (60.2)
Independent Variables:	(coefficients and standard errors)		
Days available per male worker-equivalent	.170 (.093)	.159 (.086)	.241 (.154)
Land owned or received free per male worker-equivalent	.750 (.290)	2.301 (.444)	-.0183 (.245)
Fertilizer per <u>manzana</u> (pounds)	.093 (.056)	.283 (.083)	.058 (.414)
<u>Manzanas</u> established in coffee	-5.008 (7.778)	9.545 (3.155)	13.647 (5.268)
Physical access (0 = no road, 1 = road)	-18.748 (15.759)	-12.799 (13.478)	-9.963 (25.073)
Constant	40.464 (21.400)	23.380 (18.101)	27.581 (22.904)
R ²	.174	.391	.207

there than in the western area--38 pounds/manzana planted versus 82 pounds, respectively. Use of labor in the frontier area does not increase with use of fertilizer, where average amount applied is 29 pounds per manzana planted. It would seem from these results that emphasis of programs offering technical assistance and credit to farmers would have better results by placing more emphasis in the central area. Indeed, INVIerno officials have become so concerned about performance in the western area that they have considered suspending activities there entirely.

Effects of having coffee established are, of course, positive only in the central and eastern areas where climate and soil are appropriate for this crop. And, finally, roads seem to have a negative, though not significant, effect on time utilized on home farms. Road, through its impact on purchase prices of grains, probably has more impact on the decision of a family to cultivate land or not, rather than on total amount of time dedicated to farming; however, in the regressions only families participating in farming are included.

Summary

In this chapter rates of participation in farming were found to vary with land ownership and road access, but not with the age of head of household. Since ownership of land is directly proportional to age of household head, it appears that a large number of newly formed family units with younger heads occupy land by renting, sharecropping or usufruct in order to grow annual crops for home consumption. This is common even among households in which some members, including the head, are employed full-time in wage-earning occupations.

Area planted per household increases directly with amount of land owned among households that own more than one manzana, but does not vary with age of head of household. Manzanas planted per worker-equivalent of male family members averages from one to eight depending on amount of land owned. Utilization of family labor measured in days worked per male member of the household was found to vary among the three agroclimatic areas, and varies with number of days available (not taken up in high paying, steady employment or by illness), amount of land owned, use of fertilizer, and area established in permanent crops. Poor road access to a community seems to cause more households to participate in farming, but in small scale for home consumption, which is associated with lower utilization of family labor on-farm.

The next two chapters carry this analysis further, and in more detail by focusing on off-farm employment activities. Because off-farm employment decisions differ among family members by position, age and sex, the model changes from one using the household as the unit of analysis, to one where the individual receives central focus. However, as in the current model, the household and community environment of the individual are included.

CHAPTER VIII

SOURCES OF EMPLOYMENT AND ACCESS TO JOBS

This chapter identifies sources and types of off-farm employment available to rural workers in the study region. Patterns of seasonal migration and working conditions are included. Environmental factors such as land tenure and agroclimatic conditions are discussed in relation to creation of employment opportunities. Educational levels of the rural population are included here because of the influence of education on access to wage employment. Some of the problems of provision of educational services are examined. Educational attainment is extremely low, but even nominal amounts of schooling seem to influence wage rate and labor force participation. Wage rates are compared for males and females across age groups and by level of education. Finally, the overall importance of wage income to rural households in the study region is discussed. The purpose of examining these issues is to provide a base for the development of a labor supply model in the next chapter.

Sources and Types of Employment

Over the entire region, nearly 38 percent of persons 11 to 70 years of age earned wage income during the year previous to the interview. Rate of employment of males within the same age range was 58 percent, while that of females was 17 percent. Table 30 breaks employment rates down by age and sex, however, it does not reflect that about 20 percent

Table 30

Off-Farm Employment Rates by Sex and Age
(Percent of Persons in Sex-Age Group Earning Wages)

Age	Males	Females	Total
< 11	1.4	1.3	1.3
11-15	41.1	15.8	27.6
16-20	56.3	16.8	38.3
21-35	66.4	22.7	46.7
26-30	71.0	15.9	44.7
31-35	64.0	22.2	44.2
36-40	63.5	17.1	35.9
41-45	69.0	9.8	39.8
46-50	63.9	19.0	47.4
51-55	52.4	30.0	41.5
56-60	61.9	14.3	38.1
61-65	30.0	0.0	13.6
66-70	35.7	6.7	20.7
> 70	21.1	0.0	13.3
Total	35.7	10.5	23.0

of males and 12 percent of females hold more than one "job" during different times of the year. A "job" is defined as earning wages while working in one occupation in the same community, which usually implies a single employer. However, some who work by the day may change employers frequently.

General field work dominates occupational categories of men, while coffee harvesting is more common among women, followed by domestic help and general field work (see Table 31). Coffee picking (and related activities before and after harvest) lasts only a few months from

Table 31
Participation in Occupational Categories by Sex
(Percent of Wage Earners)

Occupational Category	Males	Females	All Wage Earners
General Field Work	54.8	19.6	47.3
Agro-Industrial General worker	5.5	0.0	4.3
Coffee picker	25.2	52.9	31.1
Cotton or sugar cane harvester	1.4	0.7	0.9
Cowboy or milk maid	3.1	0.7	2.6
Domestic helper or cook	0.0	21.7	4.9
Driver	2.3	0.0	1.8
Trade	0.0	2.9	0.6
Specialized crafts	3.9	0.7	3.2
Administrator	3.7	0.7	3.1
Total ^a	100.0	100.0	100.0

^aMay not add due to rounding.

November to February. General field work, which may be temporary or year-round, implies machete work--clearing brush and weeds in coffee plantings and pastures, maintaining fences, etc. The physical demands of this activity place some groups at a disadvantage in productivity and wage scales as was seen in Chapter V. Most women working full-time seem to lean toward domestic jobs and cooking, which are located either on haciendas or in urban areas. Wage employment is generated by three

sectors of the economy: first the commercial farm sector (haciendas) provides most employment opportunities; second, some rural families involved in farming hire labor in peak seasons; and third, agro-industries and the service sector located in urban areas hire workers that reside in rural communities. Sample families involved in farming hire less than 10 percent of total man-days employed, and less than 8 percent of jobs held by rural residents are located in cities and towns. Nearly all the rest of the jobs are on haciendas.

About 20 percent of households surveyed live on haciendas year-round, and many more migrate to live temporarily on hacienda housing during the coffee season. Other families live in private dwellings close enough to haciendas that they can "commute" to work each day. Families living on haciendas year-round often have younger heads who normally work there full-time, along with many other family members, of both sexes and all ages.

Employment is closely tied to the amount of land held by haciendas and to the cropping pattern selected by them. Since haciendas in the western area seem to be investing more in cattle raising in recent years, their influence in providing employment has been reduced. Those in the central area that grow coffee have the largest impact on employment. Haciendas in the agricultural frontier are mostly cattle ranches, causing this area to have the fewest jobs available. In the community survey local respondents familiar with the community estimated total number of persons working exclusively for a salary, along with land holdings of haciendas. Table 32 contains averages per household in each area.

Table 32

Average Manzanas of Hacienda Land and Number of Persons Working
Exclusively for Wages by Agroclimatic Area
(Average per Household)

Area	<u>Manzanas</u> of <u>Hacienda</u> Land	Full-Time Salaried Workers ^a
Western	20.9	0.47
Central	15.6	0.71
Eastern	5.7	0.15

^aPersons who have no self-employment activities, such as farming.

Source: Community Survey of Region V, DIPSA, 1977.

With reference to the eastern frontier area, it is likely that the community survey methodology resulted in ignoring some blocks of hacienda land. This refers to areas held by cattle ranchers, where population is very sparse, limited to a few ranch employees in each location who do not form part of any local community. Only hacienda land located in communities surveyed is included. Estimates from the more populated western and central areas seem to have more nearly accounted for the entire land surface.

Table 33 presents information from the household survey showing amounts of employment obtained outside the community where each household resides. Nearly half of jobs held by persons in the western area are located outside the community of residence, and nearly 40 percent of worker-days are performed away from the community, implying that employed persons must live away from home during this time. Hence, the net

Table 33

Number of Jobs Held per Household Worker-Days and
Portion of Employment Outside of Community

	-----Area-----			Total Region
	West	Central	East	
Jobs held per household	2.01	2.15	1.52	1.98
Average number of 8-hour days/worker/year	151.6	161.1	150.3	156.1
Percent of workers employed outside community	49.0	11.0	18.7	26.4
Percent of worker-days outside of community	37.8	8.6	9.2	19.4

availability of jobs in communities of the arid western area reduces to only 94 worker-days per person employed, while communities in the central area offer 147 days to local residents who work, and the frontier offers 136 days. Though the frontier offers fewer jobs per household, people there who seek work seem to find it locally.

Again, job availability seems to be a function of concentration of land holdings and of cropping pattern on haciendas. Table 34 sheds further light on the importance of the former by categorizing families according to the general land tenure pattern predominating in the community where they reside. One extreme is where all land is owned by local residents, and the other is where all is owned by haciendas. The remaining families are in mixed situations where each group owns some of

Table 34

Indicators of Employment Opportunities by Land
Tenure Patterns of Communities

	Generalized Land Tenure Pattern of Community			
	All land owned by local residents	Local residents own some land, <u>haciendas</u> own some	<u>Haciendas</u> own nearly all land	Total region
Number of sample families	63	167	101	331
Salaried workers per family	1.02	1.80	2.89	1.98
Average number of 8-hour days/ worker/year	75.9	152.6	177.2	156.1
Percent of workers employed outside community	39.1	24.0	26.0	26.4
Percent of worker-days outside of community	32.2	18.1	19.3	19.4

the land. Table 34 shows that the number of wage earners per family and days employed per worker are highest where haciendas predominate. Where local residents own nearly all land in the community, most workers are employed part-time, averaging only 76 days per year, and about a third of employment is found outside the community.

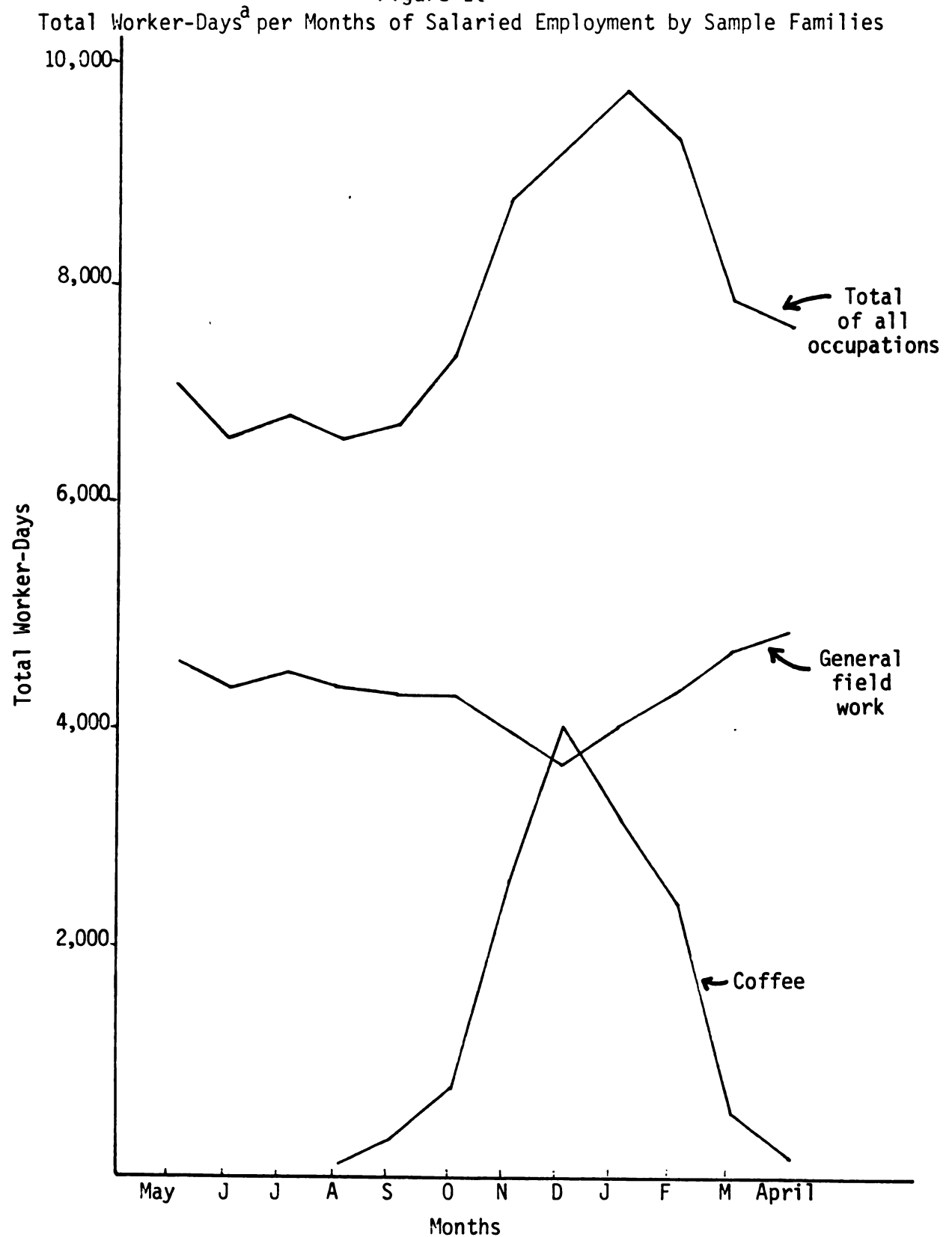
According to survey respondents, workers that migrate seasonally typically seek work in places most familiar to them, and they rely on information from friends and relatives. Haciendas also send trucks to some communities to recruit workers and transport them to job sites. This practice covers about one-third of all communities, mostly in an effort to draw workers from the western area toward jobs farther east during coffee harvest season. Frequently several family members migrate together.

Seasonality of Employment

The annual distribution of total worker-days in wage employment are given in Figure 15. The horizontal axis is arranged so that the year begins in May, which corresponds to the first planting of grains by small farmers. Persons supplying salaried labor in this season are mainly from families that do not have extensive home farm enterprises. Agricultural activity of small farmers reduces after harvests in August and September, because only about half the land area is planted in second period (October-December) as was planted in the first.

Coffee harvesting on haciendas begins in late October and peaks in December. In Figure 16 worker-days in coffee work are shown separately along with worker-days in general field work. Some workers switch from the latter to coffee harvesting since many can increase their earnings this way. But the bulk of the rise in worker-days in the peak months is from seasonal entrants, especially women. Work in coffee subsides in February, and the months of March and April offer little work on home farms and demand for labor off-farm is relatively low. However, total worker-days employed off-farm in these two months remains higher than

Figure 16



^aWorker-days of varying number of hours.

for the following months when grain crops are again being planted on small farms for the new year.

Time employed away from the community of residence also varies by season. From May through September, about 1000 of the 7000 worker-days involve employment away from the home community. As coffee work gets further advanced, the amount increases, until 2400 out of about 10,000 worker-days are away from the community in December. Still, a large portion of seasonal manpower utilized in coffee is supplied by local residents. It should be noted that labor supplied by migrants from other regions of Nicaragua were not counted in this survey.

About the same proportion of employed men and women migrate to seek work, which gives the migrant stream about the same distribution across the sexes as all workers. Age distribution shows migrants are slightly younger than other workers.

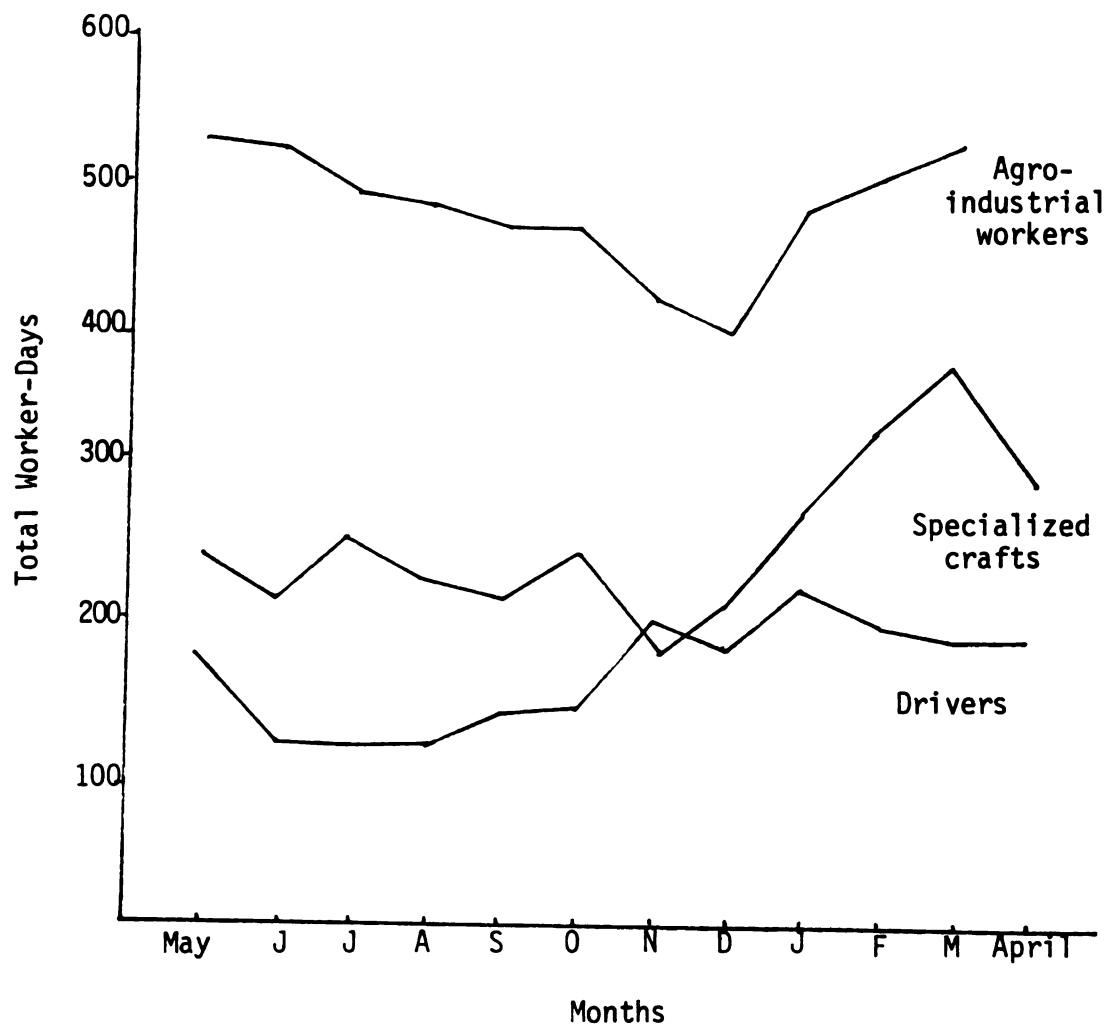
Figure 17 gives distributions of worker-days for other occupations that seem to be affected by season. Agro-industrial work and specialized crafts pick up in March and April, when alternative employment for wages and in home farm are lower. Crafts are mainly carpentry and construction, including masonry. Other trades such as forging tools for the next agricultural season are largely dominated by urban residents of municipal towns, and are, therefore, not included in the study. Work in transportation is low from June through October when rainfall makes many roads impassible.

