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RURAL ELECTRIFICATION IN THE PHILIPPINE CONTEXT:

Income, Employment, and Fertility Aftermaths of MORESCO I,
a Development Infrastructure

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This work is dedicated to

William F. Mulcahy
and
Alejandro N. Herrin

PREFACE

For several years the social effects of the MORESCO I Rural Electrification Project had gradually been intruding on the attention of the present writer until in October, 1975, Mr. William J. Mulcahy with all his wit and charm, poked his head into my own and then Alex Herrin's offices. Dr. Herrin and I had been engaged in a dual record field study of fertility and mortality from 1971 to June of 1975, in the same MORESCO area. While our study had nothing directly to do with rural electrification, we found it hard not to see the large-scale changes going on right under our noses, and wishing we had funds to study them. MORESCO I had been in final stages of construction when we initiated field work in September 1971, and thereafter through December and into 1972 began electrifying some of the Laguindingan and Alubijid homes situated in the built-up centers (poblaciones) of these two municipalities. Our own field office in Alubijid was fortunate enough to be electrified with the dwelling units, and the change from dim and hot pressure oil lamps (called "Petromax") to electricity constituted one of the most welcome changes the office staff could imagine.

Thus when Mr. Mulcahy attempted in his friendly, eager way to persuade Herrin, an economist, and myself, a sociologist, in undertaking a three-month rush evaluation of the MORESCO I Project for USAID/Manila, he needed few arguments to convince us. That study was jointly published in Manila by Mulcahy, Herrin, and myself in a glossy blue paperback, and used, I believe, by USAID as some indication of the effects of rural electrification upon the Philippine populace.

By this time Herrin and I had been infected by Mulcahy's enthusiasm for following up more in detail the MORESCO I Project. An exacting twelve-month study was proposed to the Ottawa headquarters of the International Development Research Center of Canada, and was funded in 1976.

At the conclusion of this study, Herrin and I had already begun to develop separate interests in the MORESCO I infrastructure. Herrin, who has developed into one of the most promising young Philippine economists, was particularly interested in the broad socioeconomic impacts of electrification upon the different economic groups such as fishermen, entrepreneurs, the small businessman, and proposed to commission a series of small surveys on these aspects. His studies have justifiably become familiar throughout Southeast Asia and beyond, and the ASEAN research agenda has incorporated much of his proposals into their intercountry research. I was more interested in a large survey which would compare electrified and non-electrified areas of Misamis Oriental Province for effects of the MORESCO project upon income, business, employment, and (especially) fertility (because of the economic and social costs to households of not obtaining home electrification). Herrin's studies have been funded by the FAO, the Rockefeller Foundation, the UNFPA, and the Australian Government. His research with our institution continues, and he visits regularly for a few days at a time to lay out further aspects to examine,

to check the data gathered, and to handle higher-level administrative matters. Although he has gone on to affiliation with another university (The School of Economics at the University of the Philippines), and has become centrally involved in the Philippine government's ASEAN research program, Herrin has remained keenly interested in the MORBSCO I electrification area and in the research work he continues to direct in this area through our research personnel. Alex also continues to occupy a large place in the hearts of his former students and associates at our University and our Research Institute.

My own study was funded in 1977 by AID/Washington (Agency for International Development) and had as its purpose the points stated previously. In addition to Mr. Mulcahy and to Dr. Herrin, appreciation is expressed to Mr. Lenni Kangas, who supported this project with AID/Washington, to Dr. Arnold A. Leibowitz and Dr. Warren Weinstein of the Institute of International Law and Economic Development, who assisted the channelling of the project to AID/W, and to Mr. L. E. Stanfield, Chief, OTR Branch, AID/W, who was the Grant Officer. Special thanks are due to Dr. Richard L. Shortlidge, Jr., at the beginning of the project and for most of its term up till recently with the Sector and Program Analysis Division of the AID/W Bureau for Program and Policy Coordination but now with the AID/W Development Support Bureau Office of Education as Education Specialist. At all times, Mr. Shortlidge was most cooperative and helpful, and much of the credit for the smoothness of project operations is due to the providence, care, and hard work of Dr. Shortlidge in dealing with the many problems that inevitably arose in working out smooth procedures, and in facilitating administration of such matters as the preliminary project report in Washington, D.C. in December, 1979.

Special gratitude is due my staff of the Rural Electrification/of /Project The Research Institute for their wholehearted dedication to this project: To Dr. Teresa B. Almonte, Operations Manager, and her field staff of supervisors, interviewers, editors, and coders; to Mrs. Magdalena C. Cabaraban, Data Processing Chief and to her staff for the data processing of the bivariate analyses; and to Mrs. Marilou D. Tabor, Assistant Manager for Finance and Logistics, who handled supplies, transportation and lodging, and financial accounting in her usual impeccable style.

Special thanks are also expressed to Dr. Michael A. Costello and Dr. Amanda N. Te who divided up between themselves responsibility for the programming for SPSS treatment of the Multiple regressions of this study, and then saw them through the data processing stage at several computing centers.

Lastly, warm thanks are expressed to the Institute Secretary, Mrs. Caridad P. Gomez, for her care and patience in typing an often difficult manuscript over five or six months.

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BACKGROUNDS OF THE STUDY

INTRODUCTION

A feasibility study in 1967 by the Agency for International Development of the United States (USAID) and the National Rural Electric Cooperative Association (NRECA), a private American cooperative, at the request of the government of the Philippines demonstrated the practicability of a rural electrification cooperative in western Misamis Oriental Province, and this project was soon thereafter funded by the National Electrification Administration (NEA) which was established in August, 1969, and the Agency for International Development of the United States. In 1969 construction began upon the various components of the Misamis Oriental Rural Electric Service Cooperative, Area I (MORESCO I). The Cooperative supplied power for illumination to the first section of its project area on September 26, 1971. Thus by September 26, 1980, it will have completed its ninth year of operations. Even by the end of its eighth year, it had already brought electricity to some 8,200 households (about 35 per cent of the total) residing in the ten municipalities of Misamis Oriental Province located westwards of Cagayan de Oro City.

This study is concerned with the influence which the electricity supplied by this cooperative has had upon the people of these ten municipalities, with its social impact, if one may speak of influence in this way, and especially its influence upon the poorer people of this region, who constitute the majority of the population.

MISAMIS ORIENTAL PROVINCE

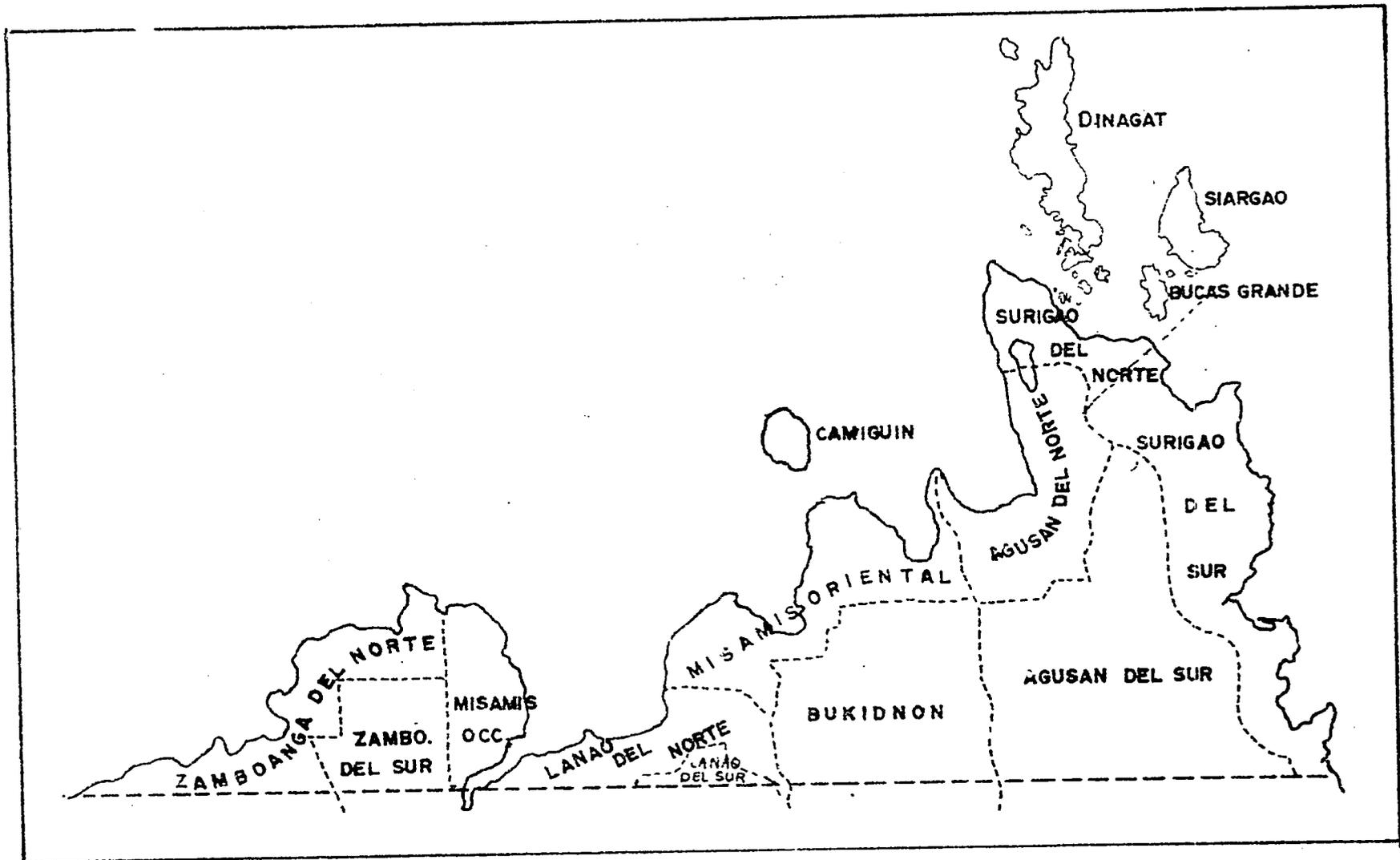
Mindanao

Mindanao is the largest southern island of the Philippine archipelago. Located in the Pacific Ocean between 112° and 127° east longitude and between 5° and 10° north latitude, the island is northeast of Borneo and due east of Salang in Malaya.

North Coastal Provinces

Map 1 shows coastal provinces of north Mindanao from Zamboanga del Norte on the west to Surigao del Norte and Surigao del Sur on the east. The north coast is a generally hilly region with best soils along the coastal plains and in the river valleys, where the bulk of the population lives. Bukidnon Province, which is part of the North Mindanao Region for cultural ties as well as because Cagayan is its main commercial outlet for crops and other products, is an exception to this rule. The best of the extensive Bukidnon soils lie on broad plateaus which run north and south in this province.

The peoples of the provinces lying along or close to the north coast of Mindanao are very largely engaged in farming, logging, fishing, and livestock production. The cities and large towns are mainly commercial outlets for the farm, livestock, and timber products of their areas. Industrial development thus far has been relatively light, although Iligan City and its suburbs are the site of the Maria Cristina hydroelectric power complex, the biggest in Mindanao, and now under intensive development. Iligan is also the site of several large plants, among which is a steel fabricating complex, that can produce plate, bar, and cable of specific dimensions from steel materials, but which lacks a sintering and basic steel producing capability. Other industries in the last municipality westwards or in Iligan City are a flour mill, a cement factory, a chemicals plant, and a factory producing galvanized iron roofing. A ferro-chemical plant is located in Manticao Municipality as well as an Electro-Alloy Company. Manticao is also the site of a fishing business with 30 workers. In Maawan, the third municipality from the western provincial boundary, a vinyl plastic factory is located which employs 50 persons. And in the fourth municipality, Initao, an agro-forestry corporation employs 45 persons. It also is the site of a fishing cooperative. Cagayan is the site of a large fruit producing and canning industry, the Philippine Packing Corporation, a subsidiary of California Packing Corporation, one of the divisions of the Reynolds Company, which also manufactures well-known brands of cigarettes. In this area are also found Kawasaki sintering plant (located on the Industrial Estate of the Philippine Veteran Industrial Development Corporation (PHIVIDEC), which is principally situated in the Municipality of Villameva). Located nearby is a large resins plant and a large Japanese cosmetics plant. An aluminum smelting plant is scheduled for construction on the Phividec Estate within two years, and the Philippine Government has made a feasibility study and is considering establishment of a blast furnace facility on the same estate. This blast furnace facility will be capable of taking a share of the Kawasaki sinters and converting these into bar, sheet, and steel cable which could then be barged across Macalajar Bay to Iligan to complete all links needed for an integrated steel industry in the Philippines from raw ore to finished product. Butuan, the capital of Agusan del Norte Province, and its hinterlands are the site of a lumber, veneer, and plywood industry.



Map 1. North Coastal Provinces of Mindanao, Southern Philippines.

Cagayan de Oro

Map 2 shows the territory included under the authority of the Mayor of the chartered City of Cagayan de Oro. This chartered city is really a sub-province and covers 41,278 hectares (412.8 square kilometers) or more than 159 square miles). As the map indicates, the City includes about 25 kilometers of coastline, the Cagayan, the Iponan, and several smaller rivers (which empty into Macajalar Bay), and a corner of territory stretching southwards past the airport at Lumbia (a City barrio) to the Lanao del Norte boundary west of the Cagayan River and its tributaries some 35 kilometers south of the Cagayan Poblacion. East of the river, the City extends to Bugo, its last barrio and site of the Del Monte canning factory. This is a narrow coastal strip of territory varying from 7 to 12 kilometers in width from Macajalar Bay to the Bukidnon Province border to the south.

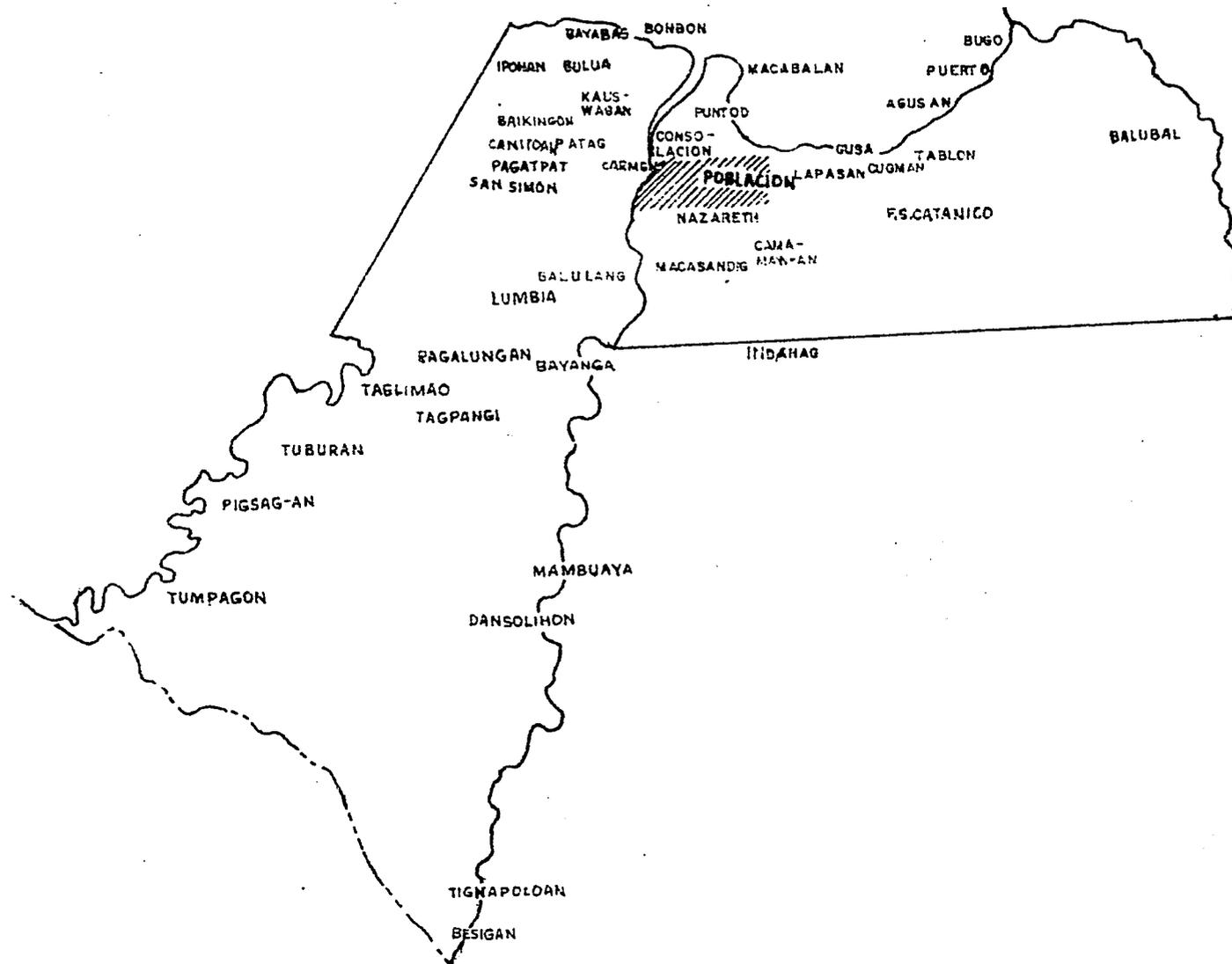
The districts of the central city (the "sociological city" as opposed to the politically chartered "city", which contains much very rural territory in terms of terrain, land use, and population density) tend to cluster about the mouth of the Cagayan River eastwards and westwards, and southwards for about five or six kilometers. While the population of the chartered city may include as many as 200,000 persons, that of the central city totals perhaps 60,000 to 70,000 persons. (The exact figure is not available because the Census definition of the "poblacion" is usually several years behind actual sociological boundaries.

Macajalar Bay is an excellent deep water harbor and is so large as to be able to include an immense number of ships riding at anchor. It is a secure anchorage because free of typhoons because of a ridge of mountains running north and south through both Surigao and a second range also running north and south between the two Agusan provinces and Misamis Oriental and Bukidnon. The City maintains city port facilities in Macabalan District and the Philippine Packing Corporation maintains a private facility at Bugo. Kawasaki has constructed a large containerized docking facility at Villanueva, and Resins has docking facilities in Jasaan.

Jet airline service is maintained from Lumbia Airport by Philippine Airlines with two flights daily to Manila, and flights three to four times a week to Davao and to Cebu. Overnight boat service operates almost nightly to and from Cebu City, and several fast boats reach Manila in 38 to 40 hours.

The airstrip is an all-weather concrete strip several hundred feet above sea level with good drainage. Because of the height, it does not flood. The visibility is usually good and serious fog is rare. The strip is long enough to accommodate short and medium range jets.

Bus service from Cagayan reaches points in all parts of the island. The road from Cagayan to Surigao City and from Cagayan to Iligan is a well-paved thoroughfare as is the road from Butuan to Davao City. Many other roads are deeply rutted, uncomfortable to travel upon, and cause high automotive maintenance costs.



Map II. City of Cagayan de Oro.

Misamis Oriental Climate

The Philippines is a country characterized by high relative humidity, continuous tropical heat broken by relatively small seasonal variations, by heavy rainfall, and with ordinarily gentle winds (outside of typhoon weather). Misamis Oriental and Cagayan share this general weather profile. The relative humidity ranges from 79 to 80 per cent, although drier and damper days at times occur. In Cagayan, the annual 24 hour mean temperature is approximately 27° Celsius while the mean monthly temperature ranges from a minimum of about 18.5° in February to a maximum of about 34.7° in July. Over a 25 year period, rainfall averaged 1,603 millimeters in Cagayan. The mean number of rainy days per year during this period was 128. The rainfall pattern of Cagayan and the western ten municipalities is designated as Philippine Intermediate Type A Climate, which features a short dry season lasting from one to three months. In the western municipalities this usually begins in February or March and ends in May. Type A climate also is characterized by the absence of a pronouncedly rainy season such as that found in Surigao. Peaks of rainfall occur in June and October. Prevailing winds between November and May are (from NE - ENE and E - ESE and from June to October SW - WSW. The rainfall pattern of the northeastern municipalities from Talisayan to Magsaysay is more rainy and has no real dry season.

Population Growth

Cagayan and Misamis Oriental Province and indeed the north Mindanao coast beyond Iligan had been Christianized by the Spanish Recoleta friars by 1630. Before the coming of twentieth century epidemiology, the area was very malarious. In Cagayan, the disease was endemic upon the population. With malaria and other diseases like cholera and typhoid fever together with the Moslem slaving raids, growth of population was severely restricted. Most would-be migrants from Philippine islands to the north were discouraged from seeking their fortunes in the Misamis area. For such reasons, in 1903 the actual municipality of Cagayan (as then actually constituted, not as reconstituted by the Census in terms of present boundaries) contained only 7,108 inhabitants, its present territory, which is larger than in 1903, only 10,957 /and in persons. Misamis Oriental, then part of a larger province called Misamis, had a population of 87,231 persons. The growth of population from that time was rapid in both City and Province. (Present Camiguin Province has been excluded):

	<u>1903</u>	<u>1918</u>	<u>1939</u>	<u>1948</u>	<u>1960</u>	<u>1970</u>	<u>1975</u>
Misamis Or.	56,477	82,114	173,007	300,072	343,898	472,756	560,490
Cagayan	10,937	28,062	53,194	54,293	68,274	128,319	165,220

Social Characteristics

The people of Misamis Oriental Province were in 1960 (the last Census year antedating the MORESCO I feasibility study and the start of construction operations upon MORESCO I) chiefly Visayans speaking Cebuano Bisaya. Of all inhabitants 95.6 per cent spoke this language as their mother tongue. (Census of 1960, Misamis Oriental, Table 1-2). Province of birth for in-migrants was reported as Bohol for 31.5 per cent and as Cebu for 21.8 per cent (Table 1-3, Appendix to Vol. II, Migration Statistics).

In 1960, the predominant occupation of employed males; ten years of age and older, was one of the outdoor occupations of farming, fishing, logging, hunting, forestry, and the like.¹

<u>Farming, Etc.</u>	<u>Other Manual</u>	<u>Transp. & Indust.</u>	<u>Clerical Workers</u>	<u>Sales & Exec.</u>	<u>Prof & Techn.</u>	<u>Serv.& Sports</u>	<u>All Occupations</u>
79.8	3.9 ^a	7.0	1.5	4.5	1.5	1.8	100.0

^aIncludes those not elsewhere classified.

In 1960, 52 per cent of the farm area of Misamis Oriental was devoted to coconuts, 24 per cent to corn, 4 per cent to rice, and 4 per cent to livestock. This appears to have been a fairly typical annual distribution of the area to types of agricultural production. (Census of Agriculture, 1960.)

Value of these crops in millions of pesos was estimated as: Coconuts 17.8, Corn 6.9, Palay (rice) 2.0, Bananas 8.6 and Tuba (coconut liquor) 1.2. Thus for every peso of farm crop production value, 44 centavos were contributed by coconuts and tuba, 16 by corn, 5 by palay, and 20 by bananas to which only 4 per cent of total farm area had been devoted.

The two areas to be compared by the present study are those of MORESCO I and of MORESCO II. The MORESCO I area is westwards of Cagayan de Oro City and contains five rural barrios of Cagayan de Oro City not serviced by the Cagayan Electric Power and Light Company (CEPALCO) as well as ten municipalities. In order to have a "cleaner" sample statistically, the five barrios of Cagayan are excluded from the present study because data is not available separately for them on many variables desired. The ten municipalities are: Alubijid, El Salvador, Gitagum, Initao, Laguindingan, Libertad, Lugait, Manticao, Naawan, and Opol.

¹Bureau of the Census and Statistics. Facts and Figures About the Philippines, 1963. Manila, 1965: 4-7, 100-102. (Now called National Census and Statistics Office.)

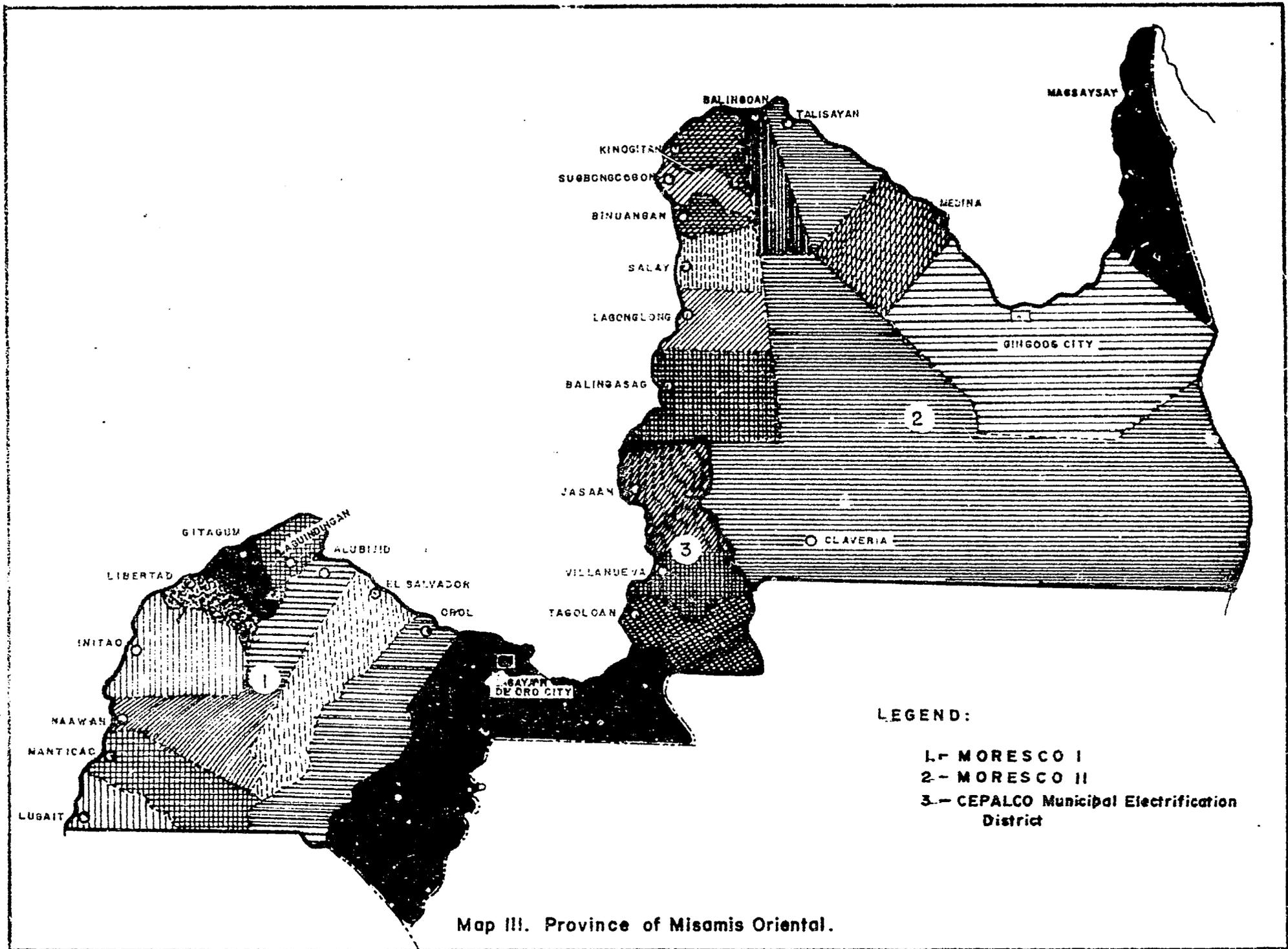
The MORESCO II area lies northeastwards of Cagayan de Oro. Sandwiched between MORESCO II and the City lie three municipalities serviced by a private, commercial utility, the Cagayan Electric Power and Light Company (CEPALCO). These are: Jasaan, Tagoloan, and Villanueva Municipalities. The twelve political units included in MORESCO II are: Gingoog City, and the Municipalities of Balingasag, Balingcan, Binuangan, Claveria, Kinoguitan, Lagonglong, Magsaysay, Medina, Salay, Sugboncogon, and Talisayan. In addition to these political units, three barrios of Jasaan: Danao, Jampason, and San Antonio, are not serviced by CEPALCO, and have therefore been included in the ambit of the MORESCO II. For the same reasons as the exclusion of the five city barangays from the MORESCO I area, the three barangays of Jasaan are excluded. In both cases, the population excluded is less than 4 per cent of the total.

Both areas are presented in Map 3, which also delineates the territories of Cagayan de Oro and of the three municipalities serviced by CEPALCO. Both sets of areas are fairly similar in settlement patterns. Most of the population in any particular municipality is settled along the narrow coastal plain and in the river valleys. The plain is generally from less than one to about four kilometers in depth so that density on the plain is relatively high. On the other hand, inland and upland areas tend to be sparsely settled because poor and rocky soils, steep slopes, and lack of roads to market and town areas tend to discourage settlement in these sites. Exceptions are Claveria in the northeast where fertile plateaus with good water sources can be found in upland areas, and Opol and Manticao in the west where good soil and/or good road facilities can be utilized.

METHODOLOGY: (1) BENCHMARK DATA

No baseline data were collected by this project for the MORESCO I area. The present study was not commissioned until 1978, and although by that time several exploratory studies had been carried out, the earliest of these was in 1975. None of these studies had gathered data on the social conditions to be found in the western ten municipalities before the feasibility study in 1967, knowledge of which may have led to investment by banks and other businesses in this area.

Nevertheless some data are available in the 1960 Censuses of Population, Housing, and of Agriculture. The two areas will be compared in terms of these data in order to discover whether conclusions can be reached as to the similarity or diversity of the two areas in 1960. Such conclusions would help to provide context for the study of the MORESCO I in the light of present conditions in the MORESCO II area.



Map III. Province of Misamis Oriental.

Population Data

Density. The 1960 Census of Agriculture estimated the total provincial area at 379,983 hectares, that is, at 3,799.83 square kilometers. This is the equivalent of 938,938 acres or 1,467.2 square miles. If the part due to Camiguin Island, then part of the Province, is subtracted, 22,927 hectares, and if the territory of Cagayan de Oro is also subtracted, 41,278 hectares, the remainder, 315,728 hectares, still includes the three municipalities of Jasaan, Tagoloan, and Villanueva. When the area of these three municipalities is also subtracted, 22,315 hectares, the area remaining, 293,413 hectares, comprises the sum of the northwestern twelve and the western ten municipalities. Of this 2,934.13 square kilometers (1,132.9 square miles), 812.19 are found in the western municipalities (27.7 per cent), and 2,121.94 (72.3 per cent) in the northeast. Of the northeastern total, 89,493 hectares were found (in 1960) in Claveria Municipality alone, and 40,462 in Gingoog City.

The overall population growth rate per annum for the present Misamis Oriental territory as estimated by the compound interest formula was:

<u>1903-18</u>	<u>1918-1939</u>	<u>1939-48</u>	<u>1948-60</u>	<u>1960-70</u>	<u>1970-75</u>
2.4%	3.8%	5.8%	1.2%	3.22%	3.5%

Average annual growth between October 1, 1948, and May 1, 1975, as reported by the Census was 2.4 per cent. As can be seen in the data, growth has been substantial, averaging more/3 per cent in four intercensal periods. /than Migration apparently played an important role in all but the first period. Net migration apparently was positive in all but the period after the war up to 1960. This migration of course included Cagayan migrants, where in-migration has since 1948 played an important role in City growth.

Of the population reported by the 1960 Census, 343,898 persons, 25 per cent lived in the MORESCO I area, 48.2 per cent in the MORESCO II area, 19.9 per cent in Cagayan de Oro, and 6.8 per cent in the three municipalities of Jasaan, Tagoloan, and Villanueva.

Population in 1960

<u>Place</u>	<u>Population</u>	<u>Per Cent</u>	<u>Cumulative Per Cent</u>
MORESCO I	86,719	25.2	25.2
MORESCO II	165,628	48.2	73.4
Cagayan	68,274	19.8	93.2
Jasaan, Tagoloan & Villanueva	<u>23,277</u>	<u>6.8</u>	<u>100.0</u>
Province	343,898	100.0	100.0

These data furnish the information needed for computation of the densities. Per square kilometer these were in 1960:

<u>MORESCO I</u>	<u>MORESCO II</u>	<u>CAGAYAN</u>	<u>3 MUNICIPALITIES</u>	<u>PROVINCE</u>
106.8	78.1	165.4	104.3	90.5

Evidently, the MORESCO II area was more sparsely settled than the rest of the province. Order of density was: Cagayan, MORESCO I, the three municipalities of Jasaan, Tagoloan, and Villanueva, the Province as a whole, and finally, the MORESCO II area.

However, most of this sparseness of the MORESCO II area is due to Claveria, a large upland municipality with a relatively sparse population. While there is considerable good land in the more western parts of Claveria, much of the east is forestland and mountainous terrain. While the same thing is to some extent true of the western ten municipalities in their more interior territories, it is somewhat less true than in the MORESCO II area, simply because not as much mountain territory has been assigned to the west by political divisions as to the northeast in the Claveria Municipality (which runs in behind all the municipalities of the northern coastline of this MORESCO II segment). If Claveria is removed from consideration, this unbalances the picture in the other direction, since mostly coastal localities are left with mountain barrios within 10 to 20 kilometers by road or trail to the coast. When Claveria is removed, the density of the remaining eleven political units is 123.3 persons per square kilometer.

Population Growth of Segments

Average population growth was more rapid after the War in the MORESCO I segment than in the MORESCO II segment. Taking for indicator of this post-war period up to 1960, the growth between 1948 and 1960, annual rate of increase was 2.2 per cent per year in the west but only 0.8 in the MORESCO II area. It seems clear that net outmigration was larger in the northeast than in the west. Part of this outmigration appears to have been that from farms in the MORESCO II area to farms in Bukidnon and Cotabato, where the Government of the Philippines was making available to settlers, generous tracts of public land.

Fertility

A fairly strong indicator of fertility level is number of children less than 15 years of age. The larger the percentage of such children in relation to the entire population, the higher the level of fertility is judged to be. Where the level of fertility is fairly low, however, the median age of the population is higher and the percentage of persons in the age groups above 19 years of age is larger. The reason is that high fertility is more determinative of population structure than are mortality effects, especially moderate mortality effects.

In 1960, the base year of comparison, the unweighted average of percentages of children under fifteen years of age in the northeastern twelve political units (MORESCO II) appeared to show slightly lower fertility than that of the western ten municipalities. The differences however were very small and may have been due to selective migration. These were:

PER CENT OF PERSONS LESS THAN 15 YEARS OF AGE	
<u>MORESCO I</u>	<u>MORESCO II</u>
48.8	50.3

These are quite high percentages, and indicate a very high level of fertility, probably 45 to 50 births per thousand persons.

The foregoing estimate of fertility level in MORESCO I and MORESCO II make it clear that both these segments must have experienced net out-migration in the 1948 - 1960 period. With an annual birth rate no lower than 45 births per thousand persons and an annual death rate of perhaps 13 to 14 deaths per thousand, the annual natural increase in both segments should be in the neighborhood of 30 persons or more per thousand, that is 3.0 per cent. Neither region showed this much growth. While some evidence suggests that the 1948 Census may have overcounted the population, so that the resultant increase between the figures for 1948 and for 1960, had to make up for an actual deficit in population of the actual from the listed totals, it is also possible that the result may have resulted from a net outmigration from the two segments, especially since free government land was being made available in Bukidnon and Cotabato under the NARRA and the LASIDECO programs of the government.

From the foregoing, one may conclude with some assurance that fertility was high in both segments of the province and probably quite similar. Density was probably also about the same in similar types of poblacions and barrios. The migration data are more opaque because of the possibility of overcounting of a selective nature in the 1948 Census. (The senior author has been told that people were told to come down to the municipal poblacion for census enumeration, and that some sections came down more than once to be enumerated as members of two different barrios. It is hard to verify such stories, but research in the early 1960s has indicated many less persons in some barrios than the 1948 Census had shown. This of course might be due to out-migration, but residents of the barrios when interviewed did not seem aware of large population losses since 1948.)

Social Characteristics

Education. The 1960 Census furnishes three sets of indicators of a very useful nature for measuring the educational quality of the population. These are literacy, highest grade completed, and school attendance. The indicators are not without problems. For example, the highest grade completed data include the entire population, that is, children less than one year of age up to adults in their late senescence. However, since the point of study

is comparison, most of these problems are not important since they are common to both members of the contrasted pair (Tables 8, 9, and 10, Misamis Oriental, 1960).

The MORESCO II area reported higher literacy for persons 10 years of age and above than the MORESCO I area, respectively 75.4 per cent literate as opposed to 68.3 per cent. Interpretation of this datum is somewhat difficult as it is based upon simple answer to the question "Can X read and write a simple message in any language," without demonstration of actual ability. It is possibly indicative of a real difference in literacy between west and northeast of about 7 per cent. It might be more realistic to take the data as evidencing comparative similarity in literacy between the two segments.

Data for highest grade completed however reinforce the impression of higher educational levels in the Northeast (MORESCO II) than in the west. Two items selected for comparison were those thought to be probably more discriminative, namely, no grades completed and high school graduation or higher attainment. Weighted percentages (the data are presented by municipality and weighted in terms of municipal population) for no grades completed and for high school graduation or higher attainment were:

	<u>No Grades Completed</u>	<u>High School Graduates or Higher</u>
MORESCO I	44.1%	3.0%
MORESCO II	40.5%	4.0%

The large percentage completing no grades will not be surprising if the population involved is kept in mind. It includes children less than seven who constitute such a large per cent of the population.

The differences of course are significant as they are based upon complete counts of the population in question. However, the question is rather whether they are large enough to be important. The difference between the top educational category sets is obviously not. That between those who had completed no grades of education, 3.6 per cent, would also appear not large enough to affect the educational quality of the populations very much, although it might make some difference.

School attendance data was almost identical. Of all persons in the MORESCO I area, 15.9 per cent were attending school at the time of the Census. In the MORESCO area, 16.0 were attending school.

The conclusion therefore that these educational data lead to is that in 1960, although some small differences which favored the MORESCO II area, were present between the MORESCO I and the MORESCO II areas, the populations were fairly homogeneous in educational backgrounds.

Social status. Another important social characteristic of a population is its social status. By this term is meant here not so much social class in the strict sense which usually is considered to involve conscious in-group class feeling and a class ethos, but rather relative status differentials that can be found in almost any barangay or municipal poblacion. That a person is adjudged to have middle social status in a barrio or even upper social status is by no means to say that person's household is middle class, but rather that in the barrio and relative to other households this particular household has a higher rating than other households on some set of social criteria.

Social status is useful as a criterion of comparison because it is usually associated not only with prestige, and political power, but also with income and possessions. Thus it presents some indications at least of relative levels of living which would be advantageous for contrasting the two segments, NORESCO I AND NORESCO II.

Among the indicators of social status presented in the 1960 Census data are information upon features of dwelling unit, and upon the materials from which the dwelling unit was constructed (Part II, Housing, Tables 1 and 2.)

The indicators chosen were percentage of barang-barong dwelling units out of all units, a category set of dwellings in terms of construction materials utilized, and toilet facilities.

A barang-barong is a shanty, and is defined in the Census introductory material (Housing, xi) as "... a shack or makeshift affair, usually built of light materials." Percentage of barang-barongs should reflect rather well the proportion of the population experiencing real penury, that is, the hard-core poverty group at the bottom end of the lower social status category set.

The percentages of barang-barongs reported for the two contrasted areas are weighted averages of the municipal values, the weights being the number of municipal dwelling units. These percentages were:

<u>NORESCO I</u>	<u>NORESCO II</u>
9.6	12.5

The difference, 2.9 per cent, is not very large but would seem to indicate that slightly more very poor families had resided in the Northeast than in the West in 1960.

Many sociologists and knowledgeable social practitioners believe that a good discrimination of households by local social status can be achieved by classifying their dwelling units in terms of the materials used in their construction. The following category set classifies dwelling units built from strong materials (stone, concrete, bricks, wood, stucco, etc.) as upper social status dwelling units. It classifies those dwelling units constructed from light materials (bamboo, sawali, nipa, cogon, etc.) as lower social status dwelling units. Finally, it classifies dwelling units constructed from a mix

of strong and light materials (e.g., wooden walls with a nipa roof) as middle status dwelling units.

This classification of households by the nature of their dwelling unit as reported in the 1960 Census produces the following table:

<u>Social Category</u>	<u>MORESCO I (WEST)</u>	<u>MORESCO II (NORTHEAST)</u>	<u>DIFFERENCE</u>
Lower Social Status	61.0%	54.8%	+ 6.2
Middle Social Status	30.9%	39.9%	- 9.0
Upper Social Status	8.1%	5.3%	+ 2.8
<u>Total</u>	<u>100.0%</u>	<u>100.0%</u>	<u>---</u>

This table suggests a larger lower social status group in MORESCO I, with less income and less social prestige. Thus although MORESCO II apparently contained slightly more destitute families, the lower status group seemed larger in MORESCO I in 1960 than in MORESCO II. In addition, the middle status group in MORESCO I appeared to be substantially smaller than in MORESCO II. The small upper status group was slightly larger however in MORESCO I. However, if the data are dichotomized into upper and lower status, and middle status is combined with upper status, the upper status group is larger in MORESCO II. This result is:

	<u>MORESCO I</u>	<u>MORESCO II</u>	<u>Difference (I - II)</u>
Lower Status	61.0	54.8	+ 6.2
Upper Status	39.0	45.2	- 6.2
<u>Total</u>	<u>100.0</u>	<u>100.0</u>	<u>0.0</u>

These data suggest substantially the same picture as that supplied from the information on education. In general, the Northeast seemed to be slightly favored over the West, although more destitute families may have resided in the Northeast. The differences however were not large and a general picture of homogeneity with almost randomly varying specific aspects emerges.

Occupation. The report for Misamis Oriental of the 1970 Census of Population and Housing presents data by municipality (Table II-6, p. 26), on a 5 per cent sample basis. For the Province as a whole, farming, fishing, hunting, and forestry (grouped into one category) formed the largest industry or occupational grouping reported by the Census. For persons 10 years of age and above, main occupations or industries reported were in terms of percentages:

<u>Agric., Fish., Hunt., For., Etc.</u>	<u>Ser- vices</u>	<u>Mfct- ring</u>	<u>Com- merce</u>	<u>Transp. Comctn., Stor.</u>	<u>Constr. ctn</u>	<u>Uti- lities</u>	<u>Other nec^a</u>	<u>Min., Quarry</u>	<u>All Ind., Occeptns</u>
56.9	16.0	9.5	6.7	5.5	3.8	0.3	1.2	0.1	100.0

Inclusion of Cagayan de Oro accounted for the relative size of some of these categories, as will be seen when Cagayan and the three municipalities are excluded from the data:

73.4	9.7	5.5	5.1	2.5	2.9	0.1	0.7	0.1	100.0
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The data for the two areas reveal considerable homogeneity of occupation in the two populations. Both were in 1970 heavily agricultural areas (hunting, fishing, and forestry employ relatively negligible numbers of persons full time), both had about the same percentage engaged in commercial activities. Considerably more persons (mostly female domestic servants) were engaged in the services in MORESCO II which accords well with the previous finding of a larger group composed of middle and upper status families. About the same proportion were engaged in transport, communication, and storage, and in "manufacturing", which may mean foodstuffs, tailored garments or footwear, etc. Proportions engaged in construction, utilities, and mining or quarrying were quite small in both areas, although larger in MORESCO I.