Work Schedules and Remuneration

Table 35 shows average hours per day and days per week of work performed in each occupational category. Of the major occupations of rural

Figure 17

Total Worker-Days^a Supplied by Sample
Families in Selected Occupations



^aWorker-days of varying number of hours.

Table 35

Average Hours per Day and Days per Week by Occupation

Occupational Category	Total Number of Workers in Sample Households	Average Hours per Day of Work	Average Days per Week of Work
General field worker	305	8.24	6.0
Agro-industrial worker	28	8.47	6.0
Coffee picker	210	8.81	6.1
Cotton or sugar cane harvester	6	12.76	6.3
Cowboy or milk maid	17	10.40	6.9
Domestic helper or cook	32	10.72	6.8
Driver	12	9.26	6.1
Trade	4	10.95	6.3
Specialized crafts	22	7.99	5.7
Administrator	20	9.43	6.3

residents of the region, domestic workers, cooks and cowboys head the list in long hours and long work weeks. Drivers and administrators are next, followed by coffee workers, agro-industrial workers and specialized craftsmen. General field workers put in fewest hours and days, but they still average nearly 50 hours per week. All of the time reported as work on the job is not applied to work tasks directly, but nevertheless, is time taken away from other activities.

From Table 35 it appears that work schedules in many occupations are fairly rigid, implying that workers cannot actually adjust hours

worked according to marginal benefits received. An exception is coffee picking, where payment is based on quantity picked. Since physical stress in coffee picking is lower than in many other kinds of occupations, it comes as a surprise that hours worked per day are not longer on the average. Here, however, the variation from one worker to another is very great.

Wages can be stated on an hourly or daily basis to obtain comparisons among occupations. Hourly wage comes closest to measuring compensation per unit of time invested, i.e., per unit of time taken away from other activities. It would certainly be the more meaningful measurement in cases where hours worked per day vary greatly, at the discretion of the worker, such as among coffee pickers. But, for comparing occupations which have fairly rigid daily and weekly schedules, and that require different amounts of physical effort, such as field work versus tending livestock, the daily wage is more meaningful. Daily wage more nearly measures the total earning capacity of the worker in any given occupation, and it is felt that this would be considered more seriously by the worker, than an hourly average. Both hourly wage and wage per "normal" work day of each occupational category will be used here.

Net wage earnings include cash remuneration plus food provided by the employer, less transportation and other expenses directly connected with holding a job. Cash remuneration was found to decrease when food is provided. Value of food was 5.15 Córdoba per day which usually covers two meals, breakfast and lunch. No value was assigned to housing provided by the employer. This is prompted, not because costs to employers are necessarily low, but because the importance of housing to many rural people appears to be low.

Net wages per hour and per normal day of work in each occupation are shown in Table 36. Highest wages are found among drivers, administrators and specialized craftsmen. Cooks and domestic workers are at the lower end, both on an hourly basis and per normal work day, which is fairly long. General field workers average about 17 Córdobas per day, or 2.43 U.S. dollars. Coffee pickers make about a third more per hour than general field workers, and nearly 40 percent more per day, given slightly longer hours. Some occupations, notably cowboys, cooks and domestic helpers, work nearly seven days a week, which helps bring total earnings up somewhat relative to other job categories.

Nicaraguan minimum wage law¹ specifies a maximum eight-hour day for general field workers in the Central interior region, and an hourly wage of 1.80 Córdobas, plus food and housing. Adding average value of food of 5.15 Córdobas brings the minimum daily wage to 19.59, or 2.44 per hour. The actual average received by general field workers 17 years of age and older is only 2.15 per hour, or 17.71 for an average work day of 8½ hours.

No hourly rate is specified for domestic employees, only maximum hours per day of 14 and minimum wage per day of 6.58 Córdobas, plus food and housing. Again, adding the value of food would bring the daily rate to 11.73. Domestic employees currently receive more than this minimum (see Table 36), but cooks on haciendas which should come under the same category, earn less. The maximum wage of workers in agro-industry (mostly coffee processing plants) is 2.50 Córdobas per hour, nearly the same as their actual wage levels. It is not known just how well enforced

¹"Tabla de Salarios Minimos de Nicaragua," Ministry of Labor, May 9, 1977.

Table 36
Average Wage per 8-Hour Period and per Normal Work Day
(Córdobas)

Occupational Category	Hourly Wage	Wage per Normal Work Day
General field worker	2.10	17.07
Agro-industrial worker	2.51	20.42
Coffee picker	2.81	23.79
Cotton or sugar cane harvester	1.79	22.79
Cowboy or milk maid	1.83	19.01
Domestic helper	1.41	14.26
Cook	0.87	10.15
Driver	3.66	33.87
Trade	1.70	18.62
Specialized crafts	3.40	27.16
Administrator	3.13	29.53

the wage laws are in urban areas outside of the capital city of Managua, but it can be seen from the above that workers in urban areas--domestic employees and agro-industrial workers--are paid the minimum wage or higher, while others working in rural areas are paid well below this amount.

Wage differentials among areas (see Table 37) show wage levels of general field workers to be higher in the central area where more jobs are available on haciendas, and lower in the eastern frontier. This

Table 37
Average Wages of General Field Workers
(Córdobas per Eight-Hour Day)

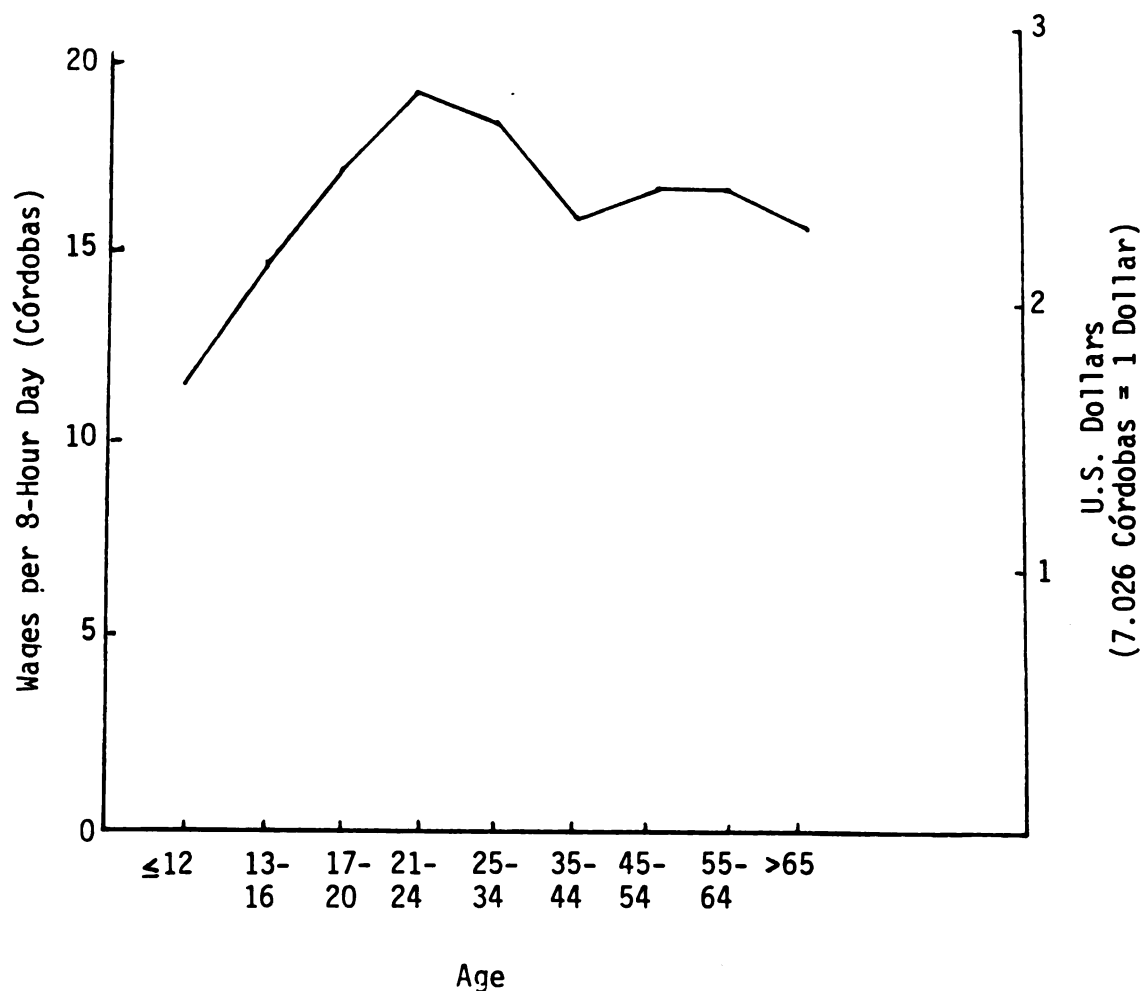
	-----Area-----		
	West	Central	East
Males	16.67	17.75	15.84
Females	9.70	12.48	12.00

result coincides with the availability of jobs noted earlier. Area differences are significant at the 3 percent level, however, they are not nearly as large as differences among occupational categories. Since access to urban centers is greater in the western area, more jobs in some of the higher paying occupations are available to rural people, so overall area differences in wage rates tend to become less significant.

Variations in wages of general field workers over age groups show that males from 21 to 34 years of age have the highest wages, averaging nearly 19 Córdobas per day (see Figure 18). As male workers get older, they tend to work less as general field workers, many getting better jobs as foremen or craftsmen. The mild tapering off of wages of general field workers with age could be caused by the less productive workers remaining in that occupation. Also, it should be noted that many of the younger workers receiving higher wages work for short periods, and frequently, far from home.

Figure 18

Wages of Male General Field Workers
per Eight-Hour Day by Age



Educational Attainment and Services

The overall societal importance of an adequate educational system was pointed out in Chapter II. Basic literacy is a prerequisite for effective participation in a modern society and increases labor productivity in all but the most rudimentary tasks. Individuals with low levels of education are at a disadvantage in complex market systems where crucial information appears in written form. Even learning and applying

new skills in agriculture, mechanics or crafts is restrained if written information cannot be interpreted, as many a farmer applying pesticides in less-developed countries has discovered.

In Nicaragua, levels of educational attainment of the rural population are extremely low, leaving the vast majority of the population, both young and old, without sufficient skills to be considered literate. Figure 19 shows that only 45 percent of persons 11 through 22 years of age had completed one year of schooling or more at the time of the survey. After 22 years, the rate drops abruptly to about 25 percent, and then gradually declines. These characteristics appear even more sharply in Figure 20 which shows that no age group had completed much more than two years of schooling on average. Again, the decrease from 21 to 22 year olds to the next older group is marked--from 2.26 down to 1.12 average years of schooling completed.

Figure 19

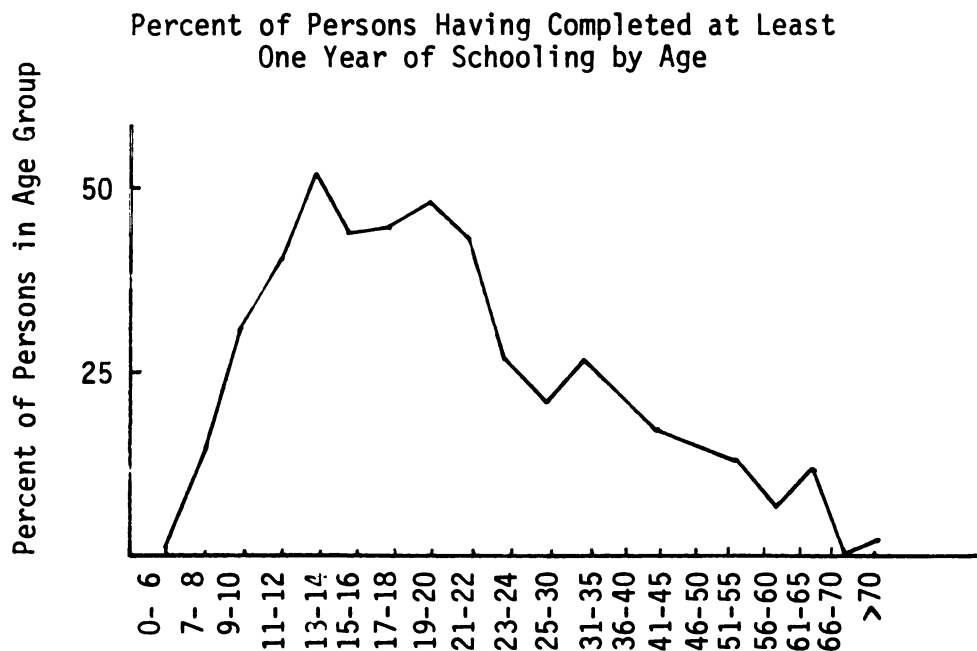
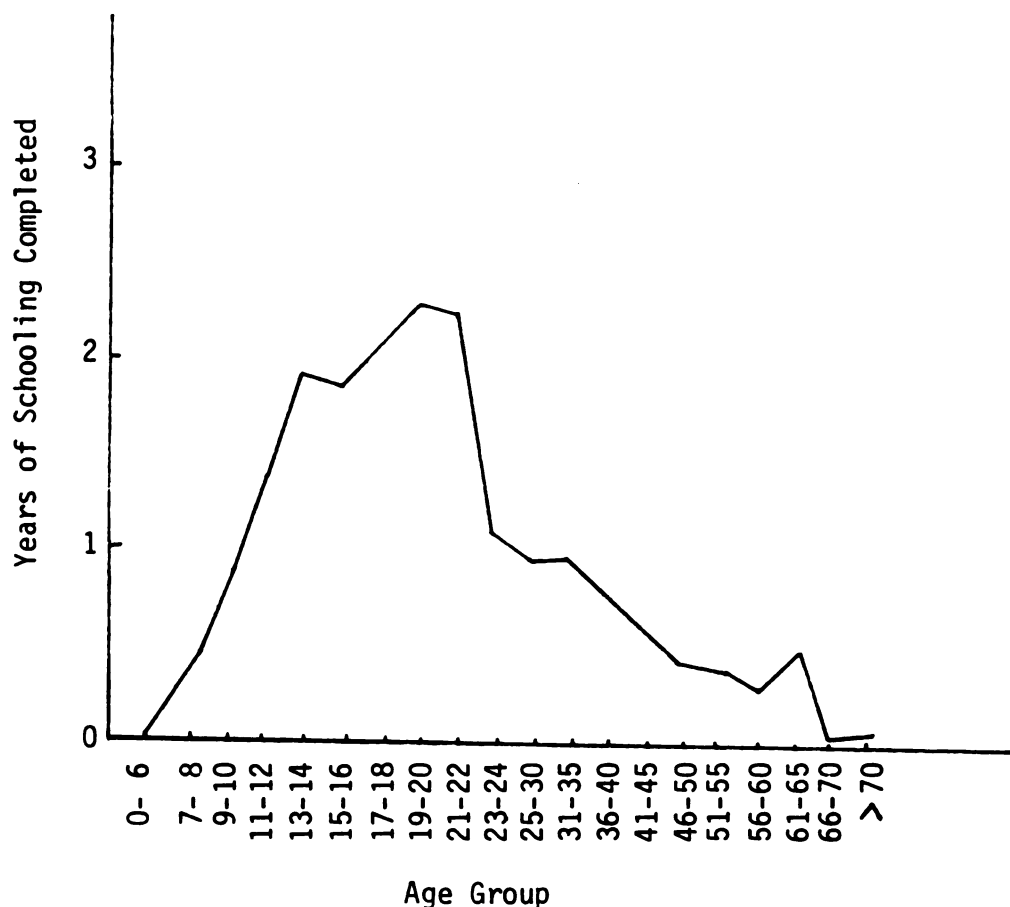