MORESCO I AREA

75.1	6.7	5.0	5.5	2.4	4.3	0.4	0.4	0.2	100.0
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MORESCO II AREA

72.6	11.2	5.7	4.9	2.6	2.2	0.0	0.8	0.0	100.0
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Clearly then, the important economic occupation in both MORESCO I and MORESCO II before the advent of electrification was agriculture. As far as relative numbers engaged in agriculture, the Population Census shows that relatively negligible difference existed between the two areas as late as 1970. Attention is turned therefore to an examination of the agriculture practised in the two areas.

Agricultural Data

The 1960 Census of Agriculture in its report for Misamis Oriental gave the number of farms at that time as 34,346 (including the present Camiguin Province). It also estimated the total area of farms at 140,804.9 hectares, and the average farm size as 4.1 hectares.

^aOther, not elsewhere classified, and inadequate information.

This report reveals that in 1960 the three main crops of Misamis Oriental Province in terms of land invested in them were coconuts, corn, and palay (unhusked rice). The 1960 Census enumerated or estimated (Table 4) 17,560 coconut farms with an area of 73,945 hectares, 9,694 corn farms with an area of 33,046 hectares, and 1,511 palay farms with an area of 5,170 hectares. Average size of coconut farm was 4.2 hectares, of corn farms was 3.4 hectares, and of palay farms (lowland and upland varieties) was 3.4 hectares. Of total farm area (140,804.9 hectares), 52.5 per cent was therefore devoted to coconuts, 23.5 per cent to corn, and 3.7 per cent to palay. Almost 80 per cent of the available farm land was thus devoted to these three crops.

Farm size was larger in the MORESCO II area in 1960. Tables 1 and 4 present farm area and number of farms. From these the following data were computed:

	<u>MORESCO I</u>	<u>MORESCO II</u>
Total area of farms	27,917.3 ha.	77,529.1 ha.
Number of farms	9,169	17,373
Mean farm Size	3.0 ha.	4.5 ha.

Rate of tenancy per hundred hectares of farm area was also greater in the MORESCO I area.

Operated by Tenants (all types)	5,719.6 ha.	9,725.3 ha.
Per Cent	20.5	12.5

These data appear to show that the mean farmer was better off in the Northeast than in the West before the advent of electrification. He was farming more land and on a substantial number of farms was less likely to be a tenant. (Among tenants, the proportion of those who are not share tenants is very small.) This would indicate higher household income from farming, the main occupation, in the Northeast.

A similar finding results when farms are examined by number rather than by area of farms. Once again, the MORESCO I area is found to have substantially more tenant farms.

	<u>MORESCO I</u>	<u>MORESCO II</u>
Number of Farms Operated by Tenants	2,715	3,170
Per Cent Farms Tenant Operated	29.6	18.3

Area planted to three main crops. In the Northeast, the main crop was coconuts. More farm area was devoted to coconut production (and to tuba, a coconut liquor produced from the fermented juice of the coconut flower or "heart") and to palay, and less area to corn than in the West. The significance of these facts is that rice commands a considerably higher price per weight than shelled corn, while copra and other coconut products find a ready market in the purchasers who travel through the area buying crops.

<u>Per Cent Farm Area Devoted to:</u>	<u>MORESCO I</u>	<u>MORESCO II</u>
Coconuts	37.1	43.0
Corn	30.3	11.8
Palay	2.2	5.7
<u>Total</u>	<u>69.6</u>	<u>60.5</u>

The planting of corn rather than of rice is not an arbitrary decision. Paddy rice demands an abundant water source either in rainfall or in a river, stream, or irrigation system. The soil must also contain enough clay to hold the water during the growth period of the young rice. If the soil is too porous, the water will sink into the ground, and the paddy will dry out. Upland rice also demands certain conditions without which corn can be grown. These data appear to show that average value of farm crops per hectare was greater in the Northeast than in the West.

Using the same data as source (Table 10), average production of palay per hectare was computed for both Northeast and West. Results were:

	<u>MORESCO I AREA</u>	<u>MORESCO II AREA</u>
Cavans/ha.	18.6	27.3

The value of this palay in terms of 1960 Pesos was also estimated from the same source:

Pesos value per Cavan of 44 kilos	₱ 8.00	₱ 8.27
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Similarly, the value of coconut production per hectare was computed from the Census estimates:

	<u>MORESCO I AREA</u>	<u>MORESCO II AREA</u>
Mean Production per Hectare, Nuts	4,949	3,744
Value/ha.	₱ 342	₱ 265
Tuba/ha. (liters)	196	96
Value/ha.	36	14
Total Value/ha.	₱ 378	₱ 279

Production of corn per hectare was also computed from the 1960 Census (Table 13). Mean production per hectare, and average value of shelled corn per cavan (57 kg.) were:

Mean Production per hectare, cavans	12.1	16.7
Value per cavan (57 kg.)	₱ 8.67	₱ 8.55

Putting these values together in terms of the amount of land invested in each crop type, and then dividing through by number of hectares allocated to these three crops, one comes to the following average per hectare crop value^a for each area:

<u>MORESCO I</u>	<u>MORESCO II</u>
₱190.40	₱225.73

The peso value of production per hectare of farmland in the MORESCO II area was thus 18.6 per cent more valuable than that of the MORESCO I area on farmland allocated to the three main crops of corn, palay, and coconut. This is a fairly substantial difference.

Summary of Census Data Upon the Two Areas

The foregoing data appear to show that the MORESCO II area (the North-eastern twelve political units) and the MORESCO I area (the Western ten

^aOnly for hectareage allocated to corn, palay, or coconut production, 69.6 per cent of all farm area in the West (MORESCO I) and 60.5 per cent of all farm area in the northeast.

municipalities) were fairly well matched and homogeneous in most social and economic categories in 1960, before the advent of electrification to the West. If either side was slightly advantaged, it would appear to be the Northeast.

The population data reveal about the same high fertility for 1960, and - for the coastal towns and hamlets - rather similar densities. The social data for 1960 seem to show a larger upper status group in the Northeast and a larger lower status group in the West (when middle and upper groups are combined). There is some evidence of more very poor families (near destitution) in the Northeast, and of more higher status families per thousand in the West (when middle and upper status groups are not combined).

The economic data reveal in both areas a population that was predominately agricultural with more service workers in the Northeast, a finding which reinforces the impression of a larger upper class in the Northeast because a large component of the service workers are female domestic servants.

They also show greater investment of land, percentagewise, in coconuts and in palay, the two more valuable of the three main crops, and less investment in corn in the Northeast as compared with the West. They show larger average farm size, and less tenancy in the Northeast also. Finally, for hectareage devoted to the three main crops, average value per hectare was almost 20 per cent greater in the Northeast.

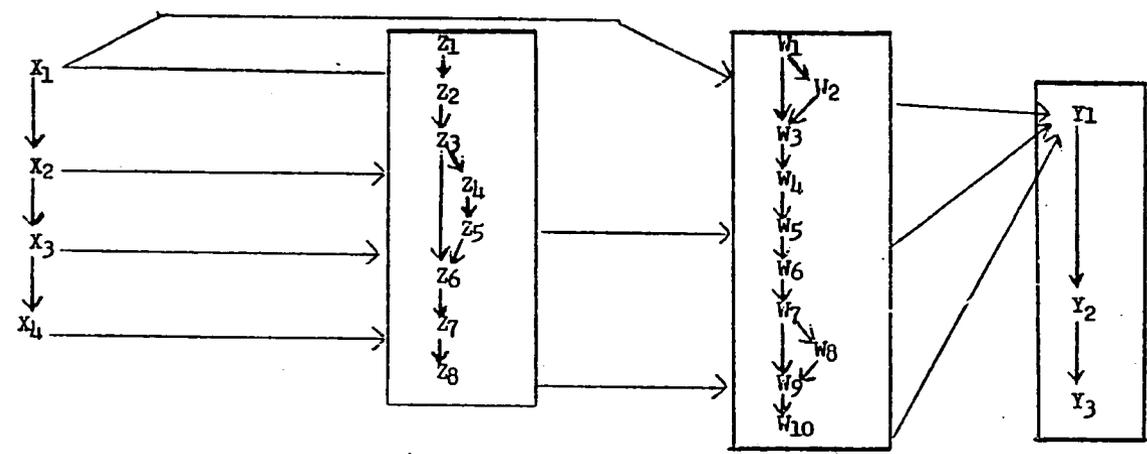
These data appear to show that the two areas did not differ much in terms of population, social, and economic characteristics. If anything, the Northeast (the MORESCO II area) had a small advantage over the West (the MORESCO I area). The two main social infrastructures that have intruded into the picture within the recent past are the rural electric service cooperatives and the concrete road. The road, however, had scarcely been opened at the time of the two surveys, and the electrification cooperative had yet to make its appearance in the MORESCO II area at the time. It is at least probable therefore that the rural electrification cooperative which began in the West in 1971 had something to do with any large-scale change that developed in later years between the MORESCO I and the MORESCO II areas.

METHODOLOGY: (2) RESEARCH DESIGN

The Substantive Logic

The overall "model" of the present infrastructural study is presented in Figure 1, following this page. In general, this is less a true model than an attempt gradually to specify a model through the empiric studies of the Research Institute for Mindanao Culture (RIMCU). The conceptual framework has grown out of rural electrification studies which began in 1975 (with financing by USAID/Philippines, IDRC/Ottawa, FAO, UNEPA, and AID/Washington). The principal hypothesis that has grown out of these studies is that cooperative rural electrification, in which recipients pay charges for both installation and monthly electric current consumption is associated with use of family

Exogenous, Independent Variables Community Level Changes Household Level Changes Decisions and Use of Family Planning



- X₁: Rural electric service cooperative (MORESCO I)
- X₂: Other governmental infrastructures (e.g., Concretizing of Butuan-Cagayan-Iligan National Road, new Cagayan concrete bridge, etc.)
- X₃: Other inputs, public or private a) health, b) nutrition, c) housing, d) potable water, e) upgrading of gov't educational facilities.
- X₄: Family planning program: (Consultation, clinical & outreach assistance, services, supplies).

- Changes at the Community Level
- Z₁: Improved Community service at municipal poblacion and/or barrio level (public health, water, medical care, sanitation, etc.)
 - Z₂: Increased effectiveness of educational services; new curricula (night classes, night school).
 - Z₃: Increase in new and in-migrant businesses (commercial, industrial).
 - Z₄: Increased investment in public & private infrastructure
 - Z₅: Increased employment of men and women in off-farm, non-family enterprise as a community phenomenon

- Z₆: Increased community income (licenses, taxes, enhancement of property values, etc.)
 - Z₇: Increased average household income as a community phenomenon.
 - Z₈: Increased social status of women as a community phenomenon.
- Changes at the Household Level
- W₁: Desire for electrification of household.
 - W₂: Recognition of problems of financing and plans for loans & credit & for regular repayments and meeting power bills

- W₃: Relative economic status (Rosterlin)
- W₄: Wife realizes she can do housework at night; can take daytime job. Can also work with children/family nights at home on income-producing tasks (shelling corn, nipa squares for roofing, etc.)
- W₅: Employment opportunities away from home available to women.
- W₆: Couple make decision and plans for allocation of wife's time (household technology of household production) (Becker, Mincer).

- W₇: Employment of women away from home as a household phenomenon.
- W₈: Increased total household income as household phenomenon.
- W₉: Increased social status of women as household phenomenon.
- W₁₀: Aspirations for more/ higher quality goods, higher level educ. and occupations for children.
- Y₁: Perceived values and opportunity costs of present and additional children.
- Y₂: Use of family planning.
- Y₃: Changes in current fertility measures.

Figure 1. Conceptualization of Flows from Infrastructure to Community, Household, and Family Planning Decisions.

planning where family planning services are available at low cost or free of charge.

This association had been noticed even in the earliest exploratory studies carried out by the RIMOU. The association continued to appear through several different area studies and occupational groupings covered by these investigations. The present study was mainly conceived as an attempt to discover whether this association would continue to appear in a large probability sample of the area covered by the cooperative rural electrification project, MORESCO I.

Philippine Census data were checked in order to see whether one might use data from the northeast segment of the Province, not yet electrified at the time of the present study's field work, as quasi benchmark data for comparison with data from the western part of the Province, already electrified since 1971 by MORESCO I. The investigations related in the preceding sections of this report show that in 1960-1969 before electrification, the rural western and the rural northeastern segments of the Province were quite comparable in terms of what seem to be relevant factors: fertility, income, occupation, education, social status, land tenure, employment in manufacturing, and employment of women.

On the basis of these findings, the northeastern segment of the Province (exclusive of Tagoloan, Villanueva, and Jasaan Municipalities) was assumed to be in 1969 quite similar to the western segment of the Province in aspects relevant to the social and economic level of the populations of the two segments. The research methodology specified was therefore that of the "Quasi-Before" and the "Quasi-After" Design. The logic of the design presumes that before 1969, the two segments of the Province were alike, differing little in the variables of interest (fertility, income, occupation, education, social status, land tenure, employment in manufacturing, and employment of women). The changes that have happened in them were therefore to be attributed to influences that had affected each one of them in parallel fashion (political context, national growth, national economic conditions, land tenure, land usage patterns, prices of crops in domestic and international markets, and so forth) and to influences that had affected each of them in diverse ways.

Of the latter type influences, a new concrete road was being developed at the time of the field work. At that time however it was unfinished in both segments of the Province and was causing more transportation difficulties because of rough detours than the previously non-concreted road. The only other main variable that had affected one or the other segment in important degree seems to have been the rural electrification cooperative MORESCO I, in the rural western segment, which appeared to have had important economic and social influences upon the western segment's population, but little or no influence upon the northeastern segment's development. The logic of the research design therefore attributes to rural electrification, specified as the MORESCO I cooperative, major differences in fertility, income, occupation, education, social status, land tenure, employment in manufacturing, and

employment of women, that can not be explained in terms of variables affecting the two populations equally (martial law, national programs implemented equally in both areas, etc.).

The logic of this design, however, is much weaker than that for a true before-and-after research design (in which one has controlled the disturbing factors to some extent and especially the experimental variable, which is in this case the introduction of a rural electrification cooperative). A true before-and-after design would have studied the western segment of the Province before establishment of the MORESCO I cooperative, and would have studied events prospectively, with control over disturbing factors (at least through observation) and strong control over the experimental variable throughout the period of study. If effects of disturbing factors and of interaction between study population and experimental factor could be eliminated or well controlled, such a design might give fairly strong indications of causal influence.

Readers should bear this caution in mind when assessing results obtained by the present study. This study can mainly show association. Attempts to show causality will of necessity be logically weak because of lack of control over both the experimental variable and the disturbing factors. The hypotheses of study are mainly hypotheses of association rather than of causality. Testing causal hypotheses about rural electrification represents a stage in the RIMCU studies still two years or more in the future. These will require much more sharply focussed and controlled field experiments. The present study is a large, multi-focussed survey.

The main hypothesis of the present study was that electric illumination had such great appeal to the poor and rural inhabitants of the western Provincial segment that when the household heads and their wives, of households in areas potentially to be electrified realized, against all expectations at that time and despite their rural residence, that they might be able to obtain electrification of their dwelling unit without inputs simply beyond their ability to pay, they went to great lengths to provide for themselves and their family this good. Most such households were near or below the subsistence level of income as determined in view of the Abrera poverty threshold (1976).¹

The study more specifically went on to hypothesize (as the recursive but over-simplified model on page 18, preceding, shows) that the electric current provided by the rural service cooperative in conjunction with other governmental infrastructures in place or being constructed together with other public and private inputs among which were family planning services would bring about improved community services at the local community (municipal poblacion or barrio) level, including educational services. These combined services, especially electrification, would stimulate business and industry to start up or

¹Ma. Alcestis S. Abrera. Philippine Poverty Threshold. In Measuring Philippine Development. Tagaytay: Development Academy of the Philippines, pp. 223-273.

migrate into the area and would also stimulate further investment in public and private infrastructure. This should lead to increased employment in off-farm, non-family business and industry. A result should be increase in community income due to licenses, taxes, the enhancement of property values and similar causes. One would expect that average household incomes would rise in the communities, and to the extent that women contribute to this increase in income, the social status of women might be expected to increase in these communities.

These community level effects were hypothesized to lead at the household level to a desire to have electric current installed in one's own dwelling unit. However, a direct effect of the electric cooperative upon individual households was also hypothesized because of the convenient, clean, and cool (as opposed to the hot pressure lamps based on oil fuels) nature of electric illumination and power.

The poverty of these households and the difficulties for them of obtaining loans and then repaying them by regular installments was seen as causing the married couple to plan together how they might obtain the loan and then repay it systematically, while at the same time making the necessary monthly payments for electric current consumed. If either parent's home had been electrically illuminated or of a social status as to call for electric illumination should it become available, it was hypothesized that this would further add to motivation for such planning, if the couple were at present living at a level below that they had experienced in either parents' households during adolescence.

The expenses of another pregnancy and birth would obviously be thought of, and, it was hypothesized, be thought of as competing with the costs of installing electrification into their residence and of meeting bills not only for current consumed but also for any electrical appliances they might buy on credit. (Trading in the old battery radio and buying an electricity-powered model was observed to be a very frequent transaction.) Some would decide to make use of family planning services at this point to prevent an inconvenient pregnancy, it was hypothesized.

With electricity, it was further hypothesized the couple would realize that the wife could take a job during the day-time (if childcare services were available to her) and do her housework at night. Employment of wife should be a distinct possibility, it was hypothesized, because the availability of electricity should have brought in businesses, and some of these should have offered employment to women. The couple should also have realized that the wife and family could do income-producing work at night after the day's farm work by means of electric light (shelling corn, making nipa squares for house roofing, poultry care, etc.).

The couple, it was hypothesized, would decide how they want to allocate their household time and household production. In some cases the decision would be that the wife will seek off-farm, non-family business employment away from the home. Some of these women would find such employment. This employment

would bring in additional income to help to meet the various loan and payment obligations for electrification. The employment would also furnish the motive for deciding to make use of the available family planning services to avoid an inconvenient birth during the time the wife is working to help pay for the various obligations taken on with the installation of electric current in the family dwelling unit.

Because of the increased cash income which the wife would now contribute, it was hypothesized, the wife would gain in family status with husband, with children, and with kin. Because of her increased status and because of her wider contacts as a result of holding a job, her aspirations for a higher living standard for her family might begin to rise. She would likely desire more and higher quality goods for the home, and in addition want her children in the future to occupy higher occupational niches in society, and would thus want them to be provided with the necessary education to make such occupations practicable. Additional children to some extent would threaten the quality of training of the children she has already fantasied and she would begin to weigh the values of larger and smaller family sizes and of children provided with higher quality education and with other advantages in comparison with children provided with lower quality education and utilities. She and her husband would very likely take into consideration farm size and tenure in reaching their conclusion.

It was hypothesized that the decision of many such rural women and their husbands would be to use family planning to avoid, space, and limit conceptions in order to exert more control over family size. They would presumably choose a method to their tastes and begin to practise it. Since their motivation would be serious, their fertility should be affected, and the level of fertility among such women should decline to a level lower than the fertility of women not practising family planning.

Such in brief was the theory governing the research which is described in the present report. In a later section, specific hypotheses guiding the data gathering will also be presented.

The Sampling Design: Statistical Aspects

The sampling plan specified a stratified, two-stage PPS design. The first stratum covered all households in the eleven municipalities and in the extra-poblacion barrios of Gingoog City, which comprise the northeastern segment of the Province from the Cagayan boundary, omitting Jasaan, Tagoloan, and Villanueva Municipalities. These (except for several barrios in Jasaan Municipality previously mentioned) receive electric current from the Cagayan commercial utility, CEFALCO. The poblacion of Gingoog City at that time was also electrified and was thus also excluded from the study. The second stratum was the western segment of Misamis Oriental Province beyond the Cagayan city boundary. The sampling frame of the ten municipalities of this western segment included all barangays and households of the segment. The reader will recognize

the "Before" stage of the study in Stratum One, and the "After" stage in Stratum Two.

In the first stage of sampling, barrios were drawn into the sample by probabilities proportional to size, measured by number of resident households enumerated in the 1975 Census. The term, barrios, here is used also to cover poblacions which were drawn into the sample as listed in the Census (given as single poblacion, or subdivided into barangays, with appended number of households per barangay). In each stratum after a random start in the first interval or half-zone, selection of primary sampling units was accomplished by systematic sampling. Altogether, 50 clusters were picked in each of the two explicit strata. Twenty-four households were to be interviewed in each cluster (if Census and actual household count tallied exactly) in the northeastern segment and 40 households per cluster in the western segment. In the northeastern segment, two barangays of the same large Gingoog City barrio, Anakan, appeared in the first stage selection, and Lanesi, a large barangay of Claveria Municipality which covered the sampling interval, also appeared twice. In the western segment, two large and unsegmented municipal poblacions (without subdivision into barangays in the 1975 Census data), Initao and Lugait, also appeared twice each in the 50 clusters.

Besides, the explicit clusters, implicit strata were also utilized and two clusters were picked per implicit stratum or zone.

Altogether, 3,469 households were interviewed, 1,224 of which were in the northeastern segment, and 2,245 of which were in the western segment. These results appear to show outmigration in the northeast, where three years after the 1975 Census, household totals had increased only 2 per cent over the 1975 Census count, after 3.4 years, and in-migration in the west where four years after the Census 12.3 per cent more households were found than in the Census. The sample included 2.9 per cent of all northeastern segment households, and 9.6 per cent of all southwestern segment households. Probabilities of selection into the sample were equal per household in its own stratum (segment) and were approximately 7.1×10^{-4} in the northeastern segment, and 1.9×10^{-3} in the western segment. The populations were estimated at 200,500 persons on September 11, 1978 (median date of interview) in northeast and at 132,595 persons on June 5, 1979 (median date in west). Estimated annual rate of increase was 2.8 in the west and 0.6 in the east.

In each selected cluster, the barrio was mapped and dwelling units and households were listed. Then households for interviewing were picked after a random start in each barrio, by systematic sampling from the lists.

AFTER ELECTRIFICATION: INCOME, OCCUPATION, AND EMPLOYMENT

INTRODUCTION

In this first chapter on results, examination of the impact of rural cooperative electrification upon various aspects of the social and physical life of the population is initiated.

Income Analysis

The logic of study suggests income analysis of the Quasi-Before and the Quasi-After Strata as an appropriate point of entrance into study of results. If after eight years of rural electrification in the Quasi-After Stratum (hereafter for convenience called simply After and the Quasi-Before called Before, understanding however a "quasi" with each) had experienced no comparative advantage over the Before Stratum (which in the 1960-69 period appeared to have higher median income), this would call into question basic assumptions, not only of the agencies providing the rural electric infrastructure, but also of the present study. Without higher average or especially median income following after electrification, it will be hard to see that the infrastructure has been of great benefit to the economically poorer households of the area. Income is so obviously a basic element to level of living that failure to increase income position relative to the non-electrified stratum would be tantamount to failure of the infrastructure to achieve its basic social goals.

Income is also basic to the main hypothesis of association between rural electrification and lower fertility. If poorer families who had installed electricity in their dwelling units have not increased their income, it will appear that they were not so intent on the installation as had been hypothesized, and not so ready to sacrifice other goals to putting together the sums necessary to repay installment costs, regular monthly electric current bills, and charges on facilities bought on credit in the Cagayan or Iligan shops. In this case such activities as work at home at night on income-producing activities, employment of the wife in extra-home jobs, night housework, and avoiding the expenses of an additional birth by means of acceptance and use of family planning seem less likely to be adopted on a meaningful scale.

In the examination of results, median income will be expected to be greater in the MORESCO I (western) sector than in the MORESCO II (eastern) sector, despite higher income in the 1960's in the MORESCO II area. Further, in the western segment higher median income will be expected in households which have installed electricity than in those households which have not. The logic for such expectations, if the basic hypothesis holds true, is the same for both comparisons and is that set forth in the preceding paragraph.

If in fact, such expectations are verified, the increased income in the west will be attributed to rural electrification as the only differentially operating infrastructure set in place since the 1960's, of long enough influence to produce the difference. This attribution will be of moderate persuasive power only, because of weaknesses in the quasi-before and after design.

It is not expected in either comparison that differences between incomes will prove significant. Variations in income data are too great to obtain a standard error in samples of size 1,200 and 2,250 capable of showing significance. Many zero cash incomes from main occupation are likely to be reported by rural household heads while others will report incomes as high as ₱25,000 or more. Nevertheless, if income results turn out as expected, binomial probability and Bayesian statistical theory would counsel non-rejection of the hypothesis of causal influence of the rural electricity upon the income as the less damaging decision between the two possible statistical errors of accepting a false hypothesis and rejecting a true one. If rural cooperative electricity has been in fact so catalytic a factor in the Misamis Oriental west, and yet the hypothesis is rejected as untrue, a very promising developmental lead will have been lost. On the other hand, non-rejection as false (acceptance) of the hypothesis when it is in fact false will probably not greatly change the provision of this infrastructure as far as the Philippines goes.

Income Results

The first of the two income hypotheses was that income is associated positively with cooperative electrification of the political unit of residence (municipal poblacion or barrio). An indicator for this analysis was segment. The northeastern segment (none of whose political units were electrified at the time of interview) was taken as a quasi-before for this test and the western segment was taken as a quasi-after. All the municipal poblacions had been electrified by MORESCO and most of the barrios, in the western segment.

The median annual incomes are given in constant September 1978 pesos:

<u>Type of Annual Income</u>	<u>Northeast</u> <u>Incomes in Constant September 1978,</u> <u>Pesos</u>	<u>West</u> <u>Incomes in Constant September 1978,</u> <u>Pesos</u>	<u>Per Cent</u> <u>Difference</u> ^c
a) Cash income from main occupation of household head	1,626 ^a	1,822 (2,021) ^b	12.1
b) total cash household income	2,287	2,678 (2,970)	17.1
c) real household income (cash plus kind)	3,310	4,502 (4,994)	36.0
<hr/> Total Number of Households	<hr/> 34,325 house- holds	<hr/> 23,280 households	

^aActual September 1978 median incomes.

^bActual June 1979 median incomes. Inflation September 1, 1978 - August 31 taken as 14.82 per cent.

^c $\frac{W-E}{E} - 17 \times 100$.

The second hypothesis predicted higher income in households with electrified dwelling units than in those with non-electrified dwelling units. This applied of course only to the western segment. Results again supported the hypothesis, but two of the differences between median incomes were not significant at .05.

<u>Income Categories</u>	<u>Electricity Facilities Installed</u> <u>in Dwelling Unit</u>	<u>Electricity</u> <u>Facilities not</u> <u>Installed</u>	<u>Per Cent</u> <u>Difference</u> ^a
Income from Main occupation of household head	(Incomes in 1979 Pesos) ₱4,308	₱ 1,929	55.2
Total Cash Income of Household	₱5,593	₱ 1,943	65.3
Total Real Household Income (Cash and kind)	₱7,096	₱ 4,050	42.9
Total Households	8,190 households	15,090 households	

^a $1 - \frac{N}{Y} \times 100$, where Y = Electrified and N = Not electrified.

While as a group, 5 of these 6 differences were not significant (very large variations were found between incomes), the binomial probability of obtaining 6 medians all favoring the income of the electrified segment or household is small, if one assumes in the two segments no significant difference. This probability is .016. The conclusion one must come to is that electrified political units and electrified dwelling units are associated with significantly higher median incomes of residents than the incomes of non-electrified political units and residences.

The two hypotheses of association of income with electrification are supported by the results. This association however does not prove causality by itself. Nevertheless, a moderately strong argument may be made for causality from the following substantive logic. The two segments, northeast and west, were shown to have been quite homogeneous with regard to indicators of income, before the introduction of rural cooperative electrification service in the west. In fact, the northeastern segment seems to have been significantly advantaged at that time. The only other major infrastructural change (other than changes dependent upon electrification) has been the opening of much of the new concrete road through both areas in late 1978. This opening however has been much too recent to have had much effect on incomes in either area before June 1979 (median date of interview in the western segment). Secondly, the road has affected both segments about equally.

The logic of this line of reasoning is to credit rural electrification, and the changes it brought about, with causing the increases in levels of income of electrified political units (represented by the west) over non-electrified political units (represented by the northeast).

Less strongly, rural electrification is also credited with the differences in median income between electrified and non-electrified households. The reasoning presumes that these differences come mainly from increases in crop production (electric pump irrigation), from better animal husbandry and poultry methods (because of available electricity), and from increased employment of family members in new off-farm, non-family businesses. Altogether 8,190 households of the 23,280 households of the western segment (35.2 per cent) are estimated to have installed electrical wiring and fittings in their residences.

Income by Educational Attainment: A Contrary View

At this point, the contrary hypothesis must be considered that wealthier households have chosen to install electricity in their residences when the opportunity presented itself through the FORESCO rural electric service. Thus the explanation of the association between higher income and electrification of the dwelling unit is simply that more wealthy families chose to make the installation, rather than that because of electrification of the dwelling unit, household income increased.

Obviously, there must be some association between antecedently higher income and electrification of the dwelling unit. Wealthier families always are in a position to profit by opportunities to a greater extent than families near or below the line of absolute poverty. That is not the point at issue in this place. The question is, was there enough effect in the opposite direction to be able to say that poorer families increased their income because of the effects of electrification upon their social and economic levels of living, including the possibilities of employment? Secondly, this hypothesis cannot explain the difference in income between the electrified west and the non-electrified eastern segment, since in the 1960s, as has been seen, the eastern segment had higher income.

A first examination of the data is made by crossclassifying education by income. Education of household head is a long-term process unlikely to be much affected by such recent events as rural cooperative electrification. The reasoning is that if education is found to be little correlated with income, the hypothesis that more wealthy families were the ones who installed electricity can be rejected because it would seem to show that income had increased (due to electrification) beyond the usual association with education. On the other hand, if a positive relationship is found between income and education, that does not necessarily support the hypothesis because it might be the result of an across the board increase in income roughly proportional to educational achievement. (Work opportunities often depend upon certain educational qualifications, for example.)

The following data for annual total cash income of the household by the educational attainment of the household head are index numbers based upon the 3rd quartile value (in U.S. dollars, \$1,061.43) of household heads who had completed some year or years of college without graduation. They are of course for the western segment only.

	<u>HIGHEST GRADE COMPLETED</u>						
	<u>No Grade</u>	<u>Some Elemen.</u>	<u>Elem. Grad.</u>	<u>Some High</u>	<u>High Grad</u>	<u>Some Coll.</u>	<u>Coll. Grad.</u>
1st Quartile	11	11	17	23	30	44	69
Median	24	24	37	46	57	71	88
Third Quartile	48	48	64	73	81	100	130
Mean	38	36	48	54	61	78	94

These index numbers indicate strong and significant association between income and education. Income rises steadily with progression from less to more education whether one examines means, medians, first, or third quartiles. This finding requires examination of the distribution by income of households who have and households who have not had their homes properly wired to receive electric power and light through the MORESCO I mains. For it partially supports

the hypothesis that it is the wealthy mainly who have installed electricity in their homes, and might be interpreted in that light in the absence of further evidence.

Income by Electrification of Dwelling Unit

If results indicate that most of those households who had installed electricity into their residences were in the high income brackets, the "contrary" hypothesis, that it was largely the rich who installed electricity into their homes, and this is the reason why the mean income of those households with electricity, is greater than those without electricity will be supported.

On the other hand, if a large proportion of those households who installed electricity are found to have lower incomes, comparatively, and if electrification of dwelling unit is spread broadly across the entire income distribution, then the "contrary hypothesis" can be rejected. For while (as must be expected) a larger proportion of the wealthier families may have installed electricity, such results can only be interpreted to mean that electricity was broadly attractive to all income groups and installed rather generally, especially since first quartile incomes among installers were considerably greater than among non-installers. In this case, the hypothesis that electrification increased the income of households where it had been installed over those in which it had not been installed, cannot be ruled out by the association between education and income already seen above.

The data were as follows:

<u>Total Annual Household Income</u>	<u>Electricity Installed</u>	<u>Electricity Not Installed</u>	<u>Electrified as % of All Household^a</u>	<u>Number of Households</u>
Below \$2,000	5.2%	23.5%	10.9%	3,990
\$2,000 - 3,999	14.1%	25.9%	22.8%	5,050
\$4,000 - 5,999	19.1%	21.8%	32.2%	4,855
\$6,000 - 7,999	17.5%	11.1%	46.0%	3,110
\$8,000 - 9,999	10.0%	6.6%	45.1%	1,815
\$10,000, or more	34.1%	11.1%	62.5%	4,460
<u>TOTALS</u>	<u>100.0%</u>	<u>100.0%</u>	<u>35.2%</u>	<u>23,280</u>

^a Within income group, per cent of electrified dwelling units out of all dwelling units.

These results show that households with total annual cash incomes of less than ₱6,000 a year made up 38.5 per cent of all households that had installed electricity in their homes. Further, these households made up 22.7 per cent of all households with total cash incomes reported in 1979 of less than ₱6,000 a year. Both of these percentages are substantial. Further, in the next section it will be argued that these incomes (less than ₱6,000 per year) are below the absolute poverty line.

An additional set of families near the poverty line, those receiving from ₱6,000 to ₱7,999, had installed electricity in their dwelling units, and in even more substantial proportions, 46.0 per cent of all such families. These constituted 17.5 per cent of all families who had installed electricity at home.

Only 34.1 of all installations had been made in the homes of the middle and upper income groups who were receiving ₱10,000 or more a month. However, 62.6 per cent of this upper income set had installed electricity in their houses.

Thus 65.8 per cent of all installations came from lower middle and low income groups, that is, persons with annual incomes below ₱10,000 (about \$1,335 a year). Further, 55.9 per cent came from persons receiving less than ₱8,000 a year.

On the basis of these data, one concludes that electrification of the dwelling unit has been broadly attractive to households across the income distribution. While a greater proportion of wealthier homes have been electrified, still the greater proportion of installations have been made in the homes of households with less than ₱8,000 a year cash incomes.

The two hypotheses that rural electrification increased the income of households living in the western segment of the province (a) as political units and (b) as individual households who had wired their homes for electricity have received some support from the data considered in the foregoing analysis. The following section considers the question of a poverty threshold in connection with the foregoing material. Readers not interested in this question should skip to the section next after that which follows, relating to coverage of the rural electric service, which continues the examination of the survey results.

A Poverty Threshold for North Mindanao

The last table has shown that 59.7 per cent of all households (averaging about six persons each) received annual incomes of less than ₱6,000. It is argued here that six thousand pesos may be taken as a minimum poverty threshold in the rural Philippines for June, 1979. Abrera in 1974-1975 (1976: 223-273) measured poverty operationally by setting down a minimum adequate diet from a nutritional standpoint, together with minimum further household requirements for clothing, housing, health, educational utilities and services. While Abrera may have included somewhat more of costly foods (fish, milk, etc.) than

are common in the Philippines, and thus her figures may have been somewhat high for 1974-1975, still the above minimum figure for 1979 of ₱6,000 appears acceptable as it does not include income for housing, clothing, health, and education. Further, USAID evaluators (1980: Annex A, Table 10) who applied to Abrera's data, Abrera's cost of living deflators for rural and urban areas, weighted for proportion of households urban and rural, arrived at a food income threshold, as a proxy for a total income threshold, for North Mindanao, in 1975 pesos, of ₱4,437.

The Bureau of the Census, Region X (October, 1979: Table 1), has computed a consumers' price index for North Mindanao indicating that all items in Region X (Food, clothing, housing and repairs, fuel, light, water, other services, and miscellaneous costs) had risen to a level of 258.1 for the region over the level of 1972 (100.0), and that all items for Misamis Oriental Province had risen to a level of 262.0. Food prices for Region X stood at a level of 248.5 and at 257.2 for Misamis Oriental. The purchasing power of the peso thus had declined to 39 per cent of its 1972 level for Region X and to 38 per cent for Misamis Oriental Province. (North Mindanao is Region X.)

Thus in terms of food, an average annual geometric inflation of 13.9 per cent took place between 1972 and 1979 for Region X, and of 14.4 per cent for Misamis Oriental Province. The average annual rate of inflation for all items is somewhat higher. At the same average annual rate of inflation for food costs for the region, ₱4,437 in June 1975 would be ₱7,462 in June 1979, and at the food inflation rate of Misamis Oriental Province, the poverty level of pesos for June 1975 would have risen to ₱7,610 in June 1979.

In view of the foregoing, it seems reasonable to take ₱6,000 as a minimum total income threshold for June of 1979, when the present survey of the western segment of Misamis Oriental was carrying out its interviews.

Change in Social Indicators

If rural cooperative electrification has been associated with an increase in income, and this association is at least partially causal, the electrification must have stimulated the economy of the western sector in several ways. Indicators of this stimulation might be some or all of the following phenomena, which this section will consider in order:

- (a) Electrification of many of the political units (poblacions and barrios) of the western segment. Such electrification would be a necessary condition for the attraction of business and industry to start up new within, or migrate into, the western segment;
- (b) Electrification of their residences by many households. This item has already been considered. Some 8,200 households had already done so by early June, 1979, a proportion significant beyond .001;

- (c) Many new businesses and industries should in fact have migrated to, or started up in, the western segment;
- (d) A larger proportion of men and women than in the 1960s should have been found employed in June 1979 in off-farm, non-family enterprise. The point of comparison should be the quasi-before stratum, the non-electrified eastern segment;
- (e) A larger proportion of women should be found employed for salary or wages in off-farm, non-family enterprise;
- (f) On-farm and family enterprise should have become more productive under the stimulus of electricity with increase in income, through such means as irrigation, truck gardening, part-time fishing (with small catches possibly stored in the deep freezers of neighborhood sari-sari stores), more efficient hog and poultry care, family work at night (shelling corn, making nipa roof squares, etc.);
- (g) A larger proportion of women should be found doing their housework at night or otherwise arranging for the accomplishment of such housework; and
- (h) Day care centers should have sprung up to answer the needs for child care of working mothers.

Electrification of Political Units

MORFESCO I by June 1979 had brought rural electrification to each of the ten municipalities of western Misamis Oriental. Within these municipalities, it had supplied electric current to all ten municipal poblacions and to all but 16 of 113 barrios of these municipalities (123 political units). These non-electrified barrios are in general found in interior and remote places in the mountains without adequate access roads. Reasons cited for the non-electrification of these barrios are: difficulty in obtaining legal rights of way across private property, absence of adequate access roads for maintenance, the scattered nature and sparseness of the housing, distance of sites from present closest power lines, and lack of enthusiasm for electrification of residents of these barrios.

The finding that all municipal poblacions and 86 per cent of all barrios are electrified does not mean that all sitios (districts, neighborhoods) of each barrio uniformly enjoy the availability of electric energy. Twenty-six of the 97 hooked-up barrios and poblacions have not yet been able to provide electric power for all their sitios. Reasons reported for this situation are similar to those for failure to electrify entire barrios: no legal rights of way, no adequate access road, affected households are few and widely scattered,

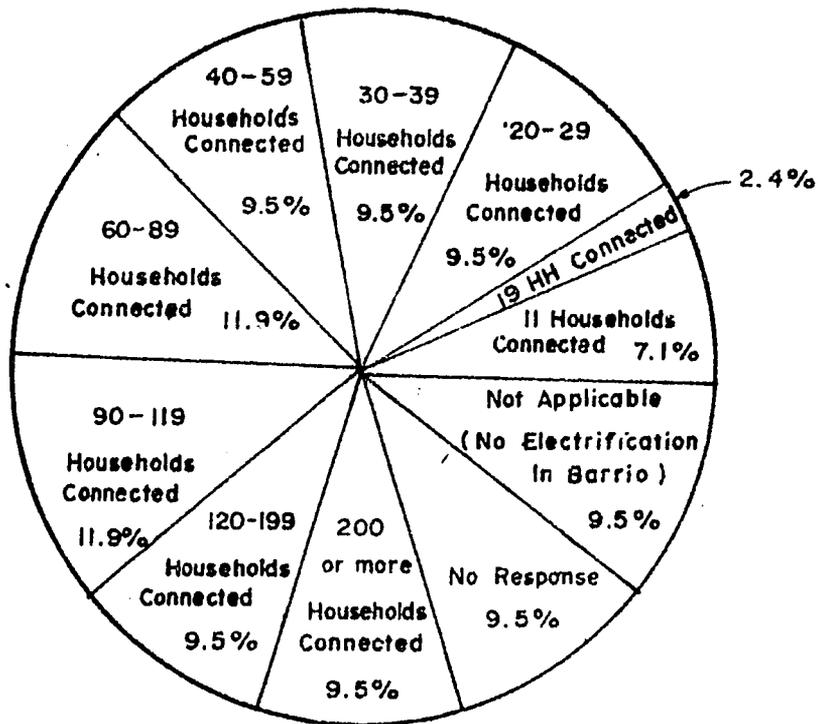


Figure 2. Volume of MORESCO \pm Installations of Electricity in Homes, By Barrio, 1979
(Excludes Municipal Poblacions)

great distance from present closest power lines, and lack of enthusiasm of residents for installation of electric power. Figure 2 presents the distribution of barrios by number of households (volume) connected to the MORESCO I grid. This section has shown that MORESCO I has brought electric power and light to each of the ten municipal poblaciones and to all but 16 of the 113 municipal barrios of the western segment. Thus the inducement for business or industrial enterprise to move in or initiate itself has indeed been provided by the MORESCO I grid. The next section considers the actual behavior of enterprise in this regard.

The Initiation of New Business

Data are presented here upon new businesses and enterprises opened in the western segment of the Province. First, of the businesses in operation at time of interview (June, 1979) 72.8 per cent (94 of 129) had initiated operations on or after January 1, 1971 or within the first calendar year of MORESCO electrification. Of these as Figure 3 shows, 82.4 per cent of all enterprises employing 10 or more persons excluding the proprietor and members of his family, and as Figure 4 shows 69.5 per cent of all 95 enterprises employing 3-9 persons, again excluding proprietor and family, had begun after January 1, 1971.

These data are for businesses existing in 1979, and for the persons they employed. Similar data are not available for businesses existing during the years 1950-1978. Businesses may have existed then which no longer exist. Some degree of bias in examining the past is thus incorporated into the retrospective data of 1979 because businesses more recently established have greater probabilities of survival to interview date than older businesses.

Nevertheless, the nature of the areas under consideration strongly suggests that the bias is small, even negligible, because businesses existing before January 1971 with few exceptions almost certainly had to be small and relatively few. The absence of electrification and the undeveloped road system would have precluded all but a handful of businesses employing more than ten persons.

The data therefore indicate a rather large increase in business and industrial enterprise in the years 1971-1979, while the electrification infrastructure was being put into place and after electrification had actually begun. Figure 5 shows the comparative growth over time. Note how the average scope increases sharply after 1970. These data support the hypothesis that electrification had caused an increase in income in the western ten municipalities of Misamis Oriental Province.

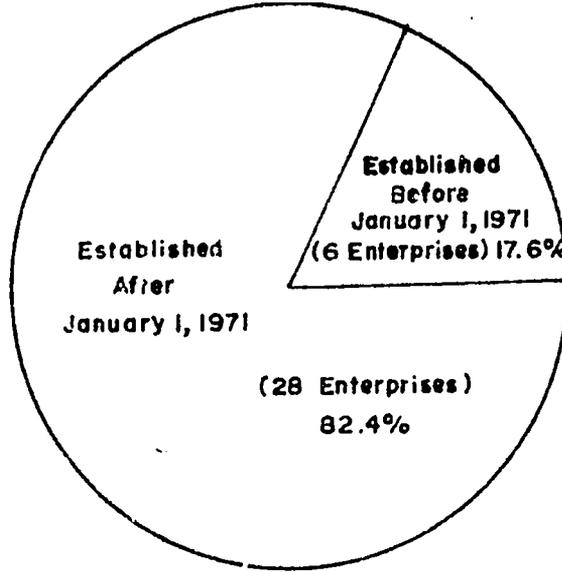


Figure 3. Distribution of Business or Industrial Enterprise Employing 10 or More Persons by Year of Establishment, all Western Municipalities, Misamis Oriental Province, 1979.