Figure 20

Average Years of Schooling Completed by Age

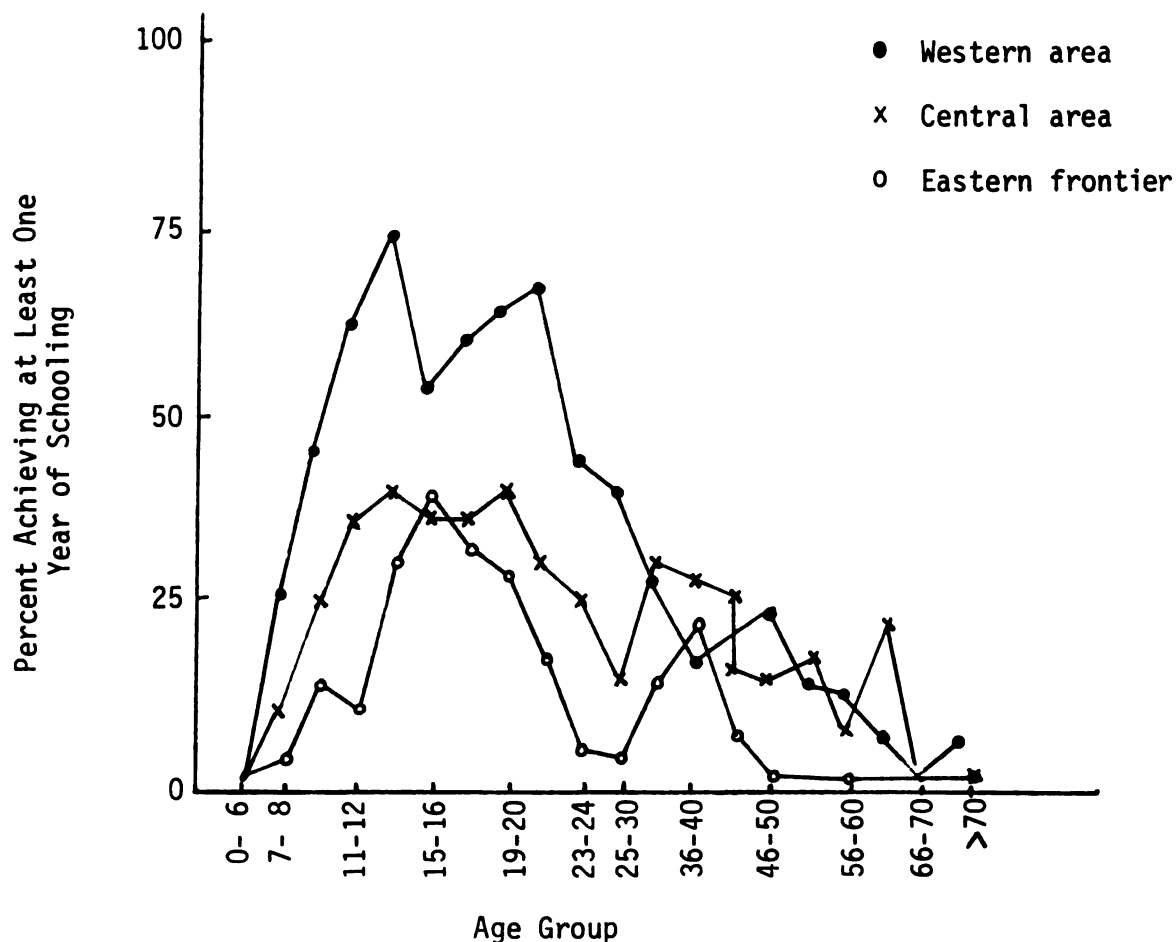


About 83 percent of household heads had not completed a single year of school. Though many households dwelling on haciendas have heads below 30 years of age, the educational level of these heads of household are lower than that of others. Only 5 of 52 heads residing on haciendas had some education (about 10 percent), whereas 52 of the remaining 279 family heads had completed at least one year of school (about 19 percent). When age level is considered, the difference is even greater.

Intraregional differences shown in Figure 21 indicate that educational attainment is greater in the western area, and is lowest in the

Figure 21

Percent of Persons Having Completed at Least One Year of School by Age and Location



eastern frontier. Undoubtedly, physical access and past guerilla activity hindered provision of educational services in eastern areas, and even in some parts of the central portion of the region a few years ago. But communities in the western portion seem to be, in general, more well defined, and better organized. This could allow them a greater voice in getting school services. Further, few people in the western areas live on haciendas because, in that area, haciendas are largely oriented toward raising cattle. Since school services are not offered on haciendas, and the distance to schools from hacienda dwellings is

often very long, attendance is lower in communities dominated by haciendas. Further, if all communities had one school at the geographical center, attendance in the eastern areas would still be lower. Households in communities of the agricultural frontier are both more in number and more dispersed. Families can be located ten kilometers, and several river crossings, from the "center" of the community. Few families allow their children to go more than 30 minutes from the house to the school.

The number of grade levels taught in each school varies from three to six (see Table 38). Both the western and central areas average the same, 4.4 grades per school, whereas the only school in the sample of six communities in the eastern frontier has three grades.

Table 38
Inhabitants per School in Each Area

Area	Number of Communities	Inhabitants	Number of Schools	Inhabitants per School
West	94	37,110	60	619
Central	54	52,422	32	1,638
East	6	7,417	1	7,417
Total	154	96,949	93	1,042

Source: Community Survey covering 40 percent of the population of the region, 1977.

Current rates of attendance are highest among persons 9 to 14 years of age (Figure 22). The reason for not starting earlier relates to problems in access and that many rural families believe children are not mature enough to attend school until they reach 8 or 9 years of age.

Female attendance rates are higher than male; 36 percent of males 7 to 15 attend, while 43 percent of females attend. Females also complete nearly a full month more each year of schooling than males. The school year begins in February, when agricultural and other work activities are at a low. Males lose some time to work later in the year. The main reasons for time lost, however, are illnesses and absence of the teacher (Table 39).

Figure 22
Rates of School Attendance by Age

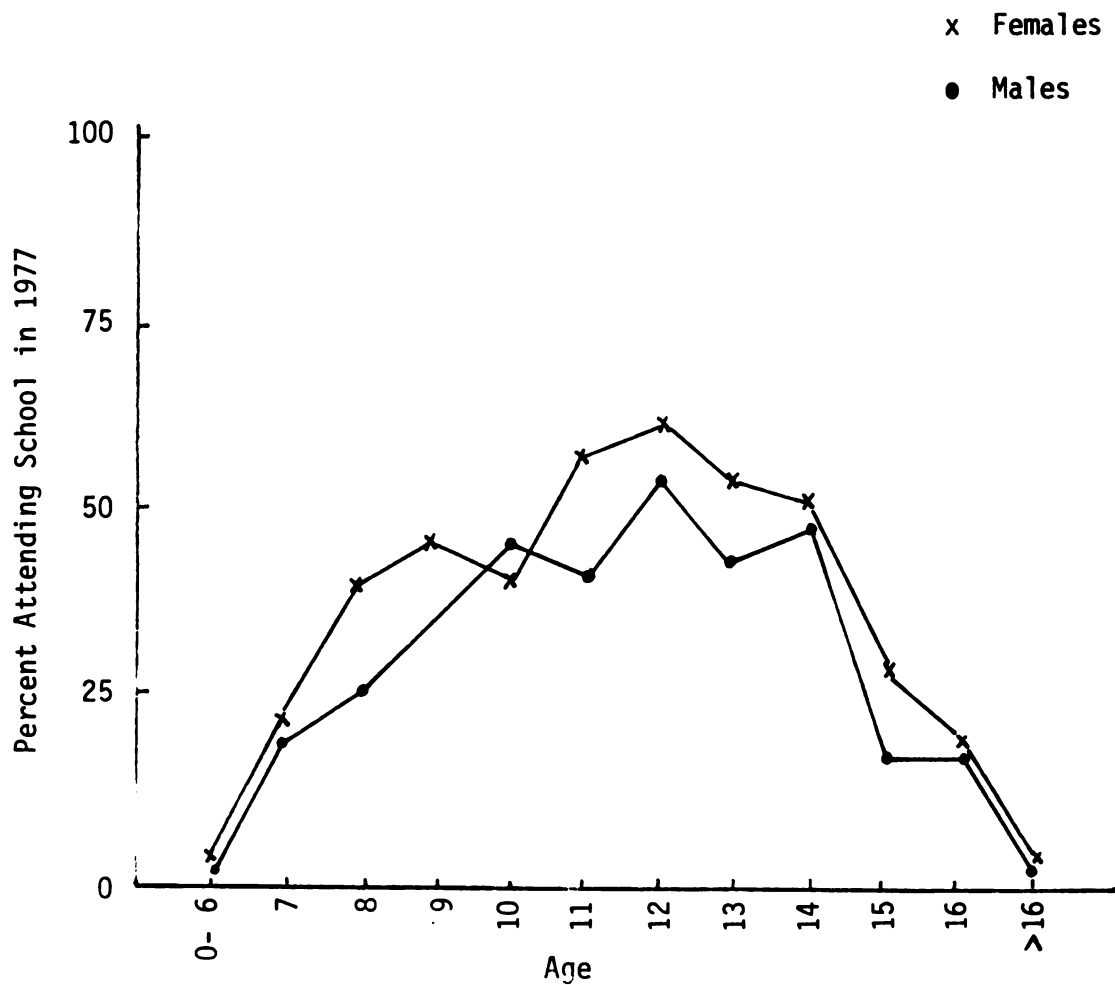


Table 39
Average Attendance per Student During the School Year
(Months)

	Registered as Student	-----Reasons for Non-Attendance ^a -----				Net months of Attendance
		Work	Ill	Teacher Absent	Other Reason	
Females	7.99	.08	.31	.21	.11	7.30
Males	7.35	.23	.34	.27	.19	6.36

^aReported by respondents in weeks, which were divided by four to obtain fractions of months.

If six years of age were used as the standard for beginning school, nearly all rural students would be behind. One main cause, according to respondents, is local service. Table 40 applies only to persons seven years of age and over who have begun their studies or will do so, thus indicating that some service is within the family's reach. From the first three entrees, it can be seen that problems with services account for 37 percent of students being behind. Again, this applies only to persons who have studied or plan to do so. Illness and work account for another 21 percent. Parents' decision to start the child later than six years old is the reason 26 percent are behind. Finally, 16 percent have had relatively uninterrupted attendance but failed to pass exams to reach the next grade level.

Parents' demand for education of their children is evident in a number of ways. One is the sacrifice made to send children to more distant schools when local services are inadequate. Of all students, 8

Table 40

Reasons for Not Being Farther Advanced in School--
Persons Over Six Years Old Who Will Continue
(or Begin) Their Studies

(Number of Times Reason Was Stated, One Reason per Child)

Reason	Number	Percent
There is (or was) no local school	61	21
Interrupted service	38	13
No room in local school	8	3
Illness	29	10
Work	33	11
Parents' decision to start child later	77	26
Attended, but failed to pass exams	47	16
Total	293	100

Source: Questionnaire "B" covering 176 sample families.

percent attend schools in towns or cities; which usually implies living temporarily away from home, sometimes at great cost. Additionally, several communities have built school buildings, but have not had a teacher assigned to work there. In one dramatic case, the building has remained unused from 1973 when it was completed, to the present, despite attempts by community leaders to have a teacher assigned there.

The influence of educational attainment is shown in the next section to be very great regarding wage levels.

Educational Attainment and Wage Rates

Table 41 indicates impacts of education on wages of all persons according to sex. Persons employed year-round are separated from all persons who hold jobs. Wages of men employed year-round rise nearly 37 percent when some formal schooling has been achieved, and those of women employed full-time rise by nearly 39 percent. With both sexes, effects of education on wages of persons seasonally employed are much lower. Especially among women, seasonal employment is likely to be in coffee harvesting, for which educational level would have no effect on productivity.

Table 41
Wages of Educational Attainment and Length
of Employment for Both Sexes
(Córdobas per Eight-Hour Day)

Sex	Employment Status	No Schooling	One or More Years of Schooling	Difference
Males	All Workers	18.38	22.82	4.44
	Employed >200 days/year	14.47	23.90	6.43
Females	All workers	13.69	14.58	0.89
	Employed >200 days/year	9.06	12.58	3.52

Table 42 demonstrates effects of schooling on wages of family heads. Again, completion of at least one year of schooling increases wages of males by about 40 percent. There seems to be no effect of educational attainment on wages of female family heads, which is due to the

Table 42

Average Wage of Household Heads by
Sex and Years of Schooling
(Córdobas per Eight-Hour Day)

Years of School Completed	Males	Females	Number of Family Heads
None	18.30	10.59	274
1 - 3	25.29	10.42	40
4 or more	26.08	---	17
Number of Family Heads	289	42	331

occupational categories available to them--domestic work and harvesting coffee. Given completion of one year of school, number of years of education seems to have little effect on wages of men. Possibly a minimum amount of schooling is sufficient to gain access to occupations with higher wage rates.

From Table 42 it is also apparent that few (only 17 percent) of family heads have achieved any education at all, and only 5 percent have achieved more than three years. Educational attainment of male and female heads is about the same when age is accounted for. Age is inversely related to years of education, and female heads average 9.1 years older than male heads. The reason for this is, of course, that many female heads were earlier married, and are now separated, divorced, or widowed. The following section briefly describes levels of income derived from wage earnings in comparison with other sources of income.

Importance of Wage Earnings

Participation rates in off-farm employment and amount of time working for wages suggest that wage earnings account for a large portion of income for rural households in the study region. As shown in Table 43, sample households averaged 8,776 Córdobas in net income per year, of which 5,674 Córdobas was derived from wage earnings. Agricultural and livestock enterprises account for an average of 2,887 Córdobas in annual income across all households of the region.

Table 43
Net Family Income by Source and Area
(Córdobas^a per Year)

Source of Income	-----Area-----			Total Region
	Western	Central	Eastern	
Crops	1213	2313	2682	1971
Livestock	601	348	2963	916
Other Family Enterprises	464	325	277	368
Wage Earning	5793	6411	3609	5674
Other & Transfers ^b	-76	-102	3	-73
Total	7864	9256	9460	8776

^aOne dollar equals 7.026 Córdobas.

^bTaxes, help given to or received from other households, etc.

There is considerable difference in sources of income among households in different areas. Income from farming is much higher in the eastern frontier and lowest in the western area. Wage earnings per household are highest in the central area and are relatively low in the eastern frontier. Only 23 percent of income in the western area comes from farming, while 74 percent is wage income. In the central area, households obtain nearly 29 percent of their income from farming and over 69 percent from wage earnings. In contrast, in the eastern area farming accounts for nearly 60 percent of income and wage earnings only 38 percent. The eastern area is where average family income from all sources is highest among sample households.

Per capita income in the western area is 153 U.S. dollars, compared to 200 and 186 dollars in the central and eastern areas, respectively. It is apparent that rural residents as a whole are on the bottom of the income scale in Nicaragua. GNP per capita in 1974 was 704 dollars and has been rising at a rate of 2.1 percent per year. Hence it may have been nearly 748 dollars per capita in 1977.

Summary

Levels of educational attainment and provision of schools in the study region are extremely low, with no age group averaging much more than two years of schooling and one school available to every 1,000 inhabitants. Still, the modest levels of education attained seem to have marked influence on occupations and wage levels of workers. Hence there is an understandable interest shown by rural families in the education of their children and an expressed regret in not having achieved more for themselves.

Over half of males between 11 and 70 years of age earned wage income during the year prior to the survey and nearly one in five females did so. General field work on haciendas is the principal source of employment, but work associated with coffee production accounts for more total worker-days in December, and is important from November through February. Coffee picking is the most frequent job of female workers, implying a preference for seasonal employment. For a large number of workers, coffee picking requires seasonal migration to the central area of the region. Workers residing in the western area are employed nearly 38 percent of work-days outside their community.

Work schedules are fairly rigid in many occupations, averaging between 50 and 70 hours per week. Cowboys, cooks and domestic helpers work long hours nearly seven days a week. Domestic workers and agro-industrial workers earn wages equal to minimums set by the government for the Central interior region, but cooks on haciendas and general field workers earn less. From this it appears that wages in urban places adhere to minimum wage laws whereas those in rural areas do not. Average wage of general field workers is 17.07 Córdobas per work-day of $8\frac{3}{4}$ hours. Other occupations requiring special skills such as administrator or driver have higher wages. Educational level appears to affect access to these occupations.

Finally it was shown that wage earnings account for nearly 65 percent of net family income for all sample households. In the eastern frontier this reduces to 38 percent. Per capita income is 179 U.S. dollars per year, an extremely low level compared to per capita GNP in Nicaragua and compared to costs of food and other necessities.

The next chapter develops a model of off-farm supply of labor which is based on the findings of the study up to this point. Chapter X draws conclusions and policy recommendations for planners and policy makers.

CHAPTER IX

ESTIMATION OF OFF-FARM LABOR SUPPLY

Chapter VII viewed the home farm as an enterprise that utilizes family labor measured in undifferentiated units. The focus was on average time utilized by male family members, as a function of variables of the home farm production function. In this chapter, the focus shifts to labor supply; here individual characteristics of family members become relevant to determining the value of time in off-farm employment. Variables from the home farm production function of Chapter VI are included to delineate alternatives available through the family enterprise, and an attempt will be made to account for community characteristics that indicate local opportunities for off-farm employment.

General Focus of the Model

In the analysis that follows, the labor market is separated into two segments in order to account for the special nature of work in coffee involving many seasonal entrants to the labor market. One segment covers all kinds of off-farm employment except coffee, and the other segment includes only work in coffee harvesting. In Chapter VII, it was seen that the amount of seasonal fluctuation in total off-farm work except for coffee was fairly small. But because work on home farms is the main alternative for use of time, a test of significance of three seasons of the year on time worked off-farm was done to determine if dealing with each season separately would improve results sufficiently

to justify the extra complication this would impose on the model. The three seasons defined for this purpose followed the agricultural year of small farmers--May through August, September through December, and January through April. It was found that season explained less than 1 percent of total variation of off-farm employment, though it was significant at the 2 percent level. Because of the very low explanatory power, it was decided to use the entire year as the accounting period.

Special emphasis is given to choice of occupation of the family head. This choice represents more than simply a decision of one family member. It reflects an orientation of the entire family toward alternative activities--farming or wage employment. Investments in productive assets and location of the residence are influenced by this decision. Over time, even formation of families and their make-up probably corresponds to the activities in which the head is involved. When the head works on an hacienda, especially as a full-time worker, other family members seem to get preferential access to jobs with the same employer.

The second group of family members includes wives and "independent" female members of the family as defined in Chapter V. The third group is made up of independent males, and finally all dependents are taken together. Dependents probably follow the activity patterns of older household members. In fact, this is probably the way respondents identified the dependency of people in their late teens. It is hoped that this grouping of household members reflects the structure of the family and the nature of intrafamily decision making, as opposed to regarding all adults of the same sex as being on equal footing.