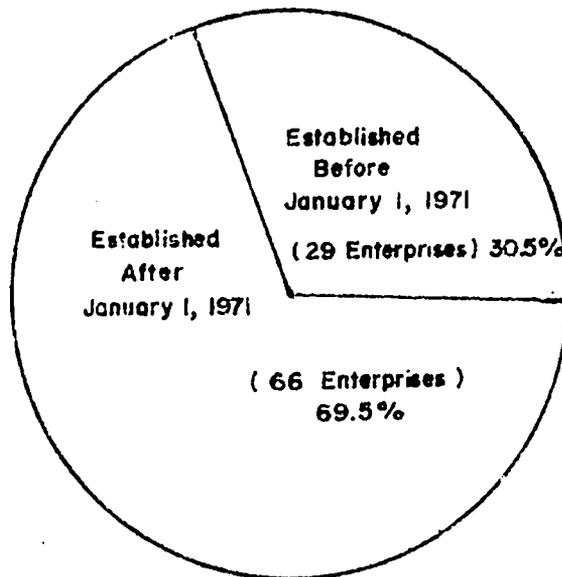


Figure 4. Distribution of Business or Industrial Enterprise Employing 3-9 Persons by Year of Establishment, all Western Municipalities, Misamis Oriental Province, 1979.

Employment in the Western Segment

Number of individual employees (in off-farm, non-family enterprise) is an important aspect of socioeconomic life which must now be considered. Data are presented here for off-farm, non-family enterprises employing one person or more in barrios and three persons or more in poblaciones, excluding proprietor and family members.

The data fall into two classes: persons employed in enterprises which were instituted before January 1, 1970, and persons in businesses originating after January 1, 1970, at which time the forthcoming electrification by MORISCO I had become a definitively approaching reality. The data relate to persons working in 1979. The table presents data for 1986 persons for whom data are available upon year in which the enterprise originated (either its actual genesis, or its in-migration into the western segment), out of 2,104 persons known to be employed in 1979.

<u>Date Instituted</u>	<u>Employees 1979</u>	<u>Per Cent</u>	<u>Date Instituted</u>	<u>Employees 1979</u>	<u>Per Cent</u>
Before 1949	66	3.3	1973	148	7.5
1950 - 1959	85	4.3	1974	222	11.2
1960 - 1968	122	6.1	1975	538	27.1
1969	14	0.7	1976	61	3.1
1970	227	11.4	1977	103	5.2
1971	96	4.8	1978	130	6.5
1972	135	6.8	1979*	39	2.0
Totals				1,986	100.0

*January to June, 1979, only.

Thus only 14.5 per cent of all persons at present employed in non-family enterprise in the western segment were working in businesses or industries that had begun before January 1, 1970. The large increases per year that began to occur soon after construction of the electricity facilities was under way (Steel stanchions, high tension wires, transformers, buildings, etc.) and after the initial electrification had begun are quite striking. For example, the number increased in the year 1970 alone by 11.4 per cent.

The influence of electricity upon employment seems evident. In the ten years 1970 - 1979, employment jumped 592 per cent over December 31, 1969, totals - an average of almost 60 per cent a year. These data again support the hypothesis that electrification contributed to the increase in incomes in the west as compared to the non-electrified east.

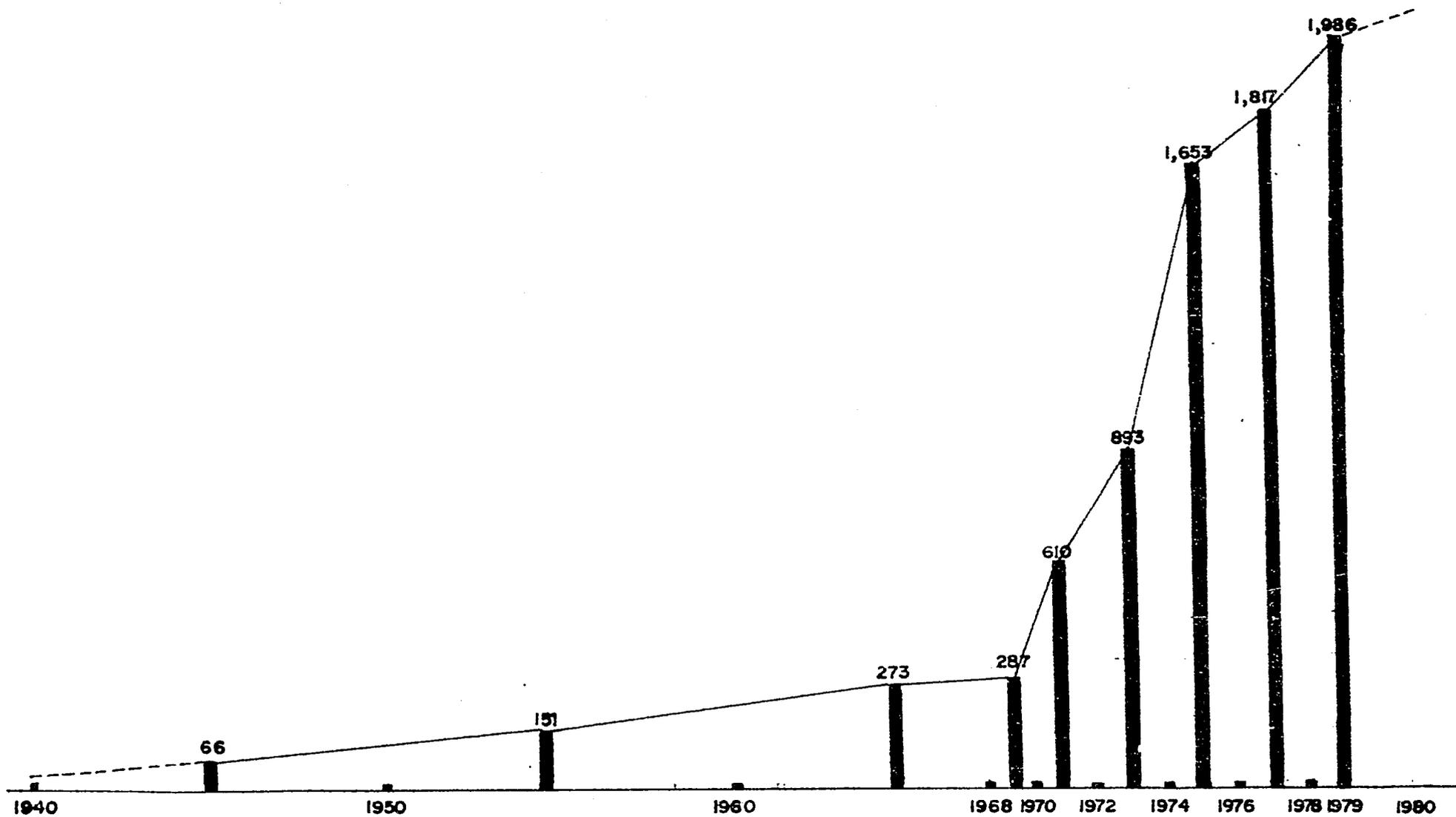


Figure 5. Growth of Off-Family Farm Business and Industrial Enterprise Operating in 1979, Western Ten Municipalities, Misamis Oriental.

Employment in Electrified and in Non-Electrified Political Units

Four of the sixteen political units which had not been electrified were selected by the mechanical sampling procedures set up to draw units by probability into the sample. In three of these units no enterprise could be found which employed even one person in addition to the owner of the enterprise and his family members.

In the fourth unit however, five mines were found. All of these were engaged in mining chromite; three had begun operations in 1975, one in 1974, and the other in 1977. These mines employed an average of 10.8 persons per mine, or 54 in all. Investigation of the four suggests rather strongly that the mining barrio is a signal exception to the general rule. However, it seems better procedure to count its data in the sample data than to exclude it as unusual and biasing the comparison.

With four non-electrified barrios, and 54 employed persons in Awang, the mining barrio, the average for the four non-electrified barrios is 13.5 persons per barrio employed in non-family enterprise, although in fact all the employed persons are found in Awang. With five enterprises for the four barrios, the average is 1.25 enterprises per barrio (with all enterprises in Awang, actually).

The electrified political units drawn into the sample (44) included 135 enterprises. (Altogether 50 clusters were drawn into the sample but the same political unit or cluster was picked twice, as mentioned earlier, in two cases in the western segment.) These enterprises were of various sizes from large-scale industries producing galvanized iron roofing, cement, electro-alloy products, and flour to small-scale tailoring establishments. These enterprises employed 2,182 persons of both sexes. Thus business enterprises averaged 3.1 per political unit and employed an average of 49.6 persons per political unit.

This comparison of electrified and non-electrified political units in the west is somewhat strained because the electrified units include all the poblacions and the non-electrified barrios include no poblacion. Poblacions are the sites of larger residential populations than the barrios because they are the sites of the municipal government, and in addition are usually sited upon more accessible terrain. They are therefore rather obvious targets for business enterprises because closer to more of the potential customers (if retail establishments) and because they involve less transportational difficulties in moving a product. However, on the other hand, poblacions can scarcely be omitted from the comparison because most of the important business and industrial development has taken place in or near poblacions. If electricity has had a major effect upon the development of enterprise in the western segment, the largest impact would undoubtedly be felt in the poblacions.

Nevertheless, it is illuminating to consider data for electrified poblacions and electrified barrios separately. Electrified barrios are considered first, and compared with non-electrified barrios.

Employed in Businesses Originating Before January 1, 1970	<u>Number of Businesses</u>	<u>Number of Employees</u>
Electrified Barrios	7	25
Non-Electrified Barrios	0	0
Employed in Businesses Originating After January 1, 1970		
Electrified Barrios	35	514
Non-Electrified Barrios	5	54
Employed in Poblacions Before 1970	22	173
Employed in Poblacions After 1-1-70	72	1338

Data for the poblacions deserve further explicitation as this will clarify the comparison and the relation to electrification. The above data are broken down by specific sample poblacion, and means are furnished.

<u>Specific Poblacion</u>	<u>Before January 1, 1970</u>		<u>After January 1, 1970</u>	
	<u>Businesses</u>	<u>Employees</u>	<u>Businesses</u>	<u>Employees</u>
1. Alubijid	5	26	8	55
2. El Salvador	1	2	3	419
3. Initao	5	62	32	209
4. Libertad	4	41	2	7
5. Lugait	4	30	10	266
6. Manticao	3	12	17	382
Total	22	173	72	1,338
Mean:	3.7	28.8	12.0	223.0

The size and nature of several businesses which would require electrification for efficient operation casts further light upon the influence of electrification in stimulating growth of enterprise, and therefore of employment, in the western segment. The following is a listing by political unit of the larger enterprises.

<u>Poblacion</u>	<u>Enterprise</u>	<u>Employees</u>	<u>Year Originated^a</u>
El Salvador	TIPI Lumber Yard	400	1975 ^b
	Meijo-Philippines	1007	1974 ^b
Manticao	Electro-Chemical Factory	200	1970
	Electro-Alloy Factory	80	1977
	Fishing Corp. of Sil.	30	1976
Lugait	Mindanao Steel Corp.	112	1973
	Floro Portland Cement	90	1972
	Sy Trucking Co.	30	1978

^aAt least, in western segment.

^bFailed in 1978. not included.

<u>Poblacion</u>	<u>Enterprise</u>	<u>Employees</u>	<u>Year Originated^a</u>
Initao	Mabulay Agro-Forestry Corp.	45	1975
	Emergency Hospital	28	1975
	Community Hospital	14	1974
<u>Totals</u>	10 Enterprises	1,029	June, 1974 (average)

^aAt least, in western segment.

^bFailed in 1978. Not included.

From these sets of data, one is led to conclude that electrification definitely has been one of the main forces shaping and fostering the growth of enterprise in the ten rural municipalities of the Misamis Oriental west. Other factors such as the demand for raw materials (chromite, copra, lumber, etc.), good roads, cheap land, and abundant low cost labor undoubtedly also enter the picture. Nevertheless, electrification has been a very important factor among all these. That the source of electricity is a hydroelectric generating plant has probably increased the attractiveness of western Misamis Oriental for business and industry over the past few years with the escalating costs of diesel-based electric power.

Type of Occupation

This section considers occupations of household heads, and of employed males and females. Data are presented in terms of rates per 1,000 appropriate persons, in order to facilitate comparison between eastern and western segments. The point of this comparison will be to examine especially employment in off-farm enterprise.

Rates per thousand household heads by main present occupations were:

<u>Occupational Categories</u>	<u>East</u>	<u>West</u>
1. Professional, technical, and related	17	16
2. Administrative, executive, and managerial	2	9
3. Sales	43	38
4. Clerical	3	7
5. Farming	762	670
i. Owners and Managers	(493)	(406)
ii. Tenants with or without small plot of owned land	(234)	(242)
iii. Farm laborers	(35)	(22)
6. Fishing, hunting, logging and related	42	86
7. Mining, quarrying, and related	4	3

<u>Occupational Categories</u>	<u>East</u>	<u>West</u>
8. Transport, communications, and related	47	65
9. Crafts, factory/industrial, and related	54	61
10. Service, sports, entertainment, and related	13	21
11. Not employed (Aged, disabled, not seeking work, etc.)	13	24
<u>Totals per thousand</u>	<u>1,000</u>	<u>1,000</u>
Total Household Heads (est.)	34,320	23,280

One of the principal differences is the large diversity of persons employed in farm occupations. Thirteen per cent less household heads are employed in farming activities in the west. Other differences are found in the administrative, executive, and managerial category in which more than four times as many persons are employed in the west; in the clerical; in fishing, hunting, logging, and related endeavors; in transport and communications; in crafts, factories, and related, and in the non-employed category.

When attention is turned from household heads to the employment of all males, further differences appear.

<u>Occupational Categories</u>	<u>East</u>	<u>West</u>
1. Professional, technical, and related	6	7
2. Administrative, executive, and related	1	91
3. Sales	11	10
4. Clerical	1	3
5. Farming	346	226
i. Owners and Managers	(159)	(130)
ii. Tenants with or without small plot of owned land	(187)	(96)
6. Fishing, hunting, logging and related	30	37
7. Mining, quarrying, and related	1	2
8. Transport, communications, and related	23	31
9. Crafts, factory/industrial, and related	23	24
10. Service, sports, entertainment and related	7	11
11. Students (for east only), housewives, unemployed, not seeking work (aged)	---	266
12. Not employed, (retired, chronically sick, small children, etc, disabled)	550	292
<u>Totals per thousand</u>	<u>1,000</u>	<u>1,000</u>
Total Males, all ages (est.)	103,360	68,220

Larger differences appear in this set of data between numbers of men per thousand principally employed in agriculture. Only 65 per cent as many men were employed thus in the western as in the eastern segment. Of an estimated 46,465 men employed in the northeast, 77.0 per cent were employed in

agriculture, and 83.8 per cent were employed in agriculture and such outdoor occupations as logging, fishing, and hunting. The comparable figures for the estimated 30,210 employed males in the west were 51.0 for agriculture and 59.4 for agriculture plus the other outdoor occupations.

The ratio of employed males to all males 15 - 59 years of age was 92.0 per cent in the northeast and 88.9 per cent in the west. The percentage of males employed in agriculture of all males 15 - 59 years of age was 70.8 per cent in the northeast but only 45.4 per cent in the west.

All these differences are not only significant (at beyond .05). They are important indicators of changes going on in these two populations. Clearly the males in the western segment are to a much larger extent turning to other occupations than agriculture for their living, and finding opportunities in these fields for off-farm employment. It seems clear that such pursuits would result in generally higher levels of income. It is difficult to see where these opportunities would have come from had it not been for the stimulus of electricity in attracting enterprises to the western segment. The economy of the eastern segment remains evidently based largely upon agriculture. That of the western segment is moving toward a more balanced occupational mix.

A relatively large difference appears in the category of administrative, executive, and managerial jobs. Granting that much of the administrative and executive jobs reported pretentiously in the west were probably for small-scale positions, still the differences estimated for this category were also large and significant - less than 60 for the northeast and 6,190 in the west.

It is also of interest that 61 per cent of the farmers of the western segment were owners or managers and only 36 per cent were tenants, while 65 per cent of the farmers of the northeast were owners and 31 per cent were tenants. Comparing this set of data with that already seen for 1960 from the Census (cf. p. 15, preceding), one finds that tenant-operated farms were 62 per cent higher in the west than in the east in 1960. While not reaching equality by 1979, western farmers had closed the difference considerably during the intervening years. Only 36 per cent were tenants compared to 31 per cent in the eastern segment, a difference of only 14 per cent. Possibly, improved conditions had led some tenants to take other kinds of employment so that owners had taken over management of their own farms to a larger extent.

Female employment is a further interesting aspect of occupational differentiation of eastern and western segments. In neither eastern nor western segments are relatively many currently married women employed. This may be because the employment opportunities offered to women do not seem very advantageous to these women and their husbands in comparison to their absence during the working hours from their homes, or it may be because of discrimination against employing married women. A 45 day maternity leave with pay could conceivably make potential employers hesitant about employing women where abundant male labor is also present.

The data are per ten thousand currently married women of the respective populations:

<u>Occupational Categories</u>	<u>East</u>	<u>West</u>
1. Professional, Technical, and related	98	145
2. Administrative, managerial, executive	3	97
3. Sales	364	372
4. Clerical	17	32
5. Farmers:	199	158
a. Owner/manager	(110)	(129)
b. Tenant with or without small lot	(89)	(29)
6. Fishing, Logging, Hunting, and Related	20	3
7. Transport and communication	9	3
8. Crafts, factory/industrial, and related	43	31
9. Domestic and other service, sports & related	121	127
10. Students	---	2,771
11. Housewives	---	2,879
12. Others (students (for east only), small children, etc., unemployed, not seeking work (disabled, retired, aged, chronically sick)	9,126	3,382
<u>Totals per ten thousand</u>	<u>10,000</u>	<u>10,000</u>
Total Females, all ages (est.)	97,140	64,370

These data show western segment women in more professional and managerial positions than eastern segment women. Relatively, more women were also found in the west in more strictly business positions. On the other hand less women in the western segment were employed in agricultural and "outdoor" types of work, and more women in the eastern segment. These data support the hypothesis that increased business and industrial enterprise in the western segment gave greater opportunities for western segment women for off-farm employment, and that this was an effect of rural electrification.

Female Employment

One might have expected the foregoing data which were obtained in response to a question on present occupation to answer also the question on the employment of women. Such however proved not to be the case. Present occupation was interpreted to include also the occupation of women not now working, apparently on the grounds that it was their last occupation, and would probably some day be resumed again. Possibly something in the Bisaya wording gave this nuance to the respondents, although the senior researcher, studying the Bisaya, was not able to discover such a meaning.

The data are limited to the respondents or (if the respondent was the head of the household) to the wife or mother of the respondent (depending upon his age). While similar data were also obtained for other female members of the household, variations in age and accuracy of answers made it seem preferable to take data only for respondents themselves.

Altogether, an estimated 5,470 currently married women 15 - 49 years of age, and who were respondents or wives or mothers of the respondents, were employed in the northeastern segment. The ratio of these women to all currently married women in 1978 was 23.3 per cent. In the western segment, an estimated 2,440 currently married women 15 - 49 years of age, also respondents or their wives or mothers, were employed, a ratio of only 8.6 per cent to all currently married women.

While at first sight, these data might seem to invalidate the hypothesis that there is more economic opportunity in the western segment than in the east because of the rural electrification project, in fact they do not. What they do seem to show however is that the eastern segment women more eagerly seek after employment than women of the west, even when the employment is rather unsubstantial and unrewarding. The following data break down by occupation the number of currently employed women of the two sectors.

Percentage Distribution by Segment, and by Occupation, of Currently
Married and Currently Employed women, 15 - 49 Years of Age,
Respondents, or Wives or Mothers of Respondents

<u>Occupational Categories</u>	<u>Eastern Segment</u>		<u>Western Segment</u>	
1. Professional or paraprofessional work	12.8		18.3	
Teachers		12.3		15.7
Medical workers (nurses, technicians, midwives, etc.)		0.5		2.6
2. Business and Industrial Enterprise	0.5		4.8	
Executives, managers, administrators		0.0		0.9
Accountants		0.0		0.4
Bookkeepers, accounting clerks, cashiers		0.0		0.9
Stenographers, typists		0.0		0.5
Office machine operators		0.0		0.4
Clerical workers		0.5		1.3
Packing and labelling work		0.0		0.4
3. Minor Government Positions	0.5	0.5		0.0
4. Sales Workers	65.7		66.4	
Wholesale, retail trade		2.1		1.7
Commercial travellers, "Dealers"		1.0		0.4
Vendors, peddlers, petty trade		62.6		64.3

<u>Occupational Category</u>		<u>Eastern Segment</u>	<u>Western Segment</u>	
5. Crafts and Cottage Industries	7.1		3.5	
Manufacturing		0.5		0.0
Carpentering, cabinet making		0.0		0.5
Tailors, dressmakers, sewers, embroiderers, etc.		5.1		3.0
Weavers		1.0		0.0
Nipa square makers (roofing)		0.5		0.0
6. Agricultural Work	8.2		0.9	
Farm owners and managers		1.5		0.0
Farm tenants		2.1		0.0
Agricultural laborers		4.6		0.9
7. Barbering, Hair Dressing, Beauticians	1.3	1.1	1.3	1.3
8. Sports, Entertainment, and Related Work	0.0	0.0	0.5	0.5
9. Domestic Work	4.1		4.3	
Housekeepers		0.0		2.6
Maids, cooks, etc.		4.1		1.3
Laundry, dry cleaning		0.0		0.4
<u>Totals (Per cent)</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>
(N)		5,470		2,440

If one eliminates the vendors, peddlers, and petty trade category of jobs in both east and west, on the grounds that these are very unsubstantial and unrewarding jobs (like selling sweepstake tickets, selling foodstuffs as hucksters, etc.), and eliminates the agricultural workers as not associated with rural electrification, 26.1 of the eastern set of employed women are left, and 32.7 of the western set.

Assessing the jobs of the remaining more substantially employed persons, one notes the following types of positions:

	<u>East</u>	<u>West</u>
1. Teachers	12.3	15.7
2. Med. Workers	0.5	2.6
3. Administrators	0.0	0.9
4. Office workers	1.0	3.9
5. Crafts and Cottage Industries	7.1	3.5
6. Sports, etc.	0.0	0.5
7. Domestic work	4.1	4.3
8. <u>Barbering, etc.</u>	<u>1.1</u>	<u>1.3</u>
	26.1	32.7

Women in the western segment were advantaged by type of job. Relatively more of them (9.3 percentage points) were employed in the better paying and more substantial jobs of the first four categories, 23.1 per cent in the west, as against 13.8 in the east. Relatively less were employed in the cottage industries, which tend to require long hours for little pay. And of course many fewer women were employed regularly for agricultural labor where work is long and tiring, and pay minimal.

However, in neither segment were the numbers of the employed substantially large. Only 1430 women of the approximately 34,300 households of the east and 800 of the approximately 23,280 households of the west had jobs likely to increase household income significantly. One concludes that rural electrification has not changed the incomes of households of the west much over the incomes of the eastern segment because of the work of currently married women. Thus this aspect of the hypothesis has not been supported by the data.

Further insight into the employment conditions of women are furnished by percentage data on distance of work from home, upon hours worked per week, and upon contributions made by employed respondent women 15 - 49 years of age.

<u>Distance of Work from Home</u>	<u>East</u>	<u>West</u>
Works at home	55.4	40.9
Less than 300 m. away	13.3	26.0
300 - 999 m. away	8.2	11.1
One kilometer or more	23.1	22.1
<u>Total</u>	<u>100.0</u>	<u>100.0</u>

Thus 68.7 per cent of the eastern segment work at home or less than 300 meters away, and 66.9 of the western segment women. Only among the remainder would one expect to find the separation of the mother from the children, because of work, important.

Hours worked per week were quite long. For example, the median currently married respondent woman 15 - 49 years of age of the western segment worked 48.7 hours per week. In the eastern segment, the median woman worked 54.2 hours per week. Possibly the longer hours per week in the east reflects the longer hours working in the fields on farms as well as the long hours of vendors and peddlers going about trying to sell their wares.

Returns from family businesses in the east were relatively small, only \$141.20 per month in 1978. While no doubt, adding \$141 to the monthly income of husband would help, still the long hours of work for the small return indicates insufficient monetary compensation for the time expended. Under-employment of the woman's time in terms of financial returns is clearly indicated.

Returns for female labor were greater in the west. Median contribution to household income from all employed respondent women 15 - 49 years of age was \$351.34 per month. When this was broken down by women working for salary or wages (37.4 per cent), the median was much higher, \$509.47. Women working in family businesses (62.6 per cent) were able to contribute to the median family income only \$276.34 per month. The mean for family business was higher, \$349, because of a relatively few very high incomes from such businesses.

A further question should be asked about working women of the west. In what year did they begin to work? Such an answer could shed light on the effect of electrification on their employment. We include in this tabulation all currently married respondent women 15 - 49, who ever worked.

Only 26.2 per cent had begun to work before January, 1970. The remainder had begun to work after this date. Median date of beginning work was late April, 1974, while the average date of beginning work was late June, 1972. Presumably, electrification had some effect upon this result. This probably occurred especially in businesses in which women had found employment which had been attracted to the area by the cooperative electricity.

Indicators of Stimulation of the Western Economy by Electrification

Several indicators previously spoken of as showing a causal influence of electrification upon stimulation of the economy of the western sector have already been considered. Most of these results have been such as to support the hypothesis of such influence of the rural electrification. Summarily, the results thus far have shown widespread electrification of the western sector by the NORSOC organization, the electrification of large numbers of households by the NORSOC, the inauguration of many businesses in the western sector that had not been there before 1970, a larger proportion of men and women employed in off-farm, non-family business in the west than in the east, and a larger number of currently married female heads of household (i.e., married to or mother of the male head of household) employed for salary or wages in off-farm, non-family business. The results in general have featured these indicators, even in cases (such as for married women) when the effect was not large because of number of persons involved.

Several other indicators remain to be examined. Among these are work at night, housework at night, sharing the housework, and the presence of day care centers - all of these in response to the need of working mothers 15 - 49 years of age who must be at the place of business for long hours per day.

Work at Night

Even where women have not taken an additional position in the labor force besides their many household chores as wives and (perhaps) as additional workers on various aspects of the family farm, income-producing work at night would be an indicator of the effect of electrification in raising the income of

households which had installed electric power and light in their residences. This aspect is now examined.

Forty-six per cent of all electrified households of the western sector never did such work at night. On the other hand, 53.7 per cent did. The frequency of this work however varied greatly from household to household. Obviously enough, electricity would be the basic essential for undertaking such tasks.

Thirty-four per cent said that they rarely worked at night on income-producing activities, less than once or twice a month. Another 4/10 of one per cent said they only worked at night once or twice a month. The remainder worked at night at least once every week (0.5 per cent), often (10.1 per cent), or very often (8.2 per cent). Thus a fairly substantial minority of all electrified households, 18.8 per cent, worked regularly at night on such income-increasing activities as shelling corn, making nipa roofing squares, caring for poultry or livestock, or similar activities. The 1540 women estimated to be working thus regularly should not of course be confused with the women working during the daytime on a regular job. These are different women.

Getting Housework Done

One limitation upon taking a job during the daytime is the family housework which it is the woman's responsibility in rural Misamis Oriental to carry out. How do women who have taken a job get their housework done?

The respondent was allowed to mention different means of taking care of her housework. The method first mentioned is tabulated below.

The largest group of women stated that they accomplished the housework by dividing it up among the children, who were made responsible for its careful performance. Of course, these 46.8 per cent of all employed currently married women 15 - 49 years of age had to have children at least seven years of age or older in order to entrust to them such responsibilities. The next largest group of women, 23.8 per cent, presumably including many of those with no children or only very small children, said that they did the housework themselves at night after they had returned from work. A smaller group, 15.7 per cent, had entrusted their housework to hired help. About two per cent said that they combined hired help with work performed by their children, and in some cases by themselves. The remaining 12 per cent accomplished their housework by other means (early morning, help of relatives, letting go to weekends except for more essential needs, etc.).

Day Care Centers

Most of our field staff did not really expect to find day care centers in the poblacions and barrios of western Misamis Oriental. They believed instead that the mothers would leave their children with their mothers or other

relatives or with hired help, while they were away at work. In fact, however, quite a few such arrangements were found to be operating. They were probably far short of the formally established day care institutions of the city, but they served as an effective substitute. The question asked whether some women in the poblacion (or in the barrio where the interview was in the barrio) conducted at home or elsewhere a place where working mothers could bring their preschool children to leave them there before going to work. A fairly large number of such "centers" were found, in fact. Most of them, of course, were quite informally operated. But they seemed to serve the purpose well enough. Altogether 34 such centers were found in nine poblacions of the municipalities. The tenth did not have one. Barrios also were not without such arrangements. Forty-one per cent of all barrios had at least one center.

Difficulties in Obtaining Hired Help

An indication of a rising standard of living is increased difficulty in obtaining domestic help. Wages paid to such workers tend to be very low and the hours tend to be long. Thus an increase in opportunities for working women often attracts away from such jobs women who might otherwise be available. In order to examine this indicator of rising standards of living, all respondents were asked whether it was easier or harder to obtain domestic help in 1979 than in 1970. Opinion was divided. Slightly more than 16 per cent said it was easier. However, 83.6 per cent stated that it was harder to get household help. Following this question up with currently married female respondents 15 - 49 years old currently working, the percentage saying yes declined to 3.0 per cent, while 20.0 per cent said the difficulty was about the same.

When asked whether it was easier or harder to get relatives to watch one's home and children while away at work, 25.0 per cent said it was easier but 75 per cent said it was harder. Such being the case, working married women were asked whether they left their children regularly with their relatives while they were working. Only 14 per cent said yes, while the remainder said they did not.

Comparison of Present Living Conditions with the Past

Another indicator of improved income would be bettered living conditions. Granting that electrification had made a positive contribution such as to cause a substantial increase in income, and other conditions did not intervene, this improvement should be perceived by respondents consciously. They should in that case state, in reply to a question, that present living conditions are better than those existing before electrification (1969).

In fact, more respondents said the opposite. This is not altogether fair to electricity, since simultaneously with electricity, a severe inflation has since 1969 steadily whittled away at the real income of farmers and rural people especially. Nevertheless, the response does not endorse the conception that respondents perceive living conditions as better than in 1969.

Did the family live better in 1979 than in 1969?

<u>Income Level</u>	<u>Electrified Residences</u>			<u>Non-Electrified Residences</u>		
	<u>Yes</u>	<u>No</u>	<u>The Same</u>	<u>Yes</u>	<u>No</u>	<u>The Same</u>
Below \$4,000 a year	21.0	38.0	41.0	13.8	42.0	44.3
\$4,000-7,999	22.1	40.1	37.9	20.9	37.2	41.9
\$8,000 or More	27.1	34.7	38.2	20.2	28.1	51.7
<u>Total</u>	<u>22.5</u>	<u>38.1</u>	<u>39.4</u>	<u>15.3</u>	<u>40.3</u>	<u>44.4</u>
All Hh & Incomes	17.8	39.6	42.6			

More of the electrified households answered affirmatively than of the non-electrified households, which might be an indicator of the benefits of electricity. More of the non-electrified households answered negatively. The largest segment of opinion however was that conditions were about the same today as in 1969. The evidence, while mixed, can be taken as a mild affirmation that electricity had indeed helped those families which had installed it in their residences to make comparatively greater gains.

As a check upon the respondents' perceptions, the same question was asked with reference to the years 1975 and 1979. Answers were very similar to those just obtained which would support the idea that inflation may be largely responsible for the pessimism of the first set of answers.

Did the family live better in 1979 than in 1975?

<u>Income Level</u>	<u>Electrified Residences</u>			<u>Non-Electrified Residences</u>		
	<u>Yes</u>	<u>No</u>	<u>The Same</u>	<u>Yes</u>	<u>No</u>	<u>The Same</u>
Below \$4,000	20.2	33.3	46.5	15.6	39.1	45.3
\$4,000-7,999	23.9	36.0	40.1	22.0	34.3	43.6
\$8,000 or More	32.9	28.0	39.2	16.9	25.8	57.3
<u>Total</u>	<u>23.8</u>	<u>32.3</u>	<u>42.9</u>	<u>16.7</u>	<u>37.5</u>	<u>45.8</u>
All Hh & Incomes	19.2	36.0	44.8			

The check question seems to show that more people thought they were living better in 1979 as compared with 1975 than in 1979 compared to 1969. However, differences were not large enough for any strong conclusion.

Work Perceived as an Additional Burden by Women Workers

An attempt was made to assess the feelings of currently married working women respondents, 15 - 49 years of age, about their tasks and responsibilities. The first of these was directed at assessing the perceived physical and moral burdens of holding a job while simultaneously raising a family. They were specifically asked whether their work made their burdens substantially heavier,

<u>Response Categories</u>	<u>Off-Farm, Non-Family Employment</u>		<u>Family Business</u>		<u>All Employ- ment</u>	
	<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>
Made family burdens heavier?	26.6	73.4	13.4	86.6	17.0	83.0

The second question inquired whether their work made it harder for them to carry out family responsibilities adequately. Again the response was overwhelmingly in the opposite direction. Approximately seventy-nine per cent said it did not, although 21 per cent thought it did. The data were:

<u>Response Categories</u>	<u>Off-Farm, Non-Family Employment</u>		<u>Family Business</u>		<u>All Employ- ment</u>	
	<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>
Made family responsibilities harder to carry out?	20.3	79.7	21.6	78.4	21.3	78.7

The difference of course is not significant, but it is interesting that less women engaged in family business than women employed outside family enterprise thought their work made family burdens heavier. This probably is because not until 5:00 P.M. can those working outside close their minds to their job, give full attention to their family, and begin any household activities, whereas one can combine family business with "baby sitting," slack family business hours with housework, and "family business troubles" are easily shared.

Additional Connected Information

Before concluding the topic of employed women, some questions raised by the data deserve attention. Granted the long hours and the low pay given women workers, what advantages for the family do married women see in such employment? Why do they work? Why have those who had been working given up their jobs? If as has previously been suggested by the data, many households (or women before marriage) had migrated into the area, had they principally come in search of employment? Has the work or at least the chain of events unleashed by electrification affected their status in the family, and presumably in the community as a result, so that the females make more decisions now than

hitherto or at least participate with their husbands more in such decisions? What sort of women are the respondents in terms of education vis-a-vis their husbands and their own mothers? As a result of electrification, have such basic health factors which mothers would presumably worry about as better drinking water facilities been sought for by these women, and if so, in fact have improved health conditions resulted? How difficult was it for these women and their husbands to provide the capital to electrify their residences, and having done so, do they now think the effort was worth the trouble it cost them?

Advantages and Disadvantages of Working

Of the estimated 16,685 currently married women 15-49 years old who were wives or mothers of the male head of household or themselves (in the absence of a male head) heads of household, only 2,440 were found currently employed (14.6 per cent). Was this connected with work itself, or with the particular job opportunities open to women? The employed women as well as women who had been employed but had stopped working, were asked to describe the advantages and disadvantages they saw in taking a job. Some women gave more than one advantage. If all advantages mentioned up to three are scored, 36 per cent stressed the good which the additional income would bring the family and an additional 36 per cent the help this would give husband and family to meet their economic needs, 11 per cent that the additional income would help send the children to school, 4 per cent spoke of buying appliances for the house, 3 per cent spoke of work as personally fulfilling ("I can apply what I have learned, I can obtain business experience, I can experience what teaching children is like," etc.), and 4 per cent spoke of helping or entertaining people, being of service to others, and of simply enjoying business activities. Five per cent after some consideration saw no advantage or at least mentioned none - in addition to a few persons who did not consider the question (8/10 of one per cent).

If only first answer is scored, the following response was obtained:

<u>Advantages Mentioned</u>	<u>Per Cent</u>
1. Will provide family with additional income	44.7
2. Will help husband and family meet family needs	37.0
3. Will help send children to school	4.3
4. Can buy appliances	1.7
5. Personal fulfillment (applying learning, etc.)	1.7
6. Entertainment, help, service	1.7
7. Covered by Medicare	0.4
8. No advantage	7.7
9. No response	0.8
<u>All response</u>	<u>100.0</u>

These answers make reasonably clear that work is not generally attractive in itself but for the means it gives of helping husband and children meet their needs (less than 2 per cent speak of fulfillment).

On the other hand, disadvantages cited were principally separation from family (14 per cent), "Many debts" (9 per cent) - the allusions seem to be to borrowing money from the respondent because friends and relatives know she has a regularly received cash salary or income, or the buying from her on credit in the family business, a credit she finds hard to collect for, bad effects on health (9 per cent), business losses (7 per cent), and distance from home and children (1.4). Forty-five per cent saw no disadvantage or did not specify one. Fifteen per cent saw small gains, answered irrelevantly, or did not respond.

Again, category differences are somewhat clearer if only first response (open-ended) is scored.

<u>Disadvantages</u>	<u>Per Cent</u>
1. Less time at home with family	15.7
2. Health affected by work	8.9
3. Too many "debts" (loans/unrepaid credit)	8.9
4. Business losses (family business)	7.2
5. Far from home and children	1.7
6. Many deductions from salary/wages, other connected expenses	1.3
7. Income is limited, fixed	0.4
8. No response	0.9
9. No disadvantage felt or at least mentioned after consideration	54.9
<u>All Response</u>	<u>100.0</u>

From these two sets of responses, one might conclude that more women would work if they had the opportunity of a good, regular, well-paying job. The advantages noted in percentages of respondents clearly outweigh the disadvantages these women feel. However in addition to the feelings of the women concerned, and the opportunity of employment, social constraints upon the employment of married women may exist. To examine this possibility, currently married women 15 - 49 who had been employed and who had stopped working were asked why they had given up their jobs. There were an estimated 460 such women. Answers do not reveal the existence of any one particularly strong social constraint.

<u>Why Stopped Working</u>	<u>Per Cent</u>
1. I am in the family way	9.1
2. The business laid off most women	2.3
3. The business did not succeed very well	4.5
4. The family business did not succeed very well	13.6
5. Because I got married	18.2
	<u>47.7</u>

<u>Why Stopped Working</u>	<u>Per Cent</u>	
6. My husband did not want me to work	9.1	
7. Other (scattered) response	34.1	
8. Not applicable (business failed, had to move, business moved away, etc.)	9.1	52.3
<u>All Respondents</u>	<u>100.0</u>	<u>100.0</u>

The conclusion drawn from the data is that the main reason for ceasing work is some kind of constraint: marriage, pregnancy, difficulties of the business in supporting workers, and husband's objections. The women themselves do not seem to want to give up work by themselves.

Migration into the Western Segment

All respondents were asked whether they were born in the particular political unit (barangay or poblacion) in which they were now being interviewed or had migrated into it. More than half the households, 12,960 (55.3 per cent) were in-migrants. (No response to this question was 0.3 per cent.) When asked the year of in-migration, 54.2 per cent had in-migrated before 1970, and 45.8 had migrated in during 1970 and afterwards.

All migrant respondents were asked where they had lived for the last 12 months before in-migration. Response was:

1. In another barangay or poblacion of the western segment	59.6
2. From Misamis Oriental outside the western segment	8.3
3. From Mindanao outside Misamis Oriental	16.9
4. From one of the Visayan Islands	14.5
5. From Manila	0.2
6. Other places in Luzon	0.4
7. No response	0.1
<u>All Response</u>	<u>100.0</u>

From this table one discovers that only 40.4 of these migrants were migrants into the western segment. Of these, by far the largest portion came from Mindanao itself and the next largest from the Visayan Islands.

<u>Place of Origin</u>	<u>Per Cent</u>
1. From Misamis outside the western segment	20.5
2. From elsewhere in Mindanao	41.8
3. From the Visayan Islands	35.9
4. From Manila	0.5
5. From elsewhere in Luzon	1.0
6. No response	0.2
<u>From All Places Outside Western Segment</u>	<u>100.0</u>

These migrant women respondents were asked why they had migrated to their present residence. Responses were:

<u>Reason</u>	<u>Per Cent</u>
1. Because I had married and came to live with my husband	46.2
2. Because of reasons connected with work	29.6
a. Because my husband was seeking work here	14.3
b. Because I was seeking work here	6.9
c. Because he (and/or I) had found work here	2.1
d. Because my husband was assigned to work here	6.3
3. Because we had obtained, or bought a lot here	10.6
4. Because of relatives here	6.4
5. To go to school/send children to school	0.6
6. Because of the peace and order situation where we came from	2.6
7. Because we had transferred our residence to here	3.8
8. No response	0.2
<u>All Respondents</u>	<u>100.0</u>

The peace and order situation spoken of by respondents refers to the troubles, first, between Christian settlers in Cotabato, and Moslem blood groups there who in ancient custom owned the land in kin units in such a way that no individual could alienate it. It refers to the later troubles between the Martial Law Administration and Government of President Ferdinand Marcos and the Moro National Liberation Front which by and large has refused to recognize the legitimacy of this Government. Because of the fighting between these various groups, which has spread from Cotabato to Zamboanga and Lanao del Norte (though only 20 per cent Moslem), through raids and attacks of one group upon another, and made worse by the everpresent brigands and banditry in the mountains, many families, including some whose ancestors had lived for generations in these places, have abandoned their homes and farms and migrated to north Mindanao or to the Visayas.

Family Decision-Making

"Do you think you make more family decisions now than before electrification, or at least participate in them more fully with your husband? Such decisions would be like buying an appliance, etc." In response to this question, more respondents said no (65.1 per cent). A substantial number (34.8 per cent) said yes.

Asked why they felt that way, those who had replied affirmatively said:

1. Because of the electricity	83.0
2. Because my husband found a job	1.8
3. Because living conditions have improved, or because we have improved our house	9.1
4. Because electrical appliances are useful now that we have electricity	2.2
5. Because other expenses are less	0.7
6. No response	3.3
<u>All Respondents</u>	<u>100.0</u>

Respondents might conceivably have meant that electricity had triggered a set of domestic events which led to more decision-making on the part of the wife, or that the work of the husband took him more out of the house than before so that he left decisions on family matters more to the wife. Nevertheless, the nature of the response arouses suspicion that the question was misunderstood by numerous respondents to mean did they make more decisions, since electrification, to purchase electric appliances. Further, most respondents of the western segment are not very subtle in replying, and their answers more direct. One concludes that this response is most probably irrelevant to the question of increased social status of the wife.

Drinking Water Associations and Health Effects

The wife (or mother) of the household head is typically especially solicitous of the health of the family. One of the most potent causes of morbidity and eventual death, especially of small children, is gastro-intestinal disease. The leading source of infections and infestations of the gastro-intestinal tract in the rural Philippines is polluted drinking water. One would expect then that rural Filipino wives and mothers would be especially solicitous of the drinking water provided for their family members.

This however is not always the case. Less well-educated women are apparently not well acquainted with the risks of ingesting water from non-safe sources, or if they are, adopt a fatalistic, out-of-my-hands attitude toward use of such water.

While the education of women has already been considered in connection with income it seems worthwhile at this point to consider some aspects of it again. The women considered here are however specifically limited to respondents, and their educational achievement is compared with that of their mother.