The dependent variable of interest for occupation except for work in coffee harvesting is days worked off-farm. Days, rather than hours, is used because of the rigidities in work schedules of different occupations seen in the previous chapter. This procedure is based on the belief that wage rates compensate more for skills and physical effort than for total elapsed time during the day that the worker utilizes in the activity. The motivation for this is the observation that field workers who spend as few as six hours per day on the job are frequently exhausted by the end of this period, virtually unable to perform extra activities during the remaining hours available, whereas others, such as ranch foremen, cowboys and domestic workers, utilize long hours on the job. Interoccupational comparisons would be more consistent by considering that the time unit supplied is a work-day, the length of which being determined by the type of work, not by the individual's preferences for leisure and income. A disadvantage to this procedure arises in cases where a worker "moonlights," working a full day for wages and putting in extra hours on the home farm.

Payment for coffee harvesting is by quantity harvested, which is directly related to hours worked; therefore, hours worked are used as the measure of labor supplied rather than days. This procedure has the opposite disadvantage from that above. It fails to consider the total daily compensation that the worker achieves, especially when the worker has migrated far from home, and alternative uses of time are limited.

Each individual is regarded as a separate unit of analysis in order to account for differences in education and position in the family. No averaging over family members was done. The discussion now turns to the estimations of value of time in off-farm employment.

Estimated Value of Time Off-Farm

Wage rates were not reported for persons who did not work off-farm during the year. The opportunity cost of not working off-farm needed to be estimated, both on an hourly basis in the case of coffee harvesting and on a daily basis for all other occupations. Hall (19) assumes an error in measuring wages due in part to a transitory component. Thus use of the actual wage received as an independent variable would cause a bias. Though Hall does not elaborate, evidently the transitory nature of wages is linked to life cycle, with younger people receiving lower wages as they search for better jobs. In the Nicaraguan case, transitory nature of wages might be due to holding a job far from home, or to the season in which employment is held. Hence, Hall's strategy of using estimated wage rates even for employed persons was adopted.

The survey provided a profile of occupational experience for heads of household. If Wilfred Lewis (32) was correct, on-the-job training is more important than other types in Nicaragua for developing marketable skills, and previous history in high-paying occupations should correlate with wages. Sex, education, area and strata of community are the other variables originally included in the wage equation for heads of household. However, it was found that area and strata interact, with the effects of the latter being much stronger, so area was removed from the final equation. Also, occupational categories with few observations were grouped with others. Table 44 gives the final form used in the calculation of wage of family heads.

An indicative result of the equation was that education and occupational experience have separate effects on wage. They do not interact. This implies that workers with education are more productive in any

Table 44

Analysis of Variance Estimating Wage of Head of Household

	Córdobas per Day	F Statistic
Overall Mean	19.97	
Sex		
0 for male	.31	10.263
1 for female	-7.15	
Occupational Experience		
1 if specialized craftsman	8.15	
2 if driver, foreman or administrator	5.11	17.254
0 otherwise	-1.42	
Community Strata		
1 if no <u>haciendas</u> , all small landowners	-3.02	
2 if some <u>haciendas</u> , some small landowners	- .73	3.848
3 if some <u>haciendas</u> , some share- croppers and renters	- .02	
4 if all <u>haciendas</u> , no small farmers	1.97	
Education		
0 if no school completed	-1.06	22.398
1 if one year or more completed	5.20	
Number of Cases	171	
Total Sum of Squares	10,785	
Residual Sum of Squares	5,292	
R^2	.414	

given occupation. But generally, over the life of an individual those with superior educations would be expected to shift more easily away from general field work into occupations requiring different kinds of skills. The estimations shown in Table 44 may be affected by a two-way interaction between community strata with sex and with education. This implies that the sexes are paid differently in different community environments, and that returns to education also vary in different communities. Though it is felt that there is some logic to this, it was not pursued because of the relatively few family heads who are female, or who have completed a year of school. Because of this interaction, results shown in Table 44 should be regarded with some caution, but they do generally coincide with observed differences in wages reported in Chapter VIII.

Estimation of wages for family members other than the head of household is similar, except occupational experience could not be taken into account due to lack of data. Age is included in three categories, 9 to 12, 13 to 16, and 17 and older. Persons under 9 and over 70 are not included. Specifications using age and schooling separately encountered serious two-way interactions between these two variables, causing main effect to be of doubtful value. Investigation into effects of education on wages of different age groups showed that the interaction occurs only among older persons. Hence, age and education are combined into one variable. It can be seen in Table 45 that wage differential between adults with education and those without is 3.05 Córdobas per day. Strata of community also has a significant impact, but here, wages are highest in the third strata, rather than the fourth, a conflict with results obtained for family heads. The reasons for this

Table 45

Analysis of Variance Estimating Wage of Family Members
Other than Head of Household

	Córdobas per Day	F Statistic
Overall Mean Wage	17.13	
Sex		
0 for male	1.55	61.198
1 for female	-4.96	
Age-Schooling		
1 if 9 to 12 years old	-4.19	13.904
2 if 13 to 16 years old	-2.53	
3 if 17 or over, with no schooling completed	.44	
4 if 17 or over, with at least one year of school completed	3.49	
Community Strata		
1 if no <u>haciendas</u> , all small landowners	-4.62	5.682
2 if some <u>haciendas</u> , some small landowners	- .63	
3 if some <u>haciendas</u> , some renters and sharecroppers	1.83	
4 if all <u>haciendas</u> , no small farmers	.69	
Number of Cases	231	
Total Sum of Squares	9,683	
Residual Sum of Squares	5,051	
R^2	.340	

are unclear, since all former evidence has shown that demand for labor is highest where haciendas are most influential. Because of the doubt, a weighted average of the values shown in the table was used in computing predicted wage of persons in the last two strata.

Finally, hourly wage of coffee workers was estimated using only age and sex as explanatory variables. Since about half of coffee pickers leave their local community to work, community strata was not considered to be important. Overall level of explanation is lower than for previous estimations (see Table 46). It is worth noting that female coffee pickers earn nearly the same wage as males.

Table 46

Analysis of Variance Estimate of Hourly Wages of Coffee Pickers

	Córdobas per Hour	F Statistic
Overall Mean	2.85	
Sex		
0 for male	.10	2.356
1 for female	-.16	
Age		
1 if 9 to 12 years old	-.72	6.820
2 if 13 to 16 years old	-.22	
3 if 17 or older	.17	
Number of Cases	181	
Total Sum of Squares	212	
Residual Sum of Squares	179	
R^2	.102	

Off-Farm Labor Supply of Male Heads of Household

Characteristics that explain off-farm labor supply fall generally into four areas:

1. Socioeconomic factors related to the individual, his/her position in the family, and changes over the life cycle.
2. Wage levels and economic status or asset position.
3. Access to agricultural resources, and productivity of home farm agriculture.
4. Environmental characteristics related to the labor market.

Specification of the econometric model depends on which of these groups of characteristics is of most concern. For instance, if use of fertilizer and establishment of permanent crops, such as coffee, were of primary concern, only families that participate in farming would be included in the regression. However, regarding the decision to participate in farming as exogenously determined removes part of the influence of access to agricultural resources, especially land, which is the major concern mentioned in point number 3 above.

It was seen in Chapter II that studies designed to measure the impact of wage rates (including income effects) on labor supply usually select a group of individuals that are homogeneous with respect to many socioeconomic variables, such as sex, position in the family, age, etc. These studies have been nearly entirely limited to developed countries where families are much smaller. Focusing on the head and spouse encompasses most of the adult population. The household environment is more important in rural Latin America, where families are more extended, including many adults other than the head and spouse. The point made by Mincer (37), that a positive supply response for one individual does

not necessarily mean a positive overall supply response for the family, should be borne in mind.

The first regression includes all male heads of households (farm and non-farm) in order to measure impact of land ownership together with wage on employment. Land ownership includes usufruct of public land, and also land belonging to relatives which is occupied without charge. This total is divided by total worker-equivalents of male family members. Schooling, represented by a 0,1 variable is included, based on the belief that formal education may represent an investment by the family with the intention of orienting labor force participation more in the direction of wage employment, and especially toward occupations with higher salaries. Age is included to represent changes over the life cycle, which relate to the family's decision to remain in farming, or leave farming over time. In Chapter VI, it was seen that land ownership and age are positively correlated. Finally, days worked in coffee was included to account for substitution of work in other occupations for coffee picking, which usually implies higher wages.

The first column of Table 47 shows the results of this formulation of the model. All coefficients are highly significant, being at least twice as large as their standard errors, except for days worked in coffee. Evidently, either male family heads that are employed have steady jobs that prevent shifting to other activities temporarily, or perhaps they are unwilling to participate in migrant types of employment. Other variables dropped from the model because of lack of significance are the square of age, and interaction of age with education.

A surprising result is that land ownership does not seem to have a large impact on decisions of household heads to utilize labor off-farm.

Table 47
Off-Farm Labor of Male Heads of Household
for Farm and Non-Farm Families

	All Families	Farm Families	Non-Farm Families
Dependent Variable:	(Mean and Standard Deviation)		
Days Worked Off-Farm	123.32 (126.42)	90.89 (116.32)	245.60 (78.59)
Independent Variable:	(Coefficient and Standard Error)		
Land owned or occupied free per male worker- equivalent	-1.23 (.40)	-1.02 (.39)	
Schooling (0,1)	-162.84 (22.56)	-186.84 (26.63)	-13.82 (33.79)
Age (years)	-1.74 (.50)	-1.31 (.55)	13.67 (5.76)
Age squared			-.17 (.07)
Opportunity wage (Córdobas)	21.07 (2.05)	23.23 (2.75)	4.02 (3.14)
Days in picking coffee	-.03 (.24)	-.00 (.25)	-.52 (.42)
Fertilizer per <u>manzana</u> (pounds)		-.22 (.11)	
<u>Manzanas</u> in coffee		-13.29 (5.61)	
Central area (0,1)		15.87 (15.19)	
Eastern frontier (0,1)		33.31 (18.60)	
<u>Hacienda</u> location (0,1)			28.63 (22.98)
Constant	-201.00 (45.10)	-276.46 (56.93)	-100.11 (130.43)
Number of Cases	269	211	50
R ²	.36	.37	.25

One reason for this low response is undoubtedly the large number of families that own little or no land, but rent or sharecrop, thus occupying their time on home farm agriculture. Also households with larger amounts of land cultivate a smaller percentage of their holdings and shift to cattle raising. As age increases labor supplied by male family heads diminishes by nearly two days every year. It should be noted here that persons over 70 years of age are not included in the regressions.

Opportunity wage is estimated from individual characteristics, including educational attainment. Although multicollinearity among these variables is inevitable, the magnitudes of the standard errors of the coefficients do not seem to have been greatly affected. The very large negative impact of education on off-farm labor supply, while opportunity wage has a very large positive impact, comes as a surprise. The model was run without the inclusion of schooling in order to test the validity of this finding. The result was that the coefficient of opportunity wage reduced to about half the value shown in the table, and remained highly significant. When wage is dropped from the equation, effects of schooling are near zero (actually positive but insignificant). It appears that, for this sample, schooling does indeed positively affect wages, causing labor supply to increase, while simultaneously diminishing the tendency to work off-farm.

However, extending this result over the entire population, especially through time, would be ill-advised. There are facets of the educational system that might make schools more readily available to families involved in farming. Since few family heads have completed any schooling, and the relationship between education and occupation over the life cycle remains unclear, care should be taken with the coefficient shown.

The variable is left in the equations, however, because it is thought that the coefficient of opportunity wage is more reliable when effects of education are separately included in the model. A one Córdoba increase in wage indicates a very large increment of 21 days working off-farm. Most of this effect is due to the fact that persons having higher-paying occupations work in occupations requiring full-time, year-round participation. Wage is picking up the effects of other variables not included in the model, which relate to the nature of the labor market, and the nature of the commitment made by workers in certain occupations.

Regressions similar to that in the first column of Table 47 were run for each strata of communities described in Chapter V. It was expected that availability of jobs, and of land, would have a separate influence on time allocation of family heads, in addition to the effect of the community environment through its impact on wages. Surprisingly, this turned out not to be the case; the variables mentioned above had about the same impacts in each community environment, even though average time worked off-farm varied greatly from one strata to another. The implications of this result run counter to expectations of Nicaraguan planners that the hacienda system exerts some systematic coercive control over rural people beyond ownership of the majority of productive resources. Certainly, the choices open to many families are very limited, but families would appear to be capable of making independent decisions given their alternatives. Results of these regressions are not shown, because of the repetition with the first equation shown above.

The second column of Table 47 applies only to households participating in farming. The distinction between a farm family and non-farm

family is small in Nicaragua, because many families that farm do so on rented or sharecropped land, and can therefore enter and exit from this activity fairly easily. For many households farming is a casual activity, involving only a small amount of labor and virtually no purchased inputs. For households that own larger amounts of land, area cultivated does not seem to depend so much on availability of suitable land, but on the decision of the household of how much to devote to different uses. Hence, as in the previous chapter, area planted is considered to be endogenously determined as a function of resource availability. For farm families, technology applied is indicated by fertilizer per manzana planted, and area planted to coffee. The negative impacts of these two variables on off-farm labor supply are of the same order of magnitude and significance level as their positive impact on labor utilization on-farm, though here, only use of time of the head of household is considered. Location in the central area where wages are slightly higher and more work is generally available has a slightly positive, though not significant, effect on off-farm work of the household head. Curiously, location in the agricultural frontier has a positive impact, and the coefficient is significant. This result should be taken with some caution, however, since heads of household tend to be younger in the frontier area, and younger heads tend to work more off-farm.

The third column of the table contains results for the relatively few families that do not participate in farming at all. Average number of days worked off-farm by heads of these households is 246, roughly a full year of work after accounting for Sundays, holidays, and illnesses. This large and fairly consistent number of days worked seems to be responsible for the insignificant adjustment to differences in education

and wage. Apparently, families that have on-farm alternatives for their time are more responsive to wage changes than those with no farming activities. Many that do not farm are located on haciendas, implying more steady employment. Days used in picking coffee tend to come at the expense of work performed in other off-farm occupations, probably because nearly all heads of non-farm families work full-time. Life cycle patterns of heads of non-farm families also appear to be different, with number of days worked off-farm first increasing, peaking at about 39 years old, then decreasing.

Figure 23 shows the results of regression estimations of days supplied off-farm with age of head, using the linear form with heads of farm families, and the quadratic form with non-farm family heads. Again the age squared term for heads of farm families was very small and statistically insignificant. Referring to non-farm families, some of the younger heads may perhaps desire to work full-time, but have not yet found steady jobs.

Not fully reflected in the above is the decision to participate in farming or wage employment over the life cycle, especially among families that own no land. Household heads with some schooling seek full-time employment as age increases, while heads with no education seem to prefer farming. Figure 24 is not drawn from regression results, but from tabulations of data for households that own no land. It shows percent of household heads (of both sexes) working 200 days or more off-farm by educational attainment. Note that no heads of sample households over 60 years of age have completed a year of schooling. Hence, no data is available for the last two age categories.

Figure 23

Estimated Off-Farm Labor Supply of Male Heads of Household
by Age, for Farm and Non-Farm Families
(All Occupations Except Coffee Picking)