	<u>Grade Achievement*</u> <u>of Respondent</u>	<u>Grade Achievement*</u> <u>of Respondent's Mother</u>
No Grade	13.2	47.0
Grades 1-2	9.8	14.9
Grades 3-4	21.2	19.2
Grades 5-6(7)	34.3	15.9
High School 1-2	7.5	1.1
High School 3-4	7.6	1.1
College 1-2	1.8	0.1
College 3 or more	4.6	0.7
No response	--	--
All Response	100.0	100.0
	(N: 23,280)	(N: 23,280)

From the table, one learns that only 21.5 of all respondent women had some high school education or more. It is not clear that a purely elementary education, even including grades 5-6 (and 7 where taken), would be sufficient to impress on these women the importance for the family of obtaining drinking water from a safe source. They probably had even less chance of obtaining this caution from their mothers, only three per cent of whom had enjoyed high school or more education.

The same respondents were asked whether their family had participated or were participating in any organization or association, formal or informal, whose purpose was to provide safe drinking water. Response in percentage terms was:

	<u>Electrified Dwelling Units</u>		<u>Non-Electrified Dwelling Units</u>		<u>Sums</u>
Yes	8.3	(23.6)	7.3	(11.3)	15.6
No	26.9	(76.4)	57.5	(88.7)	84.4
Total	35.2	(100.0)	64.8	(100.0)	100.0

Relatively small amounts, although substantial, of households were participating in these better drinking water associations, although twice as many, relatively, were participating from the electrified as the non-electrified households.

Respondents were then asked whether such an association or group actually was present in their own barangay or poblacion. Absence of such an association in their barangay of residence would explain their large-scale

*Highest grade completed.

non-membership in such organizations. In fact, such proved the case.

Any Organization/Association to Obtain Better Drinking Water
in This Barangay?

	<u>Electrified</u>		<u>Non-Electrified</u>		<u>Sum</u>
	<u>DU's</u>		<u>DU's</u>		
Yes	8.8	(25.0)	9.7	(15.0)	18.5
<u>No</u>	<u>26.4</u>	<u>(75.0)</u>	<u>55.1</u>	<u>(85.0)</u>	<u>81.5</u>
Sum	35.2	(100.0)	64.8	(100.0)	100.0

Actually, the numbers of those who were not members of associations for providing better drinking water are very largely explained by the presence or absence of such associations in the barangay, as comparison of the two tables will show. Apparently, these women are well aware of the health hazards to their families posed by contaminated water sources, and do take steps to improve their source, given the opportunity.

Respondents of barangays in which a water organization had been established were asked the year when the organization was established. This was a check upon the assumed relation of water organization to electricity. Almost invariably the organization had been instituted after the electrification of the area. This shows the close association of these variables. The data were:

	<u>Electrified</u>		<u>Non-Electrified</u>		<u>All</u>
	<u>DU's</u>		<u>DU's</u>		<u>DU's</u>
Before 1970	3.6	(7.6)	2.4	(4.6)	6.0
1970 - 72	4.3	(9.1)	4.8	(9.1)	9.2
1973 - 76	13.7	(28.9)	12.3	(23.4)	26.0
1977 - 79	25.8	(54.3)	32.3	(61.5)	58.1
<u>No response</u>	<u>--</u>	<u>--</u>	<u>0.7</u>	<u>(01.3)</u>	<u>0.7</u>
	<u>47.4</u>	<u>(100.0)</u>	<u>52.5</u>	<u>(100.0)</u>	<u>100.0</u>

Thus 94 per cent of all water associations had been organized after the advent of electricity to the western segment. And with increased electrical coverage, water organizations also increased. An association seems evident, although research might show otherwise. However, since often electric pumps are utilized, the conclusion seems reasonable. A government program for better drinking water however did begin to make more impact after 1970.

A substantial, though relatively small, segment of all households had endeavored to obtain better drinking water for their family members. This seems associated with electrification of their barangays of residence. Other facilities connected with improved health were also associated with electricity (light, refrigeration and storage, sterilization potentialities in the rural

health clinic in each municipal poblacion), and the institution of small hospitals and clinics, for example. Respondents were therefore asked whether health conditions were about the same in the barangay as in 1969, or whether they had improved, or whether they had grown worse.

The question asked: "Allowing for increased age over 10 years, would you say that the health of your family was better or worse during 1978 than during 1968?" The response was:

	<u>Electrified</u> <u>DU's</u>		<u>Non-Electrified</u> <u>DU's</u>		<u>All</u> <u>DU's</u>
Better	6.3	(17.9)	9.3	(14.4)	15.6
Worse	3.1	(8.7)	10.2	(15.7)	13.3
About the same	25.8	(73.3)	45.3	(70.0)	71.1
No response	0.0	(0.1)	-	(0.0)	0.1
	<u>35.2</u>	<u>(100.0)</u>	<u>64.8</u>	<u>(100.0)</u>	<u>100.1</u> (100.0)

Slightly more of the women respondents of the electrified du's thought that family health had been better in 1978 than in 1968. On the other hand close to twice as many respondents of the non-electrified home (15.7%) thought health had been worse in 1978 than of the response to electrified households (8.7%). The difference between 8.7 and 15.7 was significant at about half the distance between .05 and .10. Electrification of the dwelling unit seems associated with respondents' perception of improved health conditions. Since these women are the wives and mothers of the families in question, it seems probable they had objective reason for their perceptions.

Source of Funding for Electrical Installation Costs

Respondents were asked the source of the funding by which they had paid the costs of installing the necessary wiring and fixtures into their homes and the necessary wiring outside so that they might be connected to the MORDESCO I grid. Their response was:

<u>Means</u>	<u>Per Cent</u>
1. Income from extra work	17.6
2. Loan from MORDESCO I	16.1
3. Selling property possessions	7.2
4. Loan from relatives	0.6
5. Use of family planning to postpone birth and thus not spend	0.6
6. Loan from MORDESCO plus income from extra work	0.6
7. Bank loan	0.3
8. Obtained prenda cash advance	0.3
9. Various other answers	55.1
10. No response	1.4
	<u>100.0</u>

Value of Electrification in Retrospect

From the foregoing answers it is fairly clear that installation of electricity cost many households considerable sacrifice and effort. In an attempt to discover how worthwhile the respondent in retrospect had found electricity actually to be now that the household had had it for some time, a question on the importance of installation of electricity was asked all respondents who had electrified their residences. As a check on these results all other respondents were also asked the same question. The question asked: "It costs perhaps ₱100-₱250 to install electricity in a house today and for the minimum monthly electricity bill. In your opinion is it worthwhile for a family to spend all that money on electricity including both installation of electricity and monthly bills?"

<u>Response</u>	<u>Electrified</u>		<u>Non-Electrified</u>		<u>Total</u>
	<u>Dwelling Units</u>		<u>Dwelling Units</u>		<u>Units</u>
Yes	34.2	(97.1)	44.2	(68.2)	(78.5) 78.4
No	1.0	(2.9)	12.1	(18.7)	(21.5) 13.2
No response	0.0	(0.0)	0.0	(0.1)	(----) 0.0
<u>Not applicable</u>	<u>0.0</u>	<u>(0.0)</u>	<u>8.4</u>	<u>(13.0)</u>	<u>(----)</u> 8.4
Totals	35.2	(100.0)	64.8	(100.0)	(100.0) 100.0

Clearly, households living in electrified dwelling units were convinced that their efforts to electrify their homes had been very worthwhile. On the other hand, those who had not made the installation were not so sure. Only 68 per cent (or 78.5 per cent, if not applicable are omitted) had answered affirmatively, and almost 20 per cent (or 21.5 per cent) had responded negatively. Respondents from non-electrified residences were asked why they had not electrified their homes, in order to obtain further insight into their outlook on electrification.

<u>Reason</u>	<u>Per Cent</u>
1. We can't afford the expense	26.6
2. Our barangay is too isolated to bring current here	28.9
3. Rights of way through particular places have not been obtained thus far	15.0
4. We don't want to install electricity	2.0
5. Already have (private) electricity	1.0
6. Alternative lighting is good enough	0.5
7. We don't like the people running the project here	0.3
8. The cost exceeds the benefits	0.3
9. <u>Other reasons</u>	<u>24.9</u>
All Response	100.0

Probably most of these respondents (70.5 per cent) would install electricity if they could. Thus a large majority of both installers and non-installers believe electricity is important and a facility worth installing if one can afford the sacrifices to pay installation costs. The respondents from the electrified dwelling units however have for the most part had electricity for several years. If obtaining it had not been worth their efforts and sacrifices, they would almost surely have been more tentative in their endorsement of installation. That 97 per cent still thought installation important in retrospect is a testimonial to the benefits it evidently is bringing to these families.

IMPLICATIONS AND CONCLUSIONS

After assessing 1960 and 1970 census data against a background of great familiarity with the two areas on the part of the researchers and after frequent visits to them by the researchers in connection with this specific research project, Chapter I concluded that the western (NORESCO I area) and the north-eastern (non-electrified area) segments had been essentially similar in relevant variables during the pre-electrification period, 1960 - 1970. These variables were: income, education, occupation, social status, type and value of crops, land tenure, employment in commerce and other off-farm occupations, and the fertility and employment of women.

For this reason the Quasi-Before and Quasi-After research design was chosen for the project. The Before stratum (the northeastern segment of Misamis Oriental Province) is therefore by the logic of this design considered to represent what the western segment would be like today in the absence of the experimental variable, rural electrification. On the other hand, the After stratum (the western ten municipalities of Misamis Oriental Province electrified by NORESCO I.) represents itself as it is at present after exposure to the experimental variable, rural electrification, over the course of approximately eight years (1972 - 1979).

By the logic of the design, hypothesized differences between the two strata are attributed to the influence of the experimental variable, rural electrification, provided that other disturbing factors can be shown to have affected both strata equally, and that rural electrification can be shown to have been the only major uncontrolled variable operating on the two strata differentially.

Chapter I also made an attempt to show that the other major variables not controlled in fact did affect the two segments equally: Martial law, the Masagana 99 Program, logging, mining, the establishment of rural banks, irrigation assistance, DBP loans to farmers, other national development programs, and especially the new concrete road running the length of the Province through the two segments and connecting Cagayan with Iligan City, Butuan City, and through this city with Surigao and with Davao.

The logic of the design is not as strong as a true Before and After study with separate groups, both measured before application of the experimental stimulus, especially if a third group has been used to secure control over environmental factors (social and physical). Thus the present study is more cogent for the demonstration of association rather than of causality. Nevertheless, the Quasi-Before and After Design, while never compelling because of its design weaknesses, can, under certain types of data outcome, furnish strong evidence of causality.

Two reasons prevented use of a true Before and After design in the present case. Such a design would have been much more expensive to carry out, and the additional funding was not available. Secondly, even if funding had been available, the design could not have been applied because interest in the project had developed only after some five years of electrification by MORESCO I, which made measurement of initial states in the two areas before application of the experimental variable impossible.

Against this logical background, Chapter II asked whether median household income in the western segment, after being lower during the '60s in the west, had by 1978 climbed to higher levels in the western than in the northeastern segment. Indeed, this was the most basic question of all. If, after eight years, rural electrification had not been associated with higher income in the western segment, it would be necessary to question the "social soundness" of the project, that is attainment of its primary aim: to aid the majority of the people, residing in this western area, who were poor.

Median income was found from 12 to 36 per cent higher in the west than in the northeast as calculated from different measures. Households living in dwelling units that had been electrified were also found to have median incomes from 43 to 65 per cent greater than households in the west not living in electrified dwelling units. The differences were significantly different at beyond .02 by binomial probability.

This differential between northeastern and western households cannot be explained in terms of wealthier households electrifying their households since (a) all households in both segments are compared and (b) since the northeast had higher mean income during the '60s. Further, the broad spectrum of households by income who had electrified their dwelling units in the west demonstrates that not only the wealthy had electrified their homes. In fact, 38.5 per cent of all installing households were below the level of absolute poverty, \$6,000; 56.0 per cent were poor families, and 68.5 per cent were households earning less than \$835 a month (\$10,000). There were no other relevant major variables that affected the two areas differentially. This gain in median income is therefore attributed by the design logic to the effects of rural electrification.

Increased income due to electrification would presume that large numbers in the west either desired or had installed electricity in their homes. It further presumed that these households had been stimulated to

work harder and earn more in order to pay for this electrification, monthly current bills, and electrical appliances that they had bought or wished to buy, mostly on credit purchasing terms. The survey showed that 35.2 per cent of all households (approximately 8,200 households) had installed electricity by June 1979, and that most of those which did not yet have electrification strongly desired it. Of the 8,200 installers, 56.0 per cent were poor. Problems of financing would require that they work harder and save over longer periods. Another aspect of the same question is the breadth of community electrification. All ten municipal government town centers (poblaciones) had been connected to the MORESCO grid and all but 16 of the 113 barrios (villages).

Working harder upon the farm probably would not have been enough to raise median incomes very substantially. Thus for income to rise to significantly higher levels in the west as compared to the northeast, business would have had to be attracted to the area from other sites or to start up new inside the MORESCO I area. That the cheap land and inexpensive labor previously available were not enough by themselves for this to occur is demonstrated by the previous history of the area. Adding cheap hydro-electricity to the mix would be a necessary input to attract business.

In fact, was business attracted to the area, and if so, did it provide the needed volume of jobs? Survey results show that 82 per cent of all businesses employing 10 or more persons in the MORESCO I area at time of interview had started during or after 1971, and 70 per cent employing 3 to 9 persons. The sharpness of the increase in employment after electrification, shown in the figures already presented is an indication that electrification was the new necessary causal factor introduced.

Data upon employment show a similar influence of electricity. Of all persons employed in the western segment in non-family enterprise, 86 per cent were employed in businesses which had located or begun operations in the western segment after January 1, 1970. In the ten years, 1970 to 1979, employment had jumped 592 per cent over its previous level. Ten of the largest enterprises alone employed 1,029 persons by 1979. On the average, these businesses had begun in 1974.

Employment was also observed in terms of electrified and non-electrified communities. The average number of businesses per non-electrified community (poblaciones or barrios) was found to be 1.25 and the average number of persons employed in non-family business 13.5. The average number of businesses per electrified community was found to be 3.1 and the average number of employed persons in non-family business was found to be 49.

Data upon occupation should confirm these conclusions if the inference is to be made that the rural electrification was causally associated with these gains in the west as a whole, and in electrified communities and households, in particular.

In agriculture, if electrification had raised median household income, one would expect to find that in 1978-79 the large difference between percentage of tenant farms in the northeastern and west segments of the Province (62 per cent more tenant farms had been found in the west) that had been observed in the 1960's had been substantially trimmed away. In business enterprise, one would expect to find in the western segment more persons employed in 1979 in clerical and office type jobs and less employed in agriculture, and to the extent that the culture had permitted it and jobs had been available, more women employed in non-family business.

The survey revealed that tenancy had almost evened out between western and northeastern segments. Only 36 per cent of western segment household heads employed in agriculture were tenants in 1979 against 31 per cent in the northeast (a difference of only 16 per cent as against the 62 per cent) in the 1960's and 61 per cent were owners or managers in 1979 against 65 per cent for the northeast.

In 1979, fewer household heads were also employed in agriculture in the western segment (67 versus 72 per cent), four times as many in the west were employed in executive, managerial, and administrative occupations as in the northeast, and twice as many in clerical occupations.

The data for all males and females (as opposed to the data for household heads who were mainly males) are similar. In 1979, in the western segment, 35 per cent fewer males were employed in agriculture than in the northeast (22.6 versus 34.6 per cent when all males of all ages are considered), and 84 per cent more in professional and white collar occupations.

In 1979, currently married women in the western segment were to a greater extent characterized by occupations other than housewife and/or student than currently married women of the northeast (9.7 versus 8.7 per cent), although the number of women in such occupations was not extensive in either segment. At the time of the 1979 survey, eleven per cent more currently married women in the west were employed in white collar type occupations (professional, business, industrial, governmental, and sales) than in the northeast, although counting employment in agriculture, more women overall were employed in the northeast.

On the basis of the foregoing, one would expect that in 1979 women worked shorter work weeks in the west and received higher pay. In fact, the median duration per week of fully employed women was lengthy in both segments (48.7 hours per week in the west and 54.2 in the northeast), but it was lengthier in the northeast. Income, as had been hypothesized, was greater in the western segment. Median income for currently married women in family businesses was \$1141 in the northeast and \$276 in the west. Median income of women employed in non-family business in the west was \$509.

As evident, these data strengthen the view that the increase in income noted in the west has been associated with rural electrification. In addition, 74 per cent of all currently married women in the west had begun work after January 1, 1970, with the median woman beginning work in April 1974, all of which dates are subsequent to establishment of NORSCO I in the west.

Another indicator of stimulus to income provided by electricity, work at night by women (and their children) upon income-producing work at night at home, made possible by the presence of electric illumination, produced the following data: Of all households with electricity, 46 per cent said they never worked at night on such activities. Of the remaining 54 per cent, 19 per cent said they worked on such activities at least once a week, often, or very often.

Several supplementary questions, asked to round out the data provide additional background for the foregoing information. Asked the advantages of working, currently married women responded: providing additional income for the family (45 per cent), helping my husband meet family needs (37 per cent), and the education of our children (4 per cent).

The same women however also saw disadvantages. These were mainly: less time with my family (16 per cent), my health (9 per cent), borrowing by friends and neighbors because they know I have income (9 per cent), possible losses (from family businesses), and separation from the children (2 per cent).

Women who had stopped working were asked why they had stopped working. Their replies were: marriage (18 per cent), pregnancy (9 per cent), our family business did not prosper (14 per cent), husband objected (9 per cent), the (non-family) business did not succeed well and/or it laid off most women (7 per cent).

Women who worked were also asked how they got their housework done, whether they could make arrangements for care of their children while they worked, and whether it was as easy now (1979) to obtain household help as it had been in 1970.

The largest group answered the household chores question by stating they divided the work up among their children (47 per cent), 24 per cent stated they did the housework themselves at night after work, 16 per cent entrusted these chores to household help, and the remainder used various means, including letting housework go to the weekends.

The question as to care of their children, brought out the fact that 34 informally organized day care centers of some sort are to be found in nine out of the ten western poblacions, and also in quite a few barrios. Approximately 75 per cent of all western working mothers said it was harder

now than before to get relatives to watch one's home and children while they were working, and only 14 per cent said they left their children with relatives while working. As for household help, 84 per cent of the women said it was harder now than in 1970 to obtain household help.

Migrants into the barangay of interview constituted 55.8 per cent of all households. Of these, 46 per cent had migrated after January 1, 1970.

Of all migrating households, 46 per cent had come from locations outside the segment. Of these, 21 per cent had come from Misamis Oriental Province sites outside the western segment, 42 per cent from other Mindanao provinces, 36 per cent from the Visayas, and less than 2 per cent from Luzon. Asked the reason for migration, respondents mainly replied:

<u>Reason</u>	<u>Per Cent</u>
1. Marriage: came here to live with my husband	46
2. Employment: husband and/or I had/or were seeking employment here	30
3. Property or relatives here	17

All these last four indicators point to increasing opportunities in the western segment in 1979 to find employment in business or industry, including female employment. Thus they corroborate the association of increased income with rural electrification.

Several further insights obtained from respondents shed additional light on the association of electricity and income. First, the women respondents were better educated than their mothers and thus more equipped to recognize and profit by the advantages of electrification. Percentages by attainment were:

	<u>Respondent</u>	<u>Mother</u>
No grade completed	13	47
Primary grades only	31	34
Some elementary education (Grades 5-6)	34	16
Some high school or higher attainment	21	3
<u>All Attainments</u>	<u>100</u>	<u>100</u>

In answer to several probes on living conditions, 23 per cent of the western segment respondents from electrified dwelling units thought their 1979 level of living was better than it had been in 1969 and 24 per

that it was better than in 1975 as against 14 and 16 per cent for respondents from non-electrified homes.

In this connection a specific probe asked about health. Allowing for increased age, 18 per cent of the respondents (currently married women) from electrified homes thought their family's health was better in 1979 than in 1968 and 73 per cent thought it about the same. Only 9 per cent said it was worse. Respondents from non-electrified homes gave a contrasting picture. Fourteen per cent said their family's health was better in 1979, 70 per cent thought it was about the same, and 16 per cent said it was worse.

Polluted water is of course one of the main causes of infections of the gastro-intestinal tract in the rural Philippines, and one of the important causes of morbidity and of death, especially of children. If income had increased since 1970 in the western segment, households would be expected to participate in groups or associations for securing improved drinking water facilities. Twenty-four per cent of respondents from electrified dwelling units had participated by 1979 in such associations to furnish or obtain pure drinking water, but only 11 per cent from the non-electrified homes. Another probe disclosed that in 1979 in such associations or groups existed in the communities (poblacion or barrio) of 25 per cent of respondents from electrified houses, and in the communities of 15 per cent of respondents from non-electrified residences. Only 6 per cent of such groups or associations had started up before 1970.

All respondents were asked whether the fairly difficult payment of costs of installation and of regular monthly electric current bills had in their judgment been worthwhile. For many with electricity a long while, this was an extended-experience retrospective question. Ninety-seven per cent of all respondents with electricity replied affirmatively, only 3 per cent saying no. Seventy-eight per cent of the respondents without electricity said yes, and 22 per cent said no.

Respondents from electrified homes were asked how they had financed the necessary wiring, fixtures, and skilled labor for the installation. Respondents from non-electrified homes were asked why they had not electrified their dwelling units.