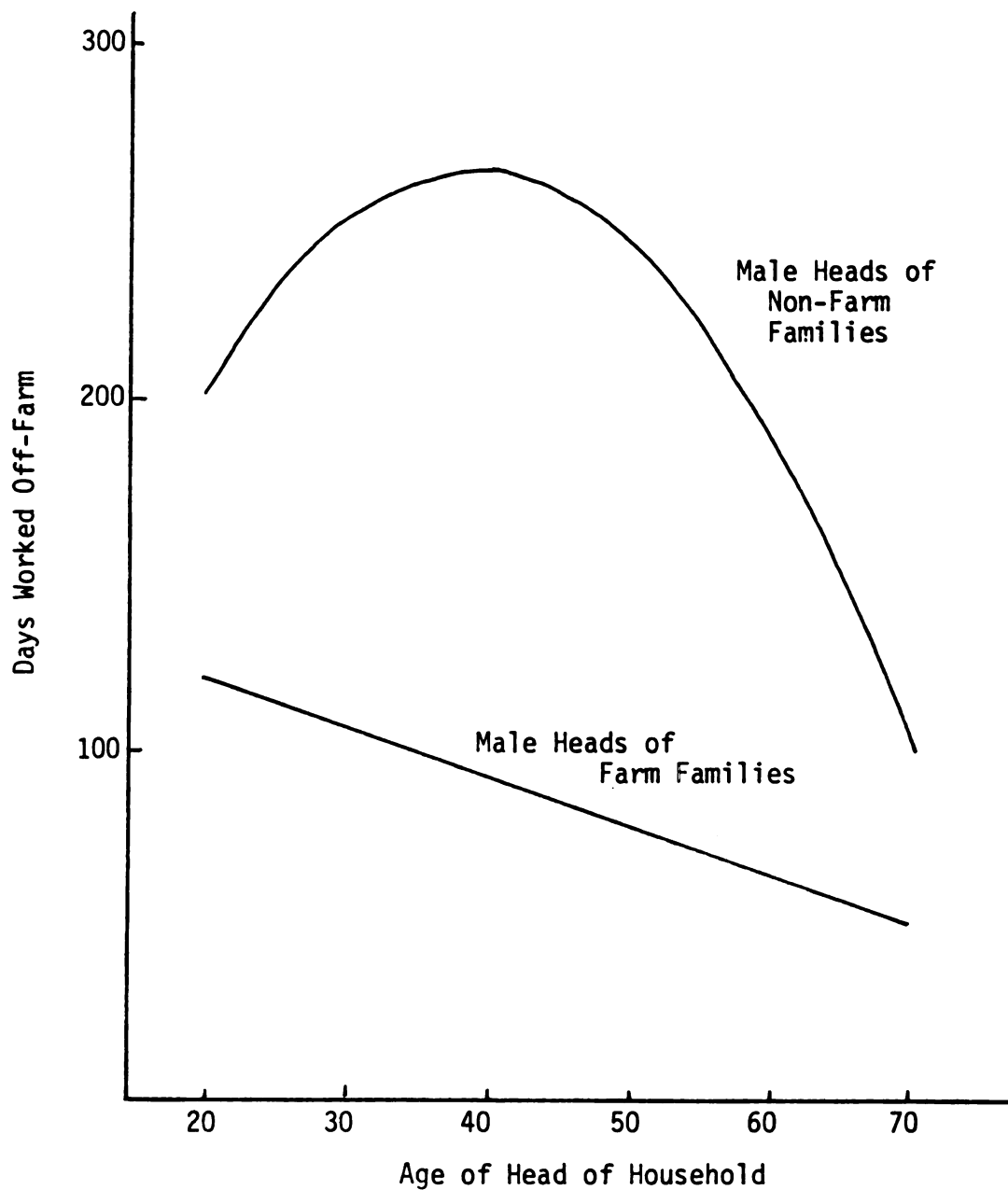
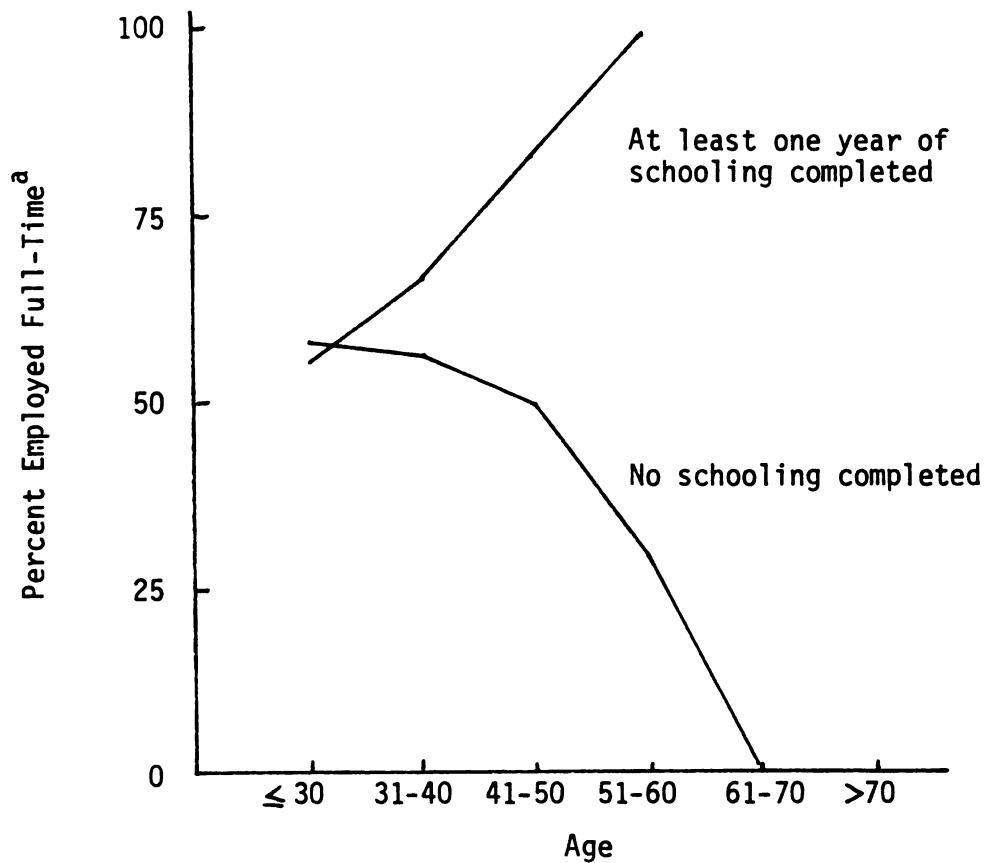


Figure 24

Participation Rates of Heads of Household in Full-Time
Employment^a for Households that Own No Land
by Age and Educational Attainment



^aFull-time employment is arbitrarily defined as working 200 days or more off-farm per year.

A further categorization was done based on land ownership and farming activity for the purpose of more carefully examining the impacts of access to land, agricultural technology, and wages on labor supply among different groups of families. First, families that own no land were divided between those that farm and those that do not. Then

among those that own land, an arbitrary line was drawn between families that own up to nine manzanas and those that own more than nine. Families with larger amounts of land would be expected to utilize more time on home farm agriculture. Their off-farm labor supply response to increased amounts of land, and to technology, would be expected to be lower than for groups with fewer resources. Conversely, response to wages among heads of families that have less land would be expected to be lower, because they would work off-farm, even if their wage rate was low.

It is important to recognize that total land owned by the family is used to categorize families, while land owned or occupied free per male worker-equivalent is included as an independent variable. As always, usufruct of public land is regarded for these purposes as if it were owned outright. In addition, there are 69 families (27 percent of farm families) that utilize land that is temporarily loaned to them, usually by relatives and sometimes by hacienda owners. Land occupied by the family without charge does not enter the criteria upon which families are categorized, but does enter the independent variable as an indication of access to land resources. In the category of families that farm, but that own no land, the "land" variable consists entirely of land occupied without charge.

The results of the estimation, found in Table 48, indicate the greater marginal impact of access to land among farm families that own smaller amounts. The point made earlier that the relationship between off-farm labor supply to land ownership is not linear over the entire range appears to be of considerable importance. It should be noted that

Table 48
Off-Farm Labor Supply of Male Heads of Household
for Farm and Non-Farm Families by Land Tenure

Land Owned (<u>manzanas</u>)	0	0	0.1-9	>9
Participation in Farming	No	Yes	Yes	Yes ^a
(Mean and Standard Deviation)				
<u>Dependent Variable:</u>				
Days of off-farm work	245.60 (78.59)	153.91 (126.55)	82.51 (103.90)	35.20 (91.07)
<u>Independent Variables:</u>				
(Coefficient and Standard Error)				
Land owned or occupied free per male worker-equivalent (<u>manzanas</u>)		-10.50 (8.96)	-5.91 (6.01)	-.20 (.42)
Schooling (0,1)	-17.81 (33.82)	-137.61 (47.20)	-166.52 (36.63)	-146.78 (75.12)
Age (years)	14.20 (5.77)	10.38 (8.66)	1.81 (4.80)	-3.64 (6.64)
Age squared	-.18 (.07)	-.14 (.11)	-.04 (.05)	.04 (.07)
Opportunity wage (Córdobas)	4.55 (3.13)	16.66 (3.90)	16.97 (3.93)	22.09 (7.06)
Fertilizer per manzana planted (pounds)		-.52 (.26)	-.26 (.17)	.07 (.18)
<u>Manzanas</u> established in coffee		-83.76 (60.95)	-10.61 (11.33)	-4.97 (5.87)
<u>Hacienda</u> location (0,1)	26.38 (23.04)			
Constant	-125.71 (129.49)	-317.23 (177.65)	-196.95 (134.93)	-274.55 (213.24)
Number of Cases	50	76	88	55
R ²	.227	.341	.315	.324

^aIncluding six families that do not cultivate land, but are involved in raising cattle.

coefficients in these regressions, especially of the "land" variable cannot be expected to show a great deal of significance, because the categorization of families has limited the range of values taken by the independent variable. The variation in labor supply is "explained" by the categories to great extent, hence, significance of other coefficients can be affected as well. The value of this formulation is in comparing changes in general magnitudes and significance levels across categories.

The coefficient associated with access to land among farm families that do not own land (second column of Table 48) bears some relation to the effects of costs of accessing land in other manners--renting or sharecropping. If one could be sure that the model was completely well-specified, especially that no important factors were left out, the interpretation of the coefficient would signify impact of land costs on marginal returns to home farm agriculture, in comparison to off-farm employment opportunities. That is, if two landless families with male heads of the same age participate in farming, but one receives land free while the other rents or sharecrops, the one receiving land free would be expected to work off-farm ten days less for every manzana utilized than the one that pays for use of land. It would be expected that much of this impact would come through sharecropping because of lower marginal returns of home farm labor to the tenant. Since only male family heads are considered here, the total impact of making an additional manzana available to a family would be obtained by adding coefficients of other family members.

Life cycle patterns of off-farm employment are less important as one moves across Table 48 from left to right. Age has very little effect

in the latter two categories where households own land. Among all farm families, most of the negative effect of age noted earlier comes from the landless farm family group. Life cycle patterns appear to be quite similar between the first two groups, which are made up of landless families. But again, this does not account for the farm/wage employment decision made over the life cycle as demonstrated earlier. Note that education has a large (negative) impact among all farm families, even those that do not own land. Supply response is greatest among heads of families that own more than nine manzanas. As far as this group of family members goes, there seems to be little indication of a backward bending supply curve, even among households with more accumulated wealth.

Finally, technology applied in home farm agriculture seems to have much more influence on off-farm employment when land holdings are small. Though the production response to fertilizer may be greater where land is not as constraining, there are reasons why time allocation of farm family members might change more in smaller farms. Families with limited farm operations perform most labor activities on their farms, hiring workers only in peak seasons, and then for only a few days. On larger farms, however, a greater portion of labor requirements are filled by hired persons; hence, the adjustment to changes in farm productivity might be more in the form of demands for hired labor than in the form of labor supplied off-farm. This is, indeed, the prediction of theory as discussed in Chapter II, but classical economic theory does not allow for families that both supply off-farm labor and also hire labor at the same time, which is common in many farm families in Nicaragua and other less-developed countries. Another factor that may be influential is that households with more land move to raising

livestock. Use of more fertilizer may mean planting less land, perhaps placing less productive plots in pasture, in order to adjust farm labor requirements to family labor availability and to entrepreneurial capacity. And of course, there is the possibility that more wealthy families prefer to work less, so that as the "consumption possibilities curve" gets higher, at a given slope (wage rate), willingness to transfer leisure into increased income decreases. This is the relationship hypothesized by Mellor (36) and observed by Hart (22) in Java, but extreme care should be taken in transferring this notion to the Latin American situation. Unfortunately, data is not available on all uses of time of all household members to test this hypothesis for the Nicaraguan case.

Labor supply of other adult males will be the subject of the next section, before turning to female family heads, and then spouses and other adult females.

Male Family Members Other than Heads of Household

This section is concerned with estimating off-farm labor supply of males 17 years of age and older who are not heads of households. Some of the individuals included are mature adults, who may or may not be married, while others are younger, in the early stages of their adult life. As described in Chapter V, respondents to the questionnaire indicated whether or not they regarded younger family members as being dependent, as a child is dependent upon parents for support, or whether the person is independent, implying that the individual may exercise rights to make separate decisions over the use of his time and of earnings. In this analysis, persons 21 years of age and over are considered to be independent.

The incentives seen by adult males who are not heads of households may not be the same as for heads. Whereas the head may place a high value on increased consumption for the family in general, independent persons living with the family might be expected to value personal consumption higher in relation to that of the remaining family members. Thus the valuation of marginal product from home farm agriculture would be lower for non-heads than for heads. But if working off-farm, earnings are received directly, increasing control of the individual over consumption decisions.

Because of the significance of the grouping used in the previous section, adult males who are not heads of households were grouped in the same fashion. This, again, has the effect of reducing the significance of many coefficients from what they would be if all families were considered as a single group. Also, the small number of observations in some groups affects reliability of results.

Results in Table 49 are comparable to those displayed for family heads in Table 47, except the first equation covering farm and non-farm families together was not run because interpretations of results from that formulation seem of less importance. Age was excluded from the equation for farm families because age distribution of persons represented in Table 49 is highly concentrated in the 17 to 34 age group, and age was found not to be significant in earlier regressions for farm families. The variable denoting dependency and age are correlated with a coefficient of $-.52$. Hence dependency picks up some of the effect of age when it, the latter, is excluded. When age is included, a great deal of weight is placed on the few observations of males over 35 years of age in determining the magnitude and sign of the regression

Table 49

Off-Farm Labor Supply of Adult Males Other than Heads of Household
for Farm and Non-Farm Families

	Non-Farm Families	Farm Families
<u>Dependent Variable:</u>	(Mean and Standard Deviation)	
Days worked off-farm	200.71 (120.09)	86.21 (112.18)
<u>Independent Variable:</u>	(Coefficient and Standard Error)	
Land owned or occupied free per male worker-equivalent (<u>manzanas</u>)		-.66 (.43)
Schooling (0,1)	-247.17 (82.13)	-74.24 (22.03)
Dependent (0,1)	-64.23 (54.55)	-7.26 (15.71)
Age (years)	-18.55 (26.93)	
Age squared	.23 (.46)	
Opportunity wage (Córdobas)	51.15 (21.51)	17.15 (4.03)
Fertilizer per <u>manzana</u> planted		-.32 (.15)
<u>Manzanas</u> established in coffee		-10.44 (4.30)
Central area (0,1)		33.94 (17.19)
Eastern frontier (0,1)		14.09 (23.14)
<u>Hacienda</u> location (0,1)	-3.29 (57.81)	
Constant	-439.15 (596.87)	-213.82 (74.21)
Number of Cases	38	196
R ²	.31	.21

coefficient. The interest in variations with age is limited in any case, since the life cycle pattern of the individual is not fully represented. Unlike heads of household that usually remain in that position with respect to other family members for a long period, the presence of other males in a particular household is, in a great many cases, a temporary arrangement.

Among families that do not participate in farming, the overall average of days worked in wage employment by males who are not heads of household is 201 days, compared to male heads who work an average of 246 days off-farm. For farm families, non-heads work 86 days and heads of farm families work an average of 90 days off-farm. These results alone seem to refute the hypothesis advanced above that incentives within the family structure cause persons in different positions to alter their time allocation to farm and off-farm activities. Note that the coefficient of the variable for dependency is not significant in either case.

Looking at the labor supply response of male non-heads to wage shows a result among non-farm families different from that obtained for heads of household. Earlier it appeared that heads of non-farm families did not adjust labor supply very much to wage, but here the response of other males living in these families is apparently very great. This may indicate that, while heads of household need to work full-time to support the family, whether wage is high or low, other males in the household have greater choice over the use of time. This statement is made only as a speculation, and not as a direct interpretation of the results given the small sample size upon which the first equation in Table 49 is based.

Among farm families, impacts of land availability, use of fertilizers and establishment of coffee are about the same as for heads of household, and are highly significant. A fairly large and significant coefficient is also observed for location in the central area where coffee growing on haciendas generally provides more jobs. For further interpretation of impacts of land and technology on home farms, a breakdown by land ownership is given in Table 50.

A comparison of overall average days worked off-farm by non-heads in Table 50 with averages for heads of household in Table 48 reveals that non-heads work off-farm less than heads in the first two categories where households are landless, and more than heads in the last two categories where households own land. However, age of head gets higher as one moves across the table from left to right, affecting time worked off-farm by heads of household, and the ratio of dependents to independents also varies. Curiously, the sign of the dummy variable indicating dependency reverses in the group of families that are landless farmers, indicating that people who are dependents of the head work off-farm more than those who are independent. Again, sample size sheds some doubt on results.

Availability of land, use of fertilizer, and area established in coffee seem to have about the same effects on off-farm labor supply for these adult males as they do on male heads of household. The significance of these variables is not generally as high as for family heads, however, indicating that the decisions of heads of household are, perhaps, more closely tied to family resources and technology.

The general implication of most of the results is that male members of a given household do not specialize (some working on-farm while others

Table 50

Off-Farm Labor Supply of Adult Males Other than
Heads of Household for Farm and Non-Farm Families by Land Tenure

Land Owned (<u>manzanas</u>)	0	0	0.1-9	> 9
Participation in Farming	No	Yes	Yes	Yes ^a
<u>Dependent Variable:</u>	(Mean and Standard Deviation)			
Days of off-farm work	200.71 (120.09)	112.35 (120.07)	106.65 (114.32)	40.50 (89.34)
<u>Independent Variables:</u>	(Coefficient and Standard Error)			
Land owned or occupied free per male worker-equivalent (<u>manzanas</u>)		-18.83 (58.29)	-26.81 (11.26)	-.34 (.37)
Schooling (0,1)	-234.20 (80.39)	-44.12 (51.25)	-75.21 (34.06)	-61.95 (33.20)
Dependent ^b (0,1)	-15.98 (41.02)	94.70 (40.57)	-30.14 (23.82)	-29.61 (23.12)
Opportunity wage	48.11 (21.14)	7.30 (9.49)	16.07 (6.18)	11.97 (6.29)
Fertilizer per <u>manzana</u> planted		-.55 (.36)	-.10 (.30)	-.03 (.18)
<u>Manzanas</u> established in coffee			-8.44 (14.99)	-5.71 (3.85)
<u>Hacienda</u> location (0,1)	-27.26 (56.28)			
Constant	-693.76 (413.51)	-35.16 (170.74)	-140.18 (116.00)	-132.69 (113.28)
Number of Cases	38	40	92	64
R ²	.26	.26	.23	.17

^aIncluding six families that do not cultivate, but are involved in raising cattle.

^b"Dependent" indicates that the person is considered to depend on parents or other adults for support, and is under 21 years of age.

work off), but instead that they all follow about the same pattern of employment. This seems to hold when heads of household are compared with "independent" males, and when the latter are compared with dependents, despite the fact that dependents are usually much younger.

Just as this result was not expected for independent members of the family, it is the predicted result for younger, dependent members. That is, dependent children 16 years of age or less would be expected to be under the control of their parents, and follow closely to the kinds of activities in which the head of the household is involved. Hence, days worked in wage employment by the head of household and area planted are considered to be the two major factors that would explain allocation of time of male children. Age and opportunity wage are positively correlated, but both would be expected to have direct impacts on time spent off-farm. Total land owned is included in the equation shown in Table 51 to provide an indicator of total family assets, similar to the categorization of families shown previously. Based on what was seen in relation to older males, it is not surprising that results of this formulation conform fairly closely to what was expected. Number of days worked off-farm is surprisingly high for this young group of people, at 40 days per year. The number of days increases by 11 with each additional year of age. Work pattern corresponds to the employment activity of the head, indicated by the significant positive coefficient associated with days worked off-farm by the head of household and by the negative relationship of off-farm work with area planted.

More detail is not given here for children because their overall contribution to labor supply is a fairly small part of the total, though

Table 51
Off-Farm Labor Supply of Male Children,
9 to 16 Years of Age

All Families	
(Mean and Standard Deviation)	
<u>Dependent Variable:</u>	
Days worked off-farm	40.42 (87.84)
<u>Independent Variables:</u>	
(Coefficient and Standard Error)	
Land owned (<u>manzanas</u>)	.06 (.17)
Age (years)	11.02 (2.34)
Opportunity wage (Córdobas)	3.43 (2.85)
Days worked off-farm by family head	.19 (.04)
Area planted (<u>manzanas</u>)	-4.76 (1.40)
Constant	-141.96 (37.74)
Number of Cases	246
R^2	.28

it is not as small as previously thought. It is apparent that a more close inspection would give results similar to what has been observed among other males. The next sections turn to off-farm labor supply of females, beginning with females who are heads of households.

Female Heads of Households

There are several differences expected in the labor supply behavior of females compared to males that make it necessary to deal with these two groups separately. First, given the difficulties of field work and customs in rural Nicaragua, work in home farm agriculture is not a use of time common to large numbers of females. Hence, amount of land owned and agricultural technology would have little direct impact on the decision of women to work off-farm versus on-farm. Second, the importance of child raising to women in earlier ages would seem to affect their labor market behavior in opposite ways than the male by increasing the comparative productivity of the female in the home, compared to other activities. However, when children get older and are able to perform housekeeping functions, the comparative advantage of older women might shift back toward work activities away from home. Thirdly, if traditional roles of women as child-bearers and housekeepers keep females from participating in activities outside the home, then level of family income would have greater effects on activities of females than of males. Females would be expected to work off-farm (or even on-farm) only in cases of great need. For many households in rural Nicaragua this implies keeping levels of consumption up to minimums needed for survival.

There is, however, an additional alternative use of time that involves mostly females; this refers to non-agricultural enterprises in the home. These are highly varied in nature, with nearly half the enterprises consisting of small stores. Others are cantinas, small restaurants, sewing and washing clothes. More than one family in four

have such activities, which are usually based in the home, and nearly always are operated by female members.

There are 42 sample households headed by females; they vary greatly with respect to composition of the family, assets, and economic activities. Age distribution of female heads averages higher than male heads. Some families are headed by an older female who owns the land operated by the family, but there is a younger male present, usually her son, that supplies most labor for field work. There are a few female heads of household who are very young. On the whole, households with female heads own less land than those with male heads. Because of these variations, sweeping generalities about the relative productivity of females in and out of the home must be regarded with considerable caution.

Because of the size of the sample, all female heads of household were included in a single regression. Many important comparisons among groups are lost in this process, thus interpretation of results is more hazardous. Table 52 gives the equation and results obtained. Female heads work off-farm an average of about 47 days per year. Off-farm work tends to decrease with age. This relationship with age may partly be due to a simultaneous decision of younger women to work for wages and, because of the location of employment, to maintain a separate household. Again, persons over 70 years of age are not included, so some (but only some) of the effect of physical disability of older persons is eliminated.

Total land owned by the family, representing the general position with regard to accumulated wealth, has a negative, but not significant, relationship with off-farm labor supply. In the same manner, area planted, indicating expected income from agriculture, seems to have no

Table 52
Off-Farm Labor Supply of Female Heads of Household

All Families	
(Mean and Standard Deviation)	
<u>Dependent Variable:</u>	
Days worked off-farm	46.63 (100.05)
(Coefficient and Standard Error)	
<u>Independent Variables:</u>	
Land owned (<u>manzanas</u>)	-1.22 (1.07)
Net income from non-agricultural home enterprises (1000 Córdobas)	-13.99 (6.81)
Dependents from 1 to 6 years of age (0,1)	53.74 (42.62)
Days worked in coffee	.41 (.59)
Area planted (<u>manzanas</u>)	-1.07 (4.44)
Opportunity wage	8.34 (6.93)
Age (years)	-2.52 (1.58)
Constant	72.89 (143.32)
Number of Cases	38
R ²	.36

significant impact. The lack of significance here comes as a surprise, and tends to refute the hypothesis that families in Nicaragua regard off-farm work of females as undesirable for social reasons. Of course, the

results here only refer to females with no spouses, and therefore would more nearly represent preferences of females, who are presumably free from coercion of male family members.

Activity in non-agricultural home enterprises has the expected impact, reducing time spent working off-farm by 14 days for every one thousand Córdobas of net income earned. This is a sizeable impact, given the low overall mean of the dependent variable. If total family income were held constant, or if it had no effect on labor supply, this coefficient would appear to indicate that female heads with no opportunities to work in income-earning activities at home would offer more labor to the market. The factor of location of work, however, is probably critical to this decision. Some women may have not been willing or able to leave the dwelling for long periods, and these could be the ones that start non-agricultural home enterprises. Work in many of these activities, such as small stores, does not usually preclude housework and care of young children. It should be noted parenthetically that some off-farm work, such as cooking on haciendas where the family resides, is not always incompatible (in terms of location) with housekeeping.

Coefficients associated with young dependents six years old or less have the opposite sign than what was expected, and low significance. Presence of young children is negatively correlated with age, and as seen, younger female heads work more off-farm. Again, the process of family formation is involved here; the fact that a young woman has formed a separate household certainly must relate to her having young children and to employment decisions. Variables dropped from the equation for lack of significance were older dependents, 7 to 20 years old, and the ratio of males (in worker-equivalents) to number of people in

the family. This latter result was the most surprising, because the proportion of able-bodied males indicates a lot about earning capacity relative to dependents, among people who presumably have a comparative advantage of working off-farm. The conclusion corresponds to what was discussed under land ownership and area planted above. That is, the decision of female heads to work off-farm does not seem to occur exclusively in situations of great necessity where there is no income from other sources.

Finally, a positive, though not significant, relation was found between days picking coffee and days in other off-farm employment. The sign and lack of significance indicate that, if anything, substitution of one activity for the other is not as strong as the tendency to work in both, during different seasons, among female heads that work off-farm.

Female Family Members Other than Female Heads of Household

In this section, wives and other females considered to be independent adults are considered as a group. Then younger females considered to be dependent, including children, receive separate attention. This separation is made because the variables linking the activities of an adult woman to the presence of dependents in the household do not apply to persons who are, themselves, considered to be dependent.

Much of what was discussed in the previous section applies here directly, and the regression model is defined similarly. Only one major change is included. Other cross-sectional studies have shown that employment of the family head (husband) at a point in time is negatively related to employment of the wife. This is due to specialization among

family members between income-earning and household activities. The same tendency is no doubt true in Latin American households. Hence, lower amounts of off-farm employment are expected than for female heads of households. But the substitution occurs with total amount of work of the head, not only with off-farm work. It would seem that in families oriented toward wage employment, location of the household and availability of suitable work for females, such as cooking on haciendas, would increase participation of females.

Also, female members of the household may not be permitted by male members to seek work outside the home unless accompanied by male members, who are also seeking work. As was seen for males, all members seem to follow similar patterns; females might also follow patterns of male family members.

In an attempt to account for these influences, number of days worked in wage employment by the head of household is included. Additionally, families are separated according to whether they participate in farming or not. Land ownership was found to have no influence, presumably for the same reason as for female heads. This variable was dropped from the final model shown in Table 53.

An additional change is that age is not included because it was found to be insignificant both for wives and for other adult females, in separate regressions (not shown). This finding is different from that reported for female heads of household.

In Table 53, it can be seen that wives and other adult females (a term used to refer to persons not considered to be dependents) in non-farm families work nearly 38 days off-farm, while those in farm families work an average of only 12 days. Comparing these with the 47 days

Table 53

Off-Farm Labor Supply of Wives and Other Adult Females
for Farm and Non-Farm Families

	Non-Farm Families	Farm Families
	(Mean and Standard Deviation)	
<u>Dependent Variable:</u>		
Days worked off-farm	37.68 (89.81)	12.45 (54.47)
<u>Independent Variables:</u>	(Coefficient and Standard Error)	
Presence of children, 1 to 6 years of age (0,1)	-1.20 (23.86)	-4.66 (6.17)
Presence of dependents, 7 to 20 years of age (0,1)	7.36 (23.36)	10.61 (6.49)
Adult female, not wife of head (0,1)	57.08 (25.44)	24.15 (6.78)
Opportunity wage (Córdobas)	12.21 (5.77)	1.26 (1.20)
Days worked picking coffee	.29 (.32)	.17 (.15)
Income from non-agricultural home enterprises (1000 Córdobas)	-1.33 (9.83)	6.99 (1.32)
Days worked off-farm by head of household	-.16 (.11)	.06 (.03)
<u>Manzanas</u> planted		-.08 (.66)
<u>Manzanas</u> established in coffee		-1.27 (2.01)
<u>Hacienda</u> location	10.69 (23.36)	
Constant	-126.50 (84.40)	-21.60 (15.81)
Number of Cases	75	332
R ²	.19	.14

worked by female heads of households suggests that there is, indeed, a difference in the amounts of labor supplied to the market between these groups, especially since age distribution of female heads is higher than wives or other adult female family members. However, there is also a large difference between labor supplied by wives from that supplied by other adult females. The third variable listed in the table indicates that the person is not the wife of the head. Both for farm and non-farm families, the coefficient of this variable is positive and significant. Thus it appears that the specialization among household members affects the wife of the head more than other females in terms of the housekeeping function.

Having very young children directly dependent on the individual seems to have no effect on the supply of off-farm labor, though the signs of the coefficients are negative in this case, as they were predicted to be. Likewise, effects of older dependents tend in the direction predicted, raising supply of labor to the market. Here the coefficient is significant only for farm families, for which more observations are available.

Effect of wage rates on females in non-farm families appears to be greater than that on females in farm families. This suggests that women in non-farm families do consider other activities, such as housekeeping or leisure, as valuable when opportunity cost of working off-farm is low. This may relate to the otherwise unexpected result that use of time in wage employment of females in non-farm households is negatively (but not significantly) related to amount worked by the family head. Among farm households, on the other hand, response to wage is very low, and off-farm work of females is positively related to that of the family

head. Results for farm households come closer to what was expected in the Nicaraguan environment. It is especially surprising that location on a hacienda does not affect labor force activity of females in non-farm households.

As with female heads of households, area planted has no effect on use of time off-farm, nor does area established in coffee. Oddly, non-agricultural enterprises bear a strong positive relation to off-farm work of women in farm families. Any explanation offered here to explain this behavior would be pure speculation; so it is left to further research to determine if this is a result of sampling error, or if, indeed, there is a meaningful relationship that is not currently understood.

Attention now turns to young female household members considered by the family to be dependents. Age range of persons included run from 9 to 20 years old. Regression results for this group are found in Table 54.

Overall number of days worked for wages--ten days per year--is much lower than for male dependents. (Table 51 reported an average of 40 days among male children 9 to 16 years old, and sharp increases with age.) As with other female members of the household, neither land owned nor manzanas planted have great effects on labor supply. As with other dependents, off-farm employment is related positively with days worked off-farm by head of household. But among female dependents, neither wage nor age, which are, themselves, correlated, have much effect on off-farm work. A word of caution should be added that off-farm work of females in picking coffee is likely to be more important than other occupations compared to males.

Table 54

Off-Farm Labor Supply of Dependent Females
9 to 20 Years of Age

All Families	
	(Mean and Standard Deviation)
<u>Dependent Variable:</u>	
Days worked off-farm	9.87 (46.13)
<u>Independent Variables:</u>	
	(Coefficient and Standard Error)
Land owned (<u>manzanas</u>)	.09 (.09)
Age (years)	1.07 (1.16)
Opportunity wage	1.51 (1.20)
Income from non-agricultural home enterprises (1000 Córdobas)	-.36 (1.13)
Days worked off-farm by family head	.08 (.03)
Area planted (<u>manzanas</u>)	-.50 (.63)
Constant	-22.57 (12.78)
Number of Cases	297
R ²	.08

The next section focuses on off-farm work in coffee picking, which has been separated from other occupations because of the seasonal nature of this occupation.

Labor Supply for Coffee Harvesting

Coffee harvest activities are of a special nature, because they account for the bulk of seasonal employment, and relative productivity of females and children is higher compared to adult males than in most other occupations. Because wages are paid based on amount picked, and workers vary the number of hours per day more widely than in other activities, the measure of labor input used in this section is hours, not days. Each respondent to the survey gave a single average number of hours per day worked while picking coffee, which was multiplied by days worked to obtain total hours.

Only persons over 16 years of age are included in the regressions, because young children are thought to follow the pattern set by adults in the household. Models were specified similarly to those earlier for other occupations, and for most of the same reasons. However, with children excluded, and males separated from females, all variation in predicted wages in coffee harvesting is accounted for. Thus hourly wage is excluded from the regression. Instead, opportunity wage in other occupations is included to indicate opportunity cost of time used in coffee harvest. This is thought to be an important factor in explaining the amount of time individuals would apply to seasonal work where productivity does not increase with literacy or managerial skills of the worker.

Results for females in Table 55 show they work less in coffee than males. Regression results for males are found in Table 56. Of all females, only 61 hours, or an average of about seven normal working days at eight and three-fourths hours per day, are utilized in coffee picking. This average is over all females over 16 years old, whether they

Table 55

Labor Supplied in Coffee Harvesting, Adult Females

<u>Dependent Variable:</u>	(Mean and Standard Deviation)
Hours worked in coffee harvest	61.40 (201.34)
<u>Independent Variables:</u>	(Coefficient and Standard Error)
Presence of children 1 to 6 years of age (0,1)	-27.55 (19.70)
Independent adult, not head nor wife of head (0,1)	-22.86 (21.03)
Dependent (0,1)	-71.36 (36.97)
Opportunity wage in other occupations (Córdoba)	-2.69 (4.02)
Days worked in other occupations	.25 (.14)
Days worked off-farm by head of household	.11 (.08)
Area planted (<u>manzanas</u>)	-4.44 (2.05)
Central area (0,1)	50.99 (20.10)
Eastern frontier (0,1)	-13.59 (26.74)
Constant	105.74 (53.98)
Number of Cases	483
R^2	.07

Table 56

Labor Supplied in Coffee Harvesting, Adult Males

	Non-Farm Families	Farm Families
<u>Dependent Variable:</u>	(Mean and Standard Deviation)	
Hours worked in coffee harvest	96.55 (227.89)	86.72 (219.59)
<u>Independent Variables:</u>	(Coefficient and Standard Error)	
Land owned or occupied free per male worker-equivalent		-1.29 (.64)
Independent male other than head of household (0,1)	-19.32 (61.28)	-32.04 (25.49)
Dependent male (0,1)	39.82 (75.21)	-22.84 (30.64)
Opportunity wage in other occupations (Córdobas)	-3.25 (6.62)	-1.87 (3.73)
Days worked in other occupations	-.51 (.25)	-.09 (.11)
Fertilizer per <u>manzana</u> planted		-.22 (.20)
<u>Manzanas</u> established in coffee on home farm		-10.97 (7.38)
Central area (0,1)	130.23 (54.75)	-61.02 (25.49)
Eastern frontier (0,1)	-18.80 (109.71)	-45.75 (32.20)
<u>Hacienda</u> location (0,1)	-35.06 (60.18)	
Constant	223.15 (176.11)	197.33 (75.01)
Number of Cases	88	395
R ²	.15	.05

work in coffee or not. Female heads of household are included in the model along with wives, other independent adults, and dependents. A reversal of the trend of the wife not working outside the home seems to occur. As indicated by the negative coefficient of the second variable, adult females other than household head or spouse work nearly 28 hours per year less than all females. Dependents, who are from 9 to 20 years old, seem to work still less in coffee harvesting.

Utilization of time in coffee harvesting seems to be only mildly influenced by time the head of household spends working off-farm. This latter variable is time worked by the head in occupations other than coffee, indicating the general orientation of the household to salaried employment, rather than indicating whether the head works in the specific activity of picking coffee. The influence of opportunity wage (in other occupations) is in the predicted direction, but far from significant. This is not too surprising for females, given that opportunity wage has a positive impact on wage employment in other occupations, which in turn is positively related to work done in coffee harvesting. Interestingly, manzanas planted by the family does have a significant negative impact on work in coffee by females, whereas, this variable was not found to be significant for other occupations. Since much of the work performed in coffee picking is of a migratory nature, dummy variables indicating area of residence seem to have large impacts on work of females. Living in the central area where coffee is grown has a positive impact, while living in the remote eastern frontier is negatively related to time utilized in coffee harvest. A clarification with respect to the eastern frontier may be useful. The climate of this area is, so far as is known, appropriate for coffee production. However, coffee

growing by large haciendas does not seem to play a large role in the economy of the area. Much of the area is still without roads, and most commercial agriculture is in the form of cattle ranches. Investments in coffee are expected to increase in this area as vehicular access improves.

Because of the influence of home farm activities among males, separate regressions were done as before for farm and non-farm families. Overall average number of hours worked suggests little difference in time in this activity between the two groups. However, this result needs to be taken with caution for persons working full-time on haciendas. Enumeration errors could have occurred if respondents failed to differentiate between their regular activities and work in coffee harvesting while with the same employer. The difference would not be important if the worker simply changes activities while receiving the same pay and working a regular schedule. Cases were found where the employer allows even steady workers to suspend normal activities during harvest and to join the coffee harvest on the same basis as incoming migrant harvesters. Though it cannot be shown that this error necessarily occurred, estimates of the equation for non-farm families should be regarded with caution, beginning with the sign of the coefficient on the variable indicating the family resides on a hacienda.

For males, days worked in other occupations seems to have a small negative relationship with time worked in coffee. Among persons with steady jobs, their regular occupation probably takes priority over coffee picking, even if the wage in their usual occupation was lower. For day laborers and general field workers who work sporadically, or seasonally, coffee harvesting could certainly take priority. The

difference in results for males and females probably reflects the fact that a greater proportion of male workers hold steady jobs than female workers.

Availability of land, use of fertilizer, and manzanas planted to coffee on the home farm all have the expected signs, and some degree of significance. As with earlier results, position in the household--head, other adult male or dependent--does not affect allocation of time significantly, but there is the same slight tendency for heads of household to work more than others. As was the case for females, opportunity wage in other occupations has the expected sign, but is not significant.

Among non-farm families, living in the central area has the expected result on time utilized in coffee harvesting, but the opposite is true among farm families. For males in farm families in the western area, migration to eastern coffee haciendas is apparently more attractive than coffee picking is to those that live in the area. One reason is that many farm families in the central area grow coffee on the home farm. Hence family members are not available to pick coffee elsewhere. It is worth noting that there is evidence of a large movement of males from some western communities. In the most dramatic case, conducting the interview for the community survey had to be postponed from late January to early February when men returned from eastern coffee areas. For several months of the year, virtually no males from 10 to 60 years of age were found in the community. The reason for the greater participation of these people than males living in the central area may be linked to the lower average productivity of work in home farm agriculture observed in the western area. If one has to work seasonally to support the family, coffee harvesting is probably the most remunerative way to do so.

Summary

Some of the more important findings of this chapter are related to off-farm employment of male heads of household over the life cycle. Male heads of non-farm families are employed a maximum number of days when they average 39 years of age. Many of those from 20 to 30 years old probably are in search of steady employment. At nearly 60 years of age, days worked by male heads of non-farm families drop to under 200 days per year. Among households that own no land, male heads of household who have completed at least one year of schooling tend to enter into full-time wage employment as age increases. Those with no schooling seem to participate less in off-farm employment with increasing age.

Wage rates were seen to affect off-farm supply of labor to a very great extent. Effects were greater for males than for females. Amount of land owned influences off-farm labor supply of males, but use of fertilizer and area planted in coffee were much more important. Home farm agricultural activity had little influence on off-farm labor supply of females, including female heads of household, wives of male heads of household and others.

Though a greater proportion of female workers participate in coffee harvesting, most labor in this activity is supplied by males. Females who work off-farm in other occupations are more likely to work in coffee harvesting as well, whereas the opposite is true for males.

Chapter X summarizes findings from the entire study and attempts to evaluate the reliability and meaning of some of them. Policy recommendations for rural Nicaragua are drawn from the findings, and suggestions are made for future studies in similar environments.

CHAPTER X

SUMMARY AND CONCLUSIONS

The purpose of this chapter is to tie together the major findings of the analysis and identify the major implications for public policy in Nicaragua. A brief section is included on applicability of the concepts and survey methodology to other countries.

The current study was done at a time in Nicaragua when pressure was building toward revolutionary change. Political uncertainties presented special problems in study design for which practical solutions were required. The methodology used for the survey and the composition and performance of the study team were both affected by these conditions as explained in Chapters I and IV. The rapidly changing setting of Nicaragua at the time of the survey should be considered when applying the findings of the study to policy issues and when adapting the methodology to other studies.

Summary of Findings

Structure of the Rural Population. The rural population of the Central interior region of Nicaragua can be thought of as having three distinct groups. About 25 percent at one extreme are non-farm families that are very active in the labor market, and at the other extreme about 10 percent of the population is made up of farmers or ranchers operating at a small to medium commercial scale. The majority of families are in the middle group and participate both in farming and in

wage employment. Families operating small farms and ranches on a commercial scale usually own more than 25 manzanas of land, hence the middle group described above includes households with no land and those that own up to roughly 25 manzanas. It is possible to disaggregate the middle group further as follows:

1. Households that concentrate on farming, usually near the subsistence level, and work off-farm to supplement income.
2. Households which gain most income from off-farm employment and produce crops and livestock to supplement income or as insurance against job insecurity.

This disaggregation is partly based on the occupational choice of the head of household which depends on access to land and employment opportunities and varies over the life cycle of the family. The average number of persons per household in the sample was 7.0, however, this varies with the age of the head of household and among areas and community types. Average size of family in terms of worker-equivalents is largest where opportunities are most constrained--in the arid western area and where sharecroppers and renters predominate. Older children tend to remain in the household of their parents for a longer time in these communities, so rates of formation of new families are lower than in other places. Worker-equivalents increase with age of head of household, and increase at a higher rate among households that own larger amounts of land.

Rural Communities. The stratification of communities by predominant pattern of land tenure and agroclimatic situation reflects the relative importance of large landholdings owned by absentee owners and their principal enterprises--coffee plantations and cattle. Availability

of land and opportunities for employment in most communities depend largely on the influence of haciendas. This is emphasized by the fact that 20 percent of households in the study region reside on haciendas.

In addition to the influence of large landholdings, community organization throughout Nicaragua is dominated by a political appointee with authority over one or several communities. This person has responsibilities for maintaining law and order, and cooperates closely with the National Guard on matters of concern to them. The local appointed official would be expected to cooperate more with superiors in the ruling political party than with local people who might like to create pressures for improved services or rights to resources. In places where local haciendas are owned by military officials of high rank, the dual structure of the society becomes more apparent. In virtually all communities studied, this top-down structure through the political party system, in conjunction with interests of the relatively well-to-do, seems to have all but eliminated involvement of local residents in community affairs.

Strata of communities were helpful in the analysis to explain wage differentials among areas. Public programs can better address the needs of the different groups of the rural population described in the previous section by first recognizing the distinct environments in which several households reside.

Land Tenure and Participation in Farming. The study region as a whole comprises a large amount of land relative to the rural population, and all available information indicates that there is still additional land that could be cultivated. The distribution of land ownership is so

skewed, however, that large numbers of rural households that participate in farming depend on methods of access other than direct ownership, such as renting, sharecropping, or otherwise occupying land belonging to relatives or to haciendas. Two factors account for the concentration in ownership: 1) haciendas own more than half the total land surface of the region, and 2) the distribution of holdings among rural households is highly skewed.

Distribution of public land through the agrarian reform has had little impact on total land holdings of rural households. Most families in the sample that moved to the agricultural frontier purchased land, rather than receiving it through the agrarian reform. They are families that owned fairly large amounts of land prior to resettling. In the more densely populated areas they leave behind, their previously owned land is usually sold to haciendas, and is frequently put to cattle raising purposes. Thus, availability of land to local residents who remain in more densely populated areas has not increased as some families leave to resettle in other places.

Inheritance is a more important method of acquisition in the more densely populated western areas than in other areas, but even here most land held by rural households has been purchased. Price paid for land by rural households is usually greater than the price received by them when they sell within the same area. One reason for this may be the relatively low value placed on improvements such as dwellings and fruit trees by purchasers, who are usually hacienda owners. But in specific cases, sample families reported being coerced into selling at low prices to members of the National Guard, and in other cases, persons sold land and resettled elsewhere to escape violence in areas of guerilla activity.

In total, a pattern seems to emerge where rural households as a whole are slowly decreasing their hold on what land is available to them, and as new families are formed, average holdings per family decline fairly rapidly.

Whereas 53 percent of sample households owned land, 76 percent participated in farming in the year prior to the survey. More than 61 percent of those participating in farming obtained land by renting, sharecropping or other means. Even though few families with young heads of household own land, the proportion of families that participate in farming is similar in all age groups of household heads. Thus, many households with younger heads occupy land by renting, sharecropping or other means.

Farm families that do not own land, but instead occupy land by other methods, average more area in cultivation than those that own small plots and have a higher ratio of area cultivated to male worker-equivalents in the family. This seems to indicate the negative effects of owning a small plot of land on mobility and consequently on productivity of labor. Many households that own small plots live in communities where no more land is available for purchase, renting or sharecropping.

The proportion of owned land which is cultivated decreases dramatically as size of holdings increase. Households that own over nine manzanas cultivate more land, on the average, than would be necessary for home consumption of food. Among households with over 27 manzanas, livestock becomes an important enterprise.

Use of Technical Inputs and Credit. Two programs have been developed to extend credit to farm families that do not qualify for commercial

loans. One is the Small Farmer Credit Project of the Banco Nacional de Nicaragua (BNN) and the other operates through the Institute for Peasant Well-Being (INVIERNO). Use of technical inputs such as fertilizer is closely associated with participation in either the Banco Nacional or INVIERNO program. Though many farmers are familiar with the use of chemicals and improved seed, provision of credit, technical advice and marketing services seem to attract farmers to utilize these inputs.

About a third of farm families in the study region participated in these programs in 1977, and the main use of credit was for purchase of livestock. The clientele of the two programs are very different in terms of income levels; BNN clients have twice as much income on average. Both groups obtain most of their income from agriculture and livestock enterprises, hence the majority would fall into the category of small farmers who supplement their income with off-farm employment. Some BNN clients would be in the small commercial farm or ranch category.

Rural Roads. Over 50 percent of households in the study region live in communities served by all-weather roads. Improved roads are most often found in the central, coffee-growing portion of the region, and especially where haciendas exist.

Price of corn reduces sharply when no road serves the community. Prices paid by remotely located families that purchase corn range from very low to very high, depending on the season. Hence, absence of a road provides some incentive to grow enough corn for home use, rather than to purchase during periods of scarcity. Though the influence of roads on grain prices appears to be great, effects on labor utilization

were difficult to isolate because road improvement relates closely to a number of other social and economic factors. All-weather roads are positively associated with high population densities, development of commercial agriculture (haciendas), and higher land prices. Land holdings of rural families are smaller when roads are improved, but more wage employment is available. Most families, including landless families, that live in places without roads occupy a plot of land for home farm agriculture. Hence, road improvement tends to cause reductions in labor utilization on home farms, but it is not clear if the reason stems from the effect on grain prices or if it is due to the greater availability of wage employment and relative scarcity of land.

Educational Attainment and Services. Levels of educational attainment and current attendance are extremely low given average income in Nicaragua and interest in education expressed by rural families. Slightly less than half of persons 11 to 22 years old have completed one or more years of schooling, while only around one-fourth of those 23 to 40 years old have done so. Schooling of persons over 40 years of age is even lower. This comparison seems to reflect a recent expansion in educational services from very meager levels in the past where very few children went to school, up to current levels where about half now attend, though not for long periods.

Compared to the size of the population, the western area is better served with schools than the central area, and the eastern frontier is far worse off than the other two areas. One cause of the variation is probably past guerilla activity in parts of the central and eastern areas, but there are other factors that seem to influence provision of school service:

1. Rural people state that teachers will not come to places where there are no roads.
2. Where large haciendas dominate the community, the public sector often neglects services to the local population.
3. Where population density is low and communities are large (as in the eastern area), one school in a community cannot serve a very large portion of the population.

Attendance is low among the youngest children, and does not rise to a peak until 12 years of age. This seems to be partly due to the parents' decision to hold younger children back, which in some cases is related to distance from the home to school. Attendance drops abruptly as the individual goes from 14 to 15 years of age. Rates of attendance are greater for females compared to males in the same age group, and females attend school nearly four weeks longer than males during a year of attendance. Part of this difference appears to be due to work at home done by males. Among students of both sexes, average months of attendance during the survey year was only seven months.

Off-Farm Employment. More than half of males 11 to 70 years of age earned wage income during the survey year, while 17 percent of females within the same age range did so. All males over 20 years of age averaged 1086 hours per year in wage employment, which would convert to 136 days of eight hours duration. Males from 9 to 20 years old worked 568 hours for wages. Females over 20 years of age worked 260 hours per year, and those 9 to 20 years old worked 147 hours in wage employment.

Most employment by far is created by haciendas, thus wage employment of rural residents still implies work in agriculture. The most common occupation among males is general field work, while a greater proportion of females participate in coffee harvesting. In the western

area, haciendas seem to be shifting toward raising cattle because of recent continuous drought, having a negative effect on wages of general field workers. But at the same time, educational attainment is higher in the western area, and more rural residents obtain employment in urban occupations with higher wage rates.

The central area where coffee is grown by haciendas offers the largest number of jobs relative to the size of the rural population, and the agricultural frontier provides the fewest.

The very strong seasonal variations observed in wage employment is dominated by activities associated with harvest of coffee which begins in November and continues through February. At the peak in December, more than 40 percent of all days worked for wages are utilized in coffee harvest. Much of the wage employment in coffee harvesting involves seasonal migration. Other occupations taken separately show mild seasonal variations, but on the whole, wage employment except for coffee is remarkably uniform over the year.

Wage Rates. The highest paying occupations are those that either involve specialized skills or those where the worker is entrusted with an unusual amount of responsibility, such as drivers, ranch foremen, and specialized craftsmen. Next in line are coffee pickers, an occupation for which no special training is necessary, but one in which seasonal shortages of labor force wages up. Lowest daily wages are paid to general field workers, domestic helpers, and cooks on haciendas. Compared to minimum wage stipulated by law, general field workers and cooks are underpaid, while domestic helpers and workers in agro-industry earn at least as much as the minimum wage applicable to them. Since the

latter two occupations usually imply urban workplaces, it appears that minimum wage laws may be operable in urban places but not rural areas. Logistics of communication and informality of the rural labor market do not explain this varied application of the law, because many rural employers are haciendas which maintain steady work forces of more than 100 employees.

Wage differentials exist among strata of communities which vary according to local influence of haciendas. Where land holdings are concentrated in haciendas, wages tend to be higher. This wage differential may reflect the higher costs of living in places where the family cannot cultivate a plot of land to provide food for home consumption, or it could represent the effect of an upward shift in demand for hacienda labor caused by higher coffee prices in recent years. The former explanation would imply an equilibrium where wage differentials are offset by other factors considered by the family, while the latter infers a disequilibrium which could cause resettlement of workers to areas of higher wages.

Wages are greatly influenced by educational attainment of the individual, more so for males employed full-time than for females or part-time workers. Effects of schooling seem to be greater as the individual becomes older and moves into more steady employment, often gaining employment in higher-paying occupations. Heads of landless households who have attained at least one year of schooling show strong tendencies to move into full-time wage employment as they grow older, while those with no schooling lean toward self-employment (farming) as age increases.

Occupational experience also has a positive effect on wages, but the relationship between occupational experience and education remains unclear. There are several reasons for this: 1) very few people over 40 have attained any schooling at all, but many of them have experience in "superior" occupations, 2) literacy does not seem to be a prerequisite for entry into most occupations, though it might be of considerable use in some, and 3) wages increase markedly with attainment of only one year of schooling, which would not permit achievement of sufficient literacy skills to increase productivity in most occupations. Survey results do not show that attainment of a second year of schooling has any appreciable effect on wages. However, if the sample population included persons with higher levels of education, a positive relationship would be expected. Among younger age groups that have higher levels of schooling, it is plausible that formal schooling increases the access of the individual to positions in which responsibilities are greater and further skills are then gained.

Response of Labor Supply to Wage Rates. Effects of wage rates on off-farm labor supply is statistically significant for nearly every group of people studied--males, females, family heads, other adult family members, and children--and in every type of household--non-farm or farm, broken down by land ownership. Males are more responsive to wage changes than are females, but wage of males also varies more due to greater effects of education and occupational experience. An increase in wage of one Córdoba (US \$.14) per day is associated with an additional 21 days per year utilized in wage employment by male family heads, and eight days by female heads. Worker days of male heads of non-farm families

change little to wage changes because these individuals work nearly full-time in any event (246 days per year).

As age of male heads of farm families rises, labor supplied to the market declines. Some families increase land holdings over the life cycle, and concentrate more on family farming. Among male heads of non-farm families, days in wage employment are low in early years, rise to a maximum at about 40 years of age, and decline afterwards. The lower amount of time worked by younger family heads is likely to be due to frictional causes: time spent looking for a job, or lost from the market between jobs perhaps during the slack season of February and March.

Female heads of families also work less as age increases. However, age has no influence on labor force participation of wives of the family head, or on other adult females.

As land ownership and the extent of family farming operation increases in size, off-farm labor force participation decreases. Use of fertilizer is associated with a decrease in off-farm supply of labor of males, especially among families that own smaller amounts of land. This suggests that in families that own less land and are involved both in wage employment and home farm operations during the same year, male workers are more likely to adjust to changing productivity in home farm agriculture than families that farm full-time. Use of fertilizer had no effect on off-farm labor supply of males in families that own more than nine manzanas. Establishment of permanent crops, mainly coffee, also decreases off-farm labor supply of males.

Interestingly, the effect of home farm operations on wage employment of females is very small. Instead, non-agricultural home enterprises, such as stores which occupy mostly female labor have negative

effects on labor supplied to the market by female heads of families.

Resettlement patterns show that families and individuals move toward places where wages are higher and hacienda jobs are available, or to urban centers. There is also movement toward the eastern frontier where wages are low, but more land is available. However, the amount of resettlement in response to higher wages and lower land prices appears to be very low. Most resettlement occurs over short distances, i.e., within the same municipality, and most new families are formed within the same community where the new head of household previously resided.

It appears that families that have access to land are reluctant to break ties in their community in order to search for work elsewhere, even when short-run returns to labor would be higher. Lack of mobility of rural families, implying a slow response to employment conditions, may be related to risk aversion. Uncertainties imposed by climate, pests and prices generally influence farmers' choice of technology and cropping patterns. Similarly, uncertainty of jobs and wages probably plays a similar role in decisions to seek wage employment or remain on a subsistence farm. Complete dependence on wage employment as a means of livelihood implies great risks for families that are at a disadvantage in the labor market. Indeed, decreasing coffee prices and political instability have contributed to reductions in demand for wage labor during the year following the survey. Hence, the decision to remain on a small plot of land and not seek work in distant locations would appear to be quite rational for many, even when short-run opportunity costs of doing so are quite high.

Sources and Distribution of Income. Average income of all households in the sample was 8,776 Córdobas or 178 U.S. dollars per capita, about one-third of which was derived from agriculture and livestock. Wage income accounted for 65 percent of net family income (cash and noncash) in the year of the study, a proportion much greater than anticipated prior to the study.

Distribution of income among groups of families by amount of land owned and occupation shows that the poorest are not landless workers, but are small farmers who have limited access to land and to the labor market. While highest income levels are found among families with commercial sized farming and livestock operations, the second highest is at the other extreme where families own no land, but some members hold steady jobs. Incomes are actually lower among farm families that own small amounts of land than among those that participate in farming but own no land. The reason is not the amount of agricultural income, it is rather the amount of income derived from wage employment. Apparently households in the latter category have focused on wage earning activities as a primary occupation, while those in the former group are subsistence farmers working part-time off-farm to supplement income. Households in the former group are more mobile, and many of them are located on haciendas.

Policy Implications

Policy represents a government's attempt to affect people's rights of access to resources, infrastructure and services and also incentives to utilize them in different ways. Sometimes policy measures involve direct operation of public programs, such as giving technical advice to

farmers. Some imply construction of public works, such as roads or water systems. Others involve the definition of property rights systems, such as rules governing labor organizations. But whatever the means, government actions are meant to change the absolute and relative well-being of different groups. Current and past systems of rights to resources are largely responsible for current levels of productivity and income distribution. The political system faces the overwhelming challenge of determining what changes are most desirable, and the challenge of economic analysis is to predict how government actions can make desired changes in production, distribution and welfare.

General Focus of Development Strategies. The most recent attempt at rural development in Nicaragua is the INVIERNO program in the Central interior region. The original concept of this program was to integrate a broad range of rural services into one institution, including agricultural credit, extension services, construction and maintenance of access roads, water projects, education and training, community development and others. However, from the outset, the program was narrowed to focus only on agricultural production credit and supply of chemical inputs. Thus the clientele of INVIERNO was reduced from all rural households and communities to only one group--the small subsistence farmer. Further, there was a shift in objectives away from changing the conditions surrounding rural organization and decision-making, toward providing capital and improved agricultural inputs to stimulate productivity and income of the poorest farm families. The latter objective reflects a desire to both increase production and also to benefit the most disadvantaged portion of the population. However, this focus poses several serious limitations on the development process:

1. Farm families receiving production credit and improved inputs often require help from the public sector for many years, requiring a long-term commitment and financial support from the government.
2. It does not lead to rapid growth and transition of the subsistence farmer to the scale of small commercial farms. Population growth and new family formation will cause the number of subsistence farmers living at poverty levels to grow.
3. The program only helps one group of the population, which is the most limited in terms of resources and alternatives.

The central concept in the above is that improvement of the economic situation of rural families in real and relative terms requires structural change in the rural economy and its institutions. Immediate massive reforms are seldom acceptable in most political environments and can have long-lasting negative impacts when misguided. Development strategies that are likely to succeed must create growth rapid enough to achieve desired structural change and reform.

One major reform which would assuredly benefit the majority of the rural population is to encourage local participation in making decisions regarding public services at the community level. The results of the current institutional structure in directing public investments was explored earlier with regard to roads and educational services. An instructive comparison can be made between a wide range of services currently provided and the priority needs as stated by community leaders. Table 57 contains the principal needs expressed by respondents to the community survey, listed from highest to lowest frequency. Current services and infrastructure are summarized in Table 58, again listed in decreasing order of frequency.

Table 57

Principal Communal Problem or Need Identified by Respondents

Service or Structure	Number of Communities	Percent
Potable Water	41	26.6
Education	39	25.3
Road	24	15.6
Health Services	19	12.3
Food for Poor Families	15	9.7
Credit and Technical Assistance	8	5.2
Other	8	5.2
Total	154	100.0

Source: Community Survey, 1977.

Table 58

Communities with Selected Services and Infrastructure

Service or Structure	Number of Communities	Percent
Credit and Technical Assistance	93	25.5
Elementary School	93	25.5
All-Weather Road	74	20.3
Church or Temple	54	14.8
Electricity	24	6.6
Health Station	13	3.6
Potable Water	6	1.6
Total	357	100.0

Source: DIPSA, Ministry of Agriculture of Nicaragua, 1976.

The most notable "imbalance" between the two tables is potable water which was the most frequently listed need, and the least frequently provided service. Potable water in most places simply refers to a well where clean water is available within reasonable walking distance. This reaction comes from people in communities where water is taken from rivers and springs that dry up during March and April. Another point of comparison relates to electrification which is provided in 16 percent of communities but was not mentioned by any of the leaders as a community need. Electricity is usually installed to serve the hacienda; if any local residents partake at all from the service, it is normally only a few, such as store owners.

The item "food for poor families" indicates the startling discovery that some people in the region have simply run out of means of support, and the community has had to organize to help them survive.

With respect to certain items, such as credit and technical assistance, a direct comparison of the two tables is not valid because these services are usually thought of as being provided to individuals rather than to the community. Thus respondents would not be expected to mention these services as a community need. Nevertheless, it is clear that if the rural population was able to participate in decisions regarding expenditures on public services, the priorities of the public sector would certainly change.

Increasing Productivity of Small Farms. In developing policy strategies it is helpful to recall the different kinds of small farms that exist in rural Nicaragua. Small- and medium-size commercial units are few in number, and in the Central interior region they concentrate

on intensive crops such as coffee and on livestock enterprises. Commercial farmers are distinguished from subsistence farmers in Nicaragua by the amount of wage income associated with the latter. Small farmers typically earn between 25 and 75 percent of their income from wages, and grow grains and other farm products for home consumption. Some small farmers earn cash income by selling surplus production and from part-time work off-farm, while others earn cash income from full-time wage employment. For the latter group, growing food for home consumption is a secondary activity meant to supplement wage income.

Because the agricultural operations play a different role for each group, their needs in terms of support from the public sector would be expected to vary. Hence public policy must be flexible enough to adjust to a heterogeneous population.

For example, extension services required by commercial farmers and ranchers would need specialized personnel to assist with specific production and marketing problems. Specialists would be needed in veterinary medicine, animal nutrition, plant pathology and other specific fields. Offices could be located centrally in departmental capitals where several agents could be grouped together. Contrastingly, farmers operating on less than commercial scale require a different kind of technical assistance, which emphasizes promotion of modern inputs and improved farming techniques. Extension agents would not be specialized and would be located in municipal towns to maintain close contacts with clients. However, as was seen earlier, many households participating in subsistence farming are located in places with no roads, or reside on

haciendas. These two situations present special problems which are very difficult for extension programs to overcome in practice.

The organization suggested above for technical assistance oriented to subsistence farmers is similar to the current organization of the INVIERNO program. Results of Chapter IX suggest that the impact of this program on productivity would be greater if more emphasis could be placed on areas with sufficient rainfall. Placing emphasis on investments in permanent crops, livestock and land should be considered. However, the viability of the INVIERNO program in terms of the ability of the poorest groups of farmers to repay appears to be in serious doubt. Though hopes were at one time high, the INVIERNO program is not now seen as a means of overcoming the poverty problem in rural areas.

It was seen that INVIERNO was created to develop into an institution with wide responsibility in delivery of an integrated package of public services to disadvantaged rural people. This was to have included farmers and non-farmers, and was to have included community organization and development. But upon beginning operations, agricultural credit was given highest priority; regional offices were specifically instructed not to engage in community development activities.¹ Limiting of credit and technical assistance to agricultural enterprises has made the program less complete in many ways than that of the Banco Nacional, meeting fewer of the needs of rural households. Changing the orientation toward the community and toward rural organizations and cooperatives would make the program more sound.

¹Officials and technicians of INVIERNO, Managua, Nicaragua, 1977.

The supply of farm inputs and services is important to all farmers, however, efforts of the government to provide needed inputs have not been reliable. Instead an effort should be made by the government to support private companies in this activity. Certainly the demand for fertilizers, insecticides, vaccines and other products is great enough to encourage private investment, but this will not happen without changes in policy. Currently the government imports and sells the bulk of inputs linked with agricultural credit of the Banco Nacional, thus pre-empting participation of private industry.

Improvement of roads is a key factor to most commercial farms, large and small. Increasing area planted in coffee, horticultural crops and fruits probably depends upon access of all-weather roads as much as any other factor. However, the positive relationship between large land holdings and improved roads deserves further study. The eastern frontier area should receive highest priority for development of access roads because of its productive potential, but the land tenure arrangements in this area should first be dealt with.

Finally, marketing services are generally lacking throughout Nicaragua for all crops except coffee, cotton and livestock products. In the marketing of fruits and vegetables, there is a need for grades and standards, better packaging, storage and market information. In basic grains, storage capacity is required along with market information. Again, the government should not establish national monopolies in these areas but should support private industry.

Land Reform and Colonization of New Areas. The concern with land distribution comes primarily from the group that does not participate

year-round in the wage labor market, but that operates a family farm smaller than commercial scale as the principal source of income. There is another group that works for low wages in the labor market because of poor education and few specialized skills. Many of these families might leave the labor market if more land was available. Even if opportunities for wage employment continue to expand along with a growing labor force, the potential contribution of land reform is very great. But if demand for wage labor does not keep pace with labor supply, access to land takes on increasing importance.

Compared to the other alternatives, distribution of public land would presumably be less threatening to others with vested interests, and therefore would be more feasible in the unstable political environment of Nicaragua. Efforts in this direction up to now, however, have had discouraging results. Some families have received only very small parcels, less than one manzana in size, through the agrarian reform, even though unoccupied land is relatively abundant in the surrounding area. Therefore, a logical step toward land reform is to more carefully define the administrative rules of the agrarian reform system for distribution of public lands. Size of parcels to be distributed should be in the 20 to 100 manzana range, depending on quality of soil. Distribution should be made to households living on less than commercial size units (including those that own no land) but that depend on farming for the majority of their income. It should be recognized, however, that persons most likely to take advantage of colonization programs are often not farm families that own small amounts of land, but are: 1) persons who currently hold low paying, insecure jobs, and 2) persons working on a family farm owned by relatives. Hence colonization programs would

tend to alleviate some problems of underemployment on small farms by absorbing younger workers at the age where they are forming new families, but the basic structure of the rural economy in already populated areas would probably persist with little change. Certainly, the opening of new areas for settlement in Nicaragua has benefited some families; however, it will not replace the need for programs aimed at the families who remain in other portions of the country.

If problems of employment and income distribution are to be seriously dealt with in rural Nicaragua, reallocation of land resources from haciendas to rural households is a necessary step. The growing number of young people in stages of formation of new families will require a vast amount of opportunities for labor utilization and generation of income. Therefore, major efforts should be dedicated to land reform. Some of the mechanisms that might be considered are the following:

1. Provide credit for purchase of land in places where people currently reside;
2. Redistribute land that is currently held by large haciendas to rural families;
3. Provide guarantees to renters and sharecroppers of continued use of land they occupy, and;
4. Place a tax on land classified as "underutilized" to provide incentives for owners of large parcels to rent or sell to rural families.

Some of the mechanisms would be more appropriate for households that use home farm production to supplement wage earnings, and some would be needed to help subsistence farmers progress to commercial levels.

Education and Training. Increasing the capacity of the population to manage resources and produce should be given first priority. In past

years an effort has been made by the Nicaraguan government to provide elementary schools in rural areas, but the services barely cover half the population. People from 13 to 22 years of age still only average two years of schooling, and older persons much less. The high priority placed on schooling by rural people corresponds to the relationship shown between educational level and wage rate. However, the overall effects of having a literate rural population cannot be fully shown by this study. Certainly as greater numbers of young people in the growing rural population turn to the labor market as their primary occupation, education takes on increasing importance.

Training in such skills as operation of equipment, mechanics, commercial agricultural practices and construction would be of great value. Currently, just knowing how to drive a car or truck is considered a valuable skill in rural areas and is rewarded in the labor market. Other managerial skills such as basic accounting, warehousing, and leadership should also be developed, though limitations of literacy would exclude most rural people from participating. Training is especially important for young entrants to the labor force who rely on wage earnings as their primary source of income. This includes a great many young people who may resettle in urban places in the future. Special attention should be given to training needs of potential migrants in the urban labor market.

Policy Toward the Labor Market. Government involvement in the labor market of rural areas is extremely small. Employers, which are mostly

commercial business enterprises, operate virtually with no requirements over wages paid, who is hired, or for what length of time. Laborers operate in this market as single household units with no union organization and with no government informational services. Even though wages are thought to be abnormally high during the period of the survey, it was seen that they are well below minimum wages set by the Ministry of Labor for many occupations, including the most prevalent, general field work.

Standards governing work conditions, especially regarding children in difficult field operations, safety regarding use of pesticides, and housing and health conditions should be established with the involvement of workers, employers and government authorities. The 20 percent of rural families residing on haciendas are virtually ignored by the government currently. Special programs are required in these situations to allow construction of schools and other facilities within the territory of the hacienda.

An important service for workers that do not have steady employment is an employment service. This should be patterned on the system used by haciendas, in that workers should be contacted in their communities and transportation should be provided to work sites in distant places. Such a service would assist workers in finding the best living and working conditions given their family situations, and would allow them the freedom of selecting among employers with minimum cost.

Finally, job creation seems to depend heavily on the use of resources on haciendas; with respect to the Central interior region, investments in coffee versus cattle appears to play the major role in determining how many jobs will be made available. Macro-economic

policies with respect to export tax on coffee and dual pricing system relating to exporting beef under the quota system cannot be analyzed through this micro-economic study. The general magnitude of the importance of these measures is implied from the importance of wage employment to rural residents, and the relative influence of employment in commercial agriculture where coffee is grown.

The final section evaluates some of the methodological aspects of the study in comparison to other approaches cited in Chapter II.

Applicability of Concepts and Methodology Applied

A great deal of previous work done in studying rural households in underdeveloped countries comes from Asian nations where the physical and economic environments are different from those of Latin America. Theorists saw rural families as peasant farmers in a "dual economy" where a minimum of economic and social interaction occurred with the commercial sector. Economic incentives guiding consumption patterns and the labor-leisure trade-off were thought to affect rural peasant families differently than families in the modern sector (36, 40, 49). This view may still have wide applicability to large parts of the world, including portions of Latin America with large indigenous rural populations, such as some Andean countries of South America, but there are clear indications that the places where this approach is useful are dwindling. Nakajima (40) distinguished between subsistence and commercial farms based on the proportion of inputs supplied by the family and the proportion of output consumed by the family. Referring to the latter, Krishna responded:

In terms of this measure, the pure subsistence farms (with a 100 percent home-consumption ratio) must be a small and diminishing proportion of the farms of the farm world (the world, that is, where farms can be defined.) At the other end of the scale, the pure commercial farms (with a zero home-consumption ratio) are simply firms. The major part of the farm world seems to lie in the intermediate zone. (27,p. 186)

Krishna states that the trend among peasants is away from subsistence agriculture; a trend that he sees as transforming peasant societies:

This unidirectional movement is forced fundamentally by three forces: the development of transportation and communications; the monetization of economic relations; and technological change. There is stagnation mainly in areas which still remain unaffected by any of these forces. (27, p. 186)

The focus on agriculture, rather than on rural households, seems to have caused both Nakajima and Krishna to miss the point that most small farmers in less developed countries who attain higher levels of income earn an increasing proportion of income from sources other than farming. Nicaragua might be seen as an example of a dualistic society, where this transformation of peasants is fairly well advanced. The outcome is not a rural society made up of commercial family farms. Instead it is a society of working class households, using home farm agriculture as insurance against unemployment and increases in cost of living.

The present study indicates the great importance of non-farm income among rural families in Nicaragua, a finding which is probably applicable to many other Latin American countries. Wage earnings are especially important, which points to the need for more study in the areas of occupational choices, education, skill levels, migration, and operation of the labor market. Generation of wage employment should receive more attention in future studies.

Through the present study it became clear that creation of wage employment in agriculture and supply of off-farm labor are both largely a result of the land tenure system. However, since haciendas were not included in the study, few conclusions could be drawn about the overall effects of agrarian reform on levels of investment, area cultivated, production and labor productivity.

Future studies in Nicaragua should include haciendas as a study unit to obtain information pertaining to the demand for labor and factors related to the labor market, such as means of contacting potential workers, skill requirements, training needs and costs of providing housing and other services. In the household survey more emphasis should be placed on costs of searching for employment, needs for information on job opportunities, and relative importance of wages versus living conditions.

Another concept coming from this study relates to nature of subsistence farming and the type of development strategies that might be more likely to create growth and change. When employment opportunities are available, growing crops for home consumption becomes a secondary activity for many households, used as insurance against job insecurity and rising costs of living. In Nicaragua the opportunities for transition out of subsistence farming are more plentiful through the labor market than through accumulation of resources to the scale of commercial farms. However, it is to be noted that most wage employment in which rural families participate is created by the agricultural sector, hence this situation would be expected to vary among countries. Development strategies in places where subsistence farmers predominate will vary depending on the potential of the agricultural sector and other sectors

to generate wage employment and the capability of subsistence farmers to acquire resources and increase productivity.

An important aspect of rural life relates to decisions regarding public services. Perhaps more immediate gains can be made in improving living standards in this area than any other single action on the part of government. Future studies in Latin America would contribute more to direction of public policy if increased emphasis were placed in this area.

Finally, it is suggested that future surveys of rural households in Nicaragua utilize methodologies similar to that developed for this study, especially with reference to the community visits and sampling procedure. Three important changes should be made, however. The same household should respond to both questionnaires "A" and "B", therefore duplicated sections on family structure, education, health, employment and land tenure can be omitted from one of the instruments. Second, the survey should cover the entire country with a sample size of about 1500 households. This would reduce costs per completed questionnaire since a great deal of cost is associated with preparation of the questionnaires and computer programs and training of personnel. Finally all communities should be visited, rather than using a sample of communities, because of the low cost and large amount of information that can be obtained.

In summary, there is a great need to better understand economic and social systems that affect rural people, coupled with empirical evidence that better reflects current conditions in Latin America. The focus presented above on the problems of development suggests that the transformation from a peasant society to a modern one is not likely to be

achieved in a single jump, but involves a series of steps implying increased public investment in rural areas, development of private industry and market mechanisms, growth of human capital, especially managerial skills, and means of participation of rural people in public decision making. Naturally these steps will vary with the physical and macro-economic environment of the country and the public policy applied.

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