The percentage distribution of relevant and intelligible answers to the financing question was:

<u>Response</u>	<u>Per Cent</u>
1. Extra work	41
2. MORESCO loans	36
3. Selling possessions or borrowing from relatives	18
4. Borrowing from banks, prenda, or MORESCO loan supplemented by income from extra work	5
	100

Respondents without electricity reported the following motivation for non-electrification of their homes:

<u>Response</u>	<u>Per Cent</u>
1. Our community is too isolated to bring electricity here	29
2. Can't afford the expense	27
3. Rights of way for electric lines not available	15
4. Already have (private) electricity	1
5. Don't like project leaders, alternative lighting sufficient, don't want electricity, or cost exceeds benefits	3
6. Other (scattered) reasons	25
<u>All reasons</u>	<u>100</u>

The response from these six probes on living conditions, health, water associations, the value of installation, means of financing, and reasons for non-electrification indicate better living conditions for electricity possessors, better health, more participation in water associations, and a general conviction on the part of both installers and non-installers of the utility and the value of electrification of the family home. These data also show the difficulties of financing the installation costs for many households, whether actual or potential users of electricity.

In summary, the data indicate with considerable strength a causal connection between the variable, rural electrification, in the ten municipalities of western Misamis Oriental Province and the variable increase in median income, because:

- (a) of the advantage in median income in the western segment in 1978, although in the 1960's the northeast had been characterized by higher median income;
- (b) of the advantage in median income, in the western segment in 1979, of households with electricity in their homes over households without electricity, even though a broad spread of households with electricity was found when households were distributed by income;
- (c) of the sharp and rapid increase in businesses and employment opportunities in the western segment since electrification;

- (d) of the large number of in-migrants, many of whom stated explicitly that employment had motivated their coming;
- (e) of the work done at night under electric illumination (housework or income work) that made daytime employment of the wife possible, or that augmented family income;
- (f) of the substantial shift by 1979 among western workers from agricultural occupations to better paying business or industrial occupations (professional, executive, white collar jobs); and finally
- (g) of many contextual/background items explored in the western segment that appear more congruous with a causal connection than with the opposite, and which taken together add circumstantial evidence for such a connection.

RURAL ELECTRIFICATION AND FERTILITY: ANY RELATIONSHIP?

INTRODUCTION

The great New York blackout some years ago was associated in many reports with a sudden increase in fertility. More sober scientists later pointed out the many fallacies involved, and the spurious nature of the association. Thus it has become almost a laughing matter for someone to suggest a relationship between electricity and fertility.

The simplistic idea that electricity operates as a mysterious contraceptive is indeed laughable. But this is not to deny that electricity may have an effect, direct or indirect, upon level of fertility. Otherwise, one must postulate that development cannot affect fertility, and that opportunity costs of childbearing may not be changed by infrastructural inputs. If however infrastructure and development can affect fertility, it is likely that the influence will not be as simple in type as suggested by the news periodicals after the New York City blackout.

The Research Institute for Mindanao Culture first became interested in possible linkages of rural electrification to fertility level during the period 1971-1975. The Institute was carrying out a dual-record demographic study in western Misamis Oriental Province in connection with a USAID/Washington financed project called the Population Laboratories Program. During this time, the Institute staff had witnessed a dramatic decline in birth rates, collected by the very accurate and painstaking dual record methodology for a sample of the MORESCO I area, which was at this time dispensing electric power and light in the western segment of the Province.

<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>Category per Specified Thousand Persons</u>
45.8	44.2	38.8	30.8	29.5	Age-standardized crude birth rates, All Persons.
209.7	202.4	177.7	140.8	135.3	Age-standardized general fertility rates, All Women, 15-49.
350.5	328.8	291.4	239.7	225.1	Age-standardized general fertility rates, currently married women, 15-49 years of age.
100	94	83	68	64	Index values, currently married women (1971=100).

These impressive declines in fertility were apparently not matched by the declines in other rural areas, and even in urban areas. Urban fertility might be at lower levels, but it did not appear to have declined as rapidly during the same short period. Fertility in urban Cagayan, for example declined at a considerably slower rate, although probably from an initially lower average level from 1965-1971. The rates are from the same dual record study:¹

<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>Category per Specified Thousand Persons</u>
45.5	41.6	43.6	44.6	35.8	Age-standardized crude birth rates, all persons.
144.2	132.0	138.3	141.5	113.7	Age-standardized general fertility rates, all women, 15-49.
349.1	316.4	322.0	290.5	273.4	Age-standardized general fertility rates, currently married women, 15-49, western segment.
100.	91	92	83	78	Index values, currently married women (1971=1.00).

The rural methodological sample included the entire municipality of Laguindingan (the site of the MORESCO I central offices as well as of its transformers and power lines to the various municipalities), about sixty per cent of Alubijid Municipality, and small segments of El Salvador and Gitagan Municipalities.

This 1971 sample area became the earliest site of extensive hook-ups of homes to electric current, and one of the most densely electrified areas in the whole western segment of ten municipalities. This was apparently partly due to proximity to the MORESCO headquarters, and partly to the better than average terrain through the methodological sample.

¹Source: Francis C. Madigan and Alejandro N. Herrin, New Approaches to the Measurement of Vital Rates in Developing Countries. Washington: Interdisciplinary Communications Program, Smithsonian Institution, 1976, pp. 22-32. It should be noted that both 1971 and 1975 rates are annualized because based on less than 12 month observation (4 months in 1971 and 6 months in 1975).

A later probability sample of these ten municipalities was also studied by the dual record methodology. Non-electrified barrios/barangays showed up in this sample as one would expect. Electrification had been slower in spreading to the barangays outside the methodological sample and had not reached barangays deep back into the mountains not accessible by road but only by trail. Nor was the density of electrified dwelling units at all as great as in the Laguindingan-Alubijid sample area in many, if not most, barangays. The fertility of this sample was as follows:

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>Category per Specified Thousand Persons</u>
51.1	35.7	35.0	Crude birth rates, all persons ²
238.4	169.2	169.7	General fertility rate, all women.
374.3	265.4	269.6	General fertility rate, currently married women.
100	71	72	Index values, currently married women (100 = 1973).

The western ten municipalities, especially the Laguindingan-Alubijid sample, appeared to RIMCU researchers, almost continually in the field from September 1, 1971 to June 30, 1975, because of the prospective nature of the Continuous Recording System, to change principally under the impact of electrification, as an effect of electrification. The road through the coast was full of potholes and bumps. (It became worse when construction of the concrete road later began and detours through fields and rough areas became the order of the day.) No other infrastructure of note seemed to have been placed in this area more than in any other area.

It had seemed likely that the decline the Research Institute was finding in their semi-annual fertility reports was in some way associated with the input, rural electrification, set in place by the government with the help of USAID. Speculation began upon the nature of this apparent association.

This association of rural electrification with fertility level also seemed to be supported by the further finding that where electrification had been later put in place, or where installations were spotty and less dense, a decline had also occurred, but a decline delayed through later calendar years, and a decline characterized by a more moderate slope.

²Source: Madigan and Herrin, New Approaches to Measurement, pp. 29-30.

As outside circumstances had varied the experimental factor (electrification) in some large-scale "natural experiment," and as the strength of this factor had varied, so had the effect upon fertility level, it seemed.

It would have been desirable to compare these fertility declines with fertility levels measured by the dual record methodology for the northeastern, non-electrified, segment of the Province. However, this was not possible. While there had been an eastern Misamis Oriental Province component for the dual record study of birth and death rates, this component had included densely populated municipalities (Tagoloan, Villanueva, and Jasaan), electrified by the Cagayan Electric Power and Light Company, and Gingoog City Poblacion (which was locally electrified), in addition to the non-electrified municipalities. Thus the electrification and non-electrification input had been confused in this area, and the data had been aggregated to the whole segment.

In assessing these fertility data, collected before the project of this current report was commissioned (1977), the present writer concluded that several causal threads might well tie together MORESCO I rural electrification and level of fertility, and that these possibilities should be investigated. As a result, the following hypotheses were framed for study:

- a. The opportunity to afford installation of electric illumination of the home (cool, clean, inexpensive once installed, convenient) and to substitute it in place of oil lamps (hot in the damp tropics, dirty, messy, increasingly expensive even after investment in a pressure lamp, and often quite inconvenient) would be lost or threatened by the expenses of bearing a child during this time (with attendant expenses of special foods for mother, of delivery, and post-natal care), or the expenses of a son or daughter's marriage at this time.
- b. The opportunity to enjoy electrical facilities and appliances in the home would similarly be lost or threatened by childbearing, or by a marriage at this time.
- c. The opportunity for women of the household to obtain off-farm, non-family employment for cash wages or salaries because of night-time electric illumination making housework then possible, would be lost or threatened by childbearing or a marriage at this time.
- d. The very opportunity to work at night at home for family members or away during the day to increase family income would be lost or threatened by a childbirth or a marriage at this time.

- e. The opportunity to climb socially in the poblacion or barrio through installation of electricity in the home would be lost or threatened by childbirth or a marriage at this time.
- f. The opportunity to provide better education for the children through increased income would be lost or threatened by a childbirth or a marriage at this time.
- g. The opportunity to provide better nutrition for the children and the rest of the family, would be lost or threatened by a childbirth or a marriage at this time.
- h. The opportunity to find off-farm, non-family employment for single women would be lost or threatened by marriage at this time with attendant immediate expenses and obligations.

The common assumption of most of these hypotheses is that the family would, because they otherwise lacked resources, have to borrow money to cover costs of installation of electricity at home. They generally assumed that households would thus have to amortize such loans and debts over a period of six to eighteen months. It assumes that this would motivate the poorer households to economize and constrain unnecessary costs in all possible ways.

Additionally, it was assumed that households which were better off would to a great extent want to purchase electrical appliances and facilities (radios, electric laundering irons, hot plates, refrigerators, etc.), and would do so on credit through an installment repayment plan. This would also motivate such wealthier households to constrain costs.

In this framework, it appeared that family planning methods, already proposed and taught in the rural health units present in every municipality, would appeal to these families as useful means to constrain and hold down expenses during the difficult amortization and repayment period. It also appeared that families might try to persuade their young women to postpone immanent marriage for some six months to more than a year, and even to take jobs, to help the family meet its schedule of repayments. Further, it appeared that young women themselves might desire to postpone marriage and take a city job or employment in the western segment in order to build up trousseaux or help out parents with the new payments.

Were such opportunity costs of fertility and marriage in some fashion perceived, even if not clearly, by MORESCO I area households? If so, what kinds of data would enable one to assay these hypotheses and the possible existence of a causal linkage between MORESCO I electricity and change in level of fertility?

Such data might include the following:

1. Increasing female age at first marriage (delayed marriage).
2. Expression by households of strong interest in and desire for electrification of their homes, and of conviction that sacrifices to this end are worthwhile.

The income distribution should reveal a generally low income level both among actual and seriously aspiring electricity customers.

Level of income in the electrified west should exceed that of the northeast. Otherwise opportunities to repay would not have been sufficient, and the struggle to repay - through harder work and a resulting increase in income - would not have been strong enough to motivate family planning. (This is conceived as a result: taking advantage of an opportunity.)

Employment opportunities should have in the western segment increased substantially. Otherwise increased efforts to repay would not have been feasible or successful. (It should be mentioned that MORESCO I procedure included disconnection of electricity after three months of non-payment.)

Most important and crucial of all, couples who had had their homes electrified should have accepted and continued to practise family planning methods to a substantially greater extent than couples who had not electrified their homes. Family planning methods are means, not motivations, to restrict births. However, provided that the motivation was great to secure electrification and thus to repay installation costs and any credit installment bills for electrical appliances, this desire to obtain and retain electrification should have provided the additional necessary motivation for adoption of family planning.

Further, once a couple had discovered that family planning could help them repay electrification costs and installment bills, it was assumed that they would also consider using family planning methods to help themselves to pay for other benefits (e.g. life insurance).

In connection with the above, the data already presented in Chapter II have already presented a rather strong case for the association as motivation of the MORESCO I rural electrification with both the delayed marriage and the adoption and use of family planning, and consequently of level of fertility, if in fact delayed marriage and family planning are found more frequently in electrified homes and in homes actively seeking to obtain electrification.

The studies reported in Chapter III found:

- a. that 35.2 per cent of all households had electrified their dwelling unit (page 27);
- b. that 68.5 per cent of all installations (page 30) were made by families earning less than ₱10,000 a year (less than ₱833 a month), 55.9 per cent by families earning less than ₱8,000 a year (less than ₱667 a month), and 38.5 per cent by families earning less than ₱6,000 a year (less than 500 a month);
- c. that families earning less than ₱6,000 a year were below the level of absolute poverty (page 31);
- d. that 55.8 per cent of all respondents (the wives of household heads) had migrated into their present barangay, and of these 45.8 per cent had in-migrated sometime after construction of the MORTESCO I power facilities had begun (page 51);
- e. that 22.5 per cent of all households living in the western segment at time of interview had migrated into the segment (page 51);
- f. that 97.1 per cent of all respondents in electrified dwelling units and 68.2 per cent of all respondents in non-electrified dwelling units stated (page 57) that it had been worthwhile to spend all the money that they had spent on electricity (including both installation and monthly electric current bills);
- g. that only 3.1 per cent of those who had not installed electricity, clearly would have been reluctant to pay costs of installation, if they had been able to afford it, although 24.9 per cent gave "other reasons" for non-installation (page 57).

These data are good evidence of a strong interest in and desire for the benefit of electricity in the dwelling unit. They also indicate an income distribution in which median income is generally low among both actual and potential electricity users. Median real income from all sources (see page 26) was only approximately 18 per cent above the absolute poverty line (₱7,096 ÷ ₱6,000).

In addition, the data exhibit income levels in the west exceeding those of the northeastern segment, and to this extent show the presence of increased efforts to pay installation and power bill costs (page 26).

The data also reveal the presence of greatly increased employment opportunities (pages 33-37) and of better paying types of work (pages 37-39).

Thus considerable evidence has already been accumulated which points to a close association between rural electrification as motivation (directly or indirectly) and the recorded fertility decline, and which strongly suggests that the electrification played a causal role.

The following section proceeds to consider further data relating to the hypothesized association and possible causal influence of electrification upon level of fertility.

Age of Women at First Marriage

Do the data show a marked differential in age of women at first marriage between electrified and non-electrified dwelling units? If so, this would powerfully support the hypothesis of association between rural electrification and level of fertility. One of the large, generally recognized elements in the Philippine fertility decline has generally been recognized to be advancing female age at first marriage. The implication of finding significantly higher ages at first marriage in electrified homes would be that the illumination of the home somehow persuaded young women to delay their marriage. The two hypothesized modes of influence are: (a) such illumination made the performance of household chores at night possible, thus releasing the young lady for daytime employment and (b) the high relative cost for the family of electrification, regular monthly current bills, and/or of electrical appliances required the young women to delay marriage in order to avoid large expenses at the critical time of installation, and to attempt to earn additional income to help the family pay installation, current, and appliance costs - and possibly to lay aside something for her wedding day.

This hypothesis was examined by use of the singulate mean age at marriage, a measure which computes the average number of years lived in the single state by women up to age 50. It is a recognized substitute measure for the age of women at first marriage directly measured.

The data showed the following measures:

<u>Electrified Homes</u>	<u>Non-Electrified Homes</u>
24.7	21.7

This an exceptionally large differential and the difference is significant beyond the .05 level. It presents exceptionally strong support for both the association and the causal influence of electrification upon level of fertility. The younger years of a woman who has reached puberty are her most fertile years, and any average number of years by which such women delay marriage almost certainly will result in diminished fertility.

Number of Children Ever Born

The preceding data make it fairly evident that number of children ever borne by women 15-49 years of age living in electrified dwelling units will be less than the children ever borne by women living in non-electrified dwelling units. The reason of course is particularly the loss of years in the child-bearing period 15-49 caused by delay in marriage. Nevertheless, it will be necessary to examine these data to gauge the precise level of children ever born and of average completed family of women in each of the electricity categories. These data on average children ever born are:

	<u>Age Limits, Five-Year Age Groups, All Women</u>							
	<u>15-19</u>	<u>20-24</u>	<u>25-29</u>	<u>30-34</u>	<u>35-39</u>	<u>40-44</u>	<u>45-49</u>	<u>15-49</u>
Electrified d.u.'s	0.0	0.4	1.8	3.1	4.2	6.0	6.7	2.4
Non-electrified d.u.'s	0.2	1.4	2.9	4.6	6.3	7.1	7.4	3.3

The difference on the average is almost one child (2.4 vs. 3.3). Size of completed family (ages 45-49) in the electrified homes is 0.9 children less, and every age group of women shows less children ever born for women from electrified dwelling units (d.u.'s). The binomial probability of obtaining such a result if no real difference in mean number of children born existed between families with and without electrification at home is less than .01. Not all this difference of course is due to delayed marriage, but the data just seen (on average age at marriage) present very strong reasons for ascribing much of the difference to the older age at marriage of women from the electrified homes.

It is worth the time to consider also the same type of data for currently married women (at time of interview). These would be from the same data but with single and widowed/separated women excluded. Also excluded of course would be births to these excluded women. Level of average children ever born will be higher for currently married women than for all women for both electricity categories, but the hypothesis is that non-electrified du's have higher fertility and larger completed families.

	<u>15-19</u>	<u>20-24</u>	<u>25-29</u>	<u>30-34</u>	<u>35-39</u>	<u>40-44</u>	<u>45-49</u>	<u>15-49</u>
Electrified d.u.'s	0.9	1.4	2.8	3.9	5.0	6.5	7.5	4.6
Non-electrified d.u.'s	1.0	2.0	3.3	4.8	6.5	7.7	8.2	4.8

These data show that even in the case of currently married women only, real differences are found between women from electrified and women from non-electrified homes. The average differences (4.6 vs. 4.8) are not

large, but average completed family size (7.5 vs. 8.2 children) is quite substantial. The binomial probability of obtaining such a result if no real difference existed is again less than .001.

Children ever born data have the constraint of including fertility for long periods of time - the entire fertile period up to date of interview. Thus they do not easily allow for disaggregation to the most recent calendar year before interview (1978 in the present case). For this reason an additional question on births during 1978 was asked in all interviewed households. This permits computation of a general fertility rate for women 15-49 years of age from electrified and from non-electrified dwelling units. This rate is a better rate than the crude birth rate because it eliminates men and women outside the ages 15-49. In addition, here we can also exclude women not currently married. Thus one can observe the actual fertility behavior of currently married women in their fertile period during the last year before interview. Both standardized and non-standardized rates are presented for calendar year 1978.

	<u>Electrified Homes</u>	<u>Non-Electrified Homes</u>
Not Standardized	175.0	273.0
Age Standardized	175.0	240.8

This set of rates tells us that in 1978 the fertility of currently married women, the principal and almost exclusive contributors to the birth rate (illegitimacy is relatively a minor source of births in the Philippines), was very substantially lower in electrified homes. The differences are significant beyond .05.

Another measure of fertility is the total fertility rate, a standardized type of rate including the fertility of all years, 15-49. These rates per woman were:

<u>Electrified Homes</u>	<u>Non-Electrified Homes</u>
6.7	9.1

Again these differences of currently married women by electrification category are significant beyond .05. The total fertility rate (TFR) is another way of estimating completed family size, and the difference between the women of electrified and of non-electrified homes in this estimate is quite large, 2.4 children.

These sets of data furnish strong evidence for an association between rural electrification and level of fertility. They show a clear linkage between electrification and fertility from many points of view: children ever born, general fertility, and total fertility rates.

Do these data indicate a causal influence or linkage between rural electrification and fertility?

It would appear that they do. Women from electrified homes are shown to be remaining single longer, and when married to have less children. What in their backgrounds has changed since 1970 that would motivate restrictive fertility behavior on their part to a greater extent than on the part of women from non-electrified homes? The answer cannot be family planning. Family planning is a means, not a motivation, and it does not explain delayed marriage.

The only apparent major change in the backgrounds of these women and their husbands is electrification and the changes which electrification has brought in its wake. It is the discriminant between couples living in electrified residences and those living in residences without this benefit.

What are these changes which electricity has initiated?

- (a) the opportunity to enjoy clean, cool adequate, and convenient illumination of the whole home at the flick of a switch;
- (b) the opportunity to find and keep an off-farm, non-family job in business or industry through housework/chores done at night;
- (c) the opportunity to augment own and family income through outside work, through irrigation of the family farm, through other electricity-dependent means of increasing farm productivity;
- (d) the consequent need to constrain expenses to meet repayment costs of installation loans and/or of facilities bought on credit while keeping up regular payment of monthly electric current bills.

The evidence seems strong that these and perhaps other opportunity costs, associated with electrification, which opportunities would be lost or at least endangered by child-bearing at the time of installation and of loan repayments, furnished the motivation for young women to delay their births and couples to seek to avoid another pregnancy at this time.

How did the married couples carry out this intention? Family planning suggests itself as the most probable means. Each municipality already had family planning services available in the government's rural health unit, at that time. It would simply be a matter of using these available services.

In the Philippines where many government services are "accepted" on the part of the target member of the population, as a personal favor to the change agent (in this case, the family planning "motivator"), acceptance rates are less useful than rates of continuing use. Acceptance may be merely nominal. Thus while acceptance is obviously important, greater weight should be attached to continuance rates.

The data are as follows:

Age Groups	Electrified Homes			Non-Electrified Homes		
	Acceptors of F. P.	Continuing Users ^a	Per Cent Attrition ^b	Acceptors of F.P.	Continuing Users ^a	Per Cent Attrition ^b
15-19	28.6	14.3	50	21.1	10.5	50
20-24	50.0	26.3	47	32.2	24.3	25
25-29	67.0	51.5	23	45.5	31.8	30
30-34	73.0	58.4	20	47.8	29.6	38
35-39	61.9	42.9	31	48.3	30.6	37
40-44	57.9	41.1	29	35.5	25.0	30
45-49	34.5	16.1	53	17.9	5.7	68
15-49	58.2	40.9	30	38.3	24.9	35
n	312	219		411	267	

^aBased on all currently married women of the particular age group, not on acceptors only.

^b(Drop-outs/acceptors x 100; rounded).

Results are confirmatory of the hypothesis of greater motivation on the part of women (couples) from electrified homes. At every age, and overall, greater proportions of these women had accepted family planning. In addition, at every age, and overall, larger proportions of women with home electricity continued their practise of family planning. (Note that the percentage of current users is not the percentage of acceptors who were continuing to use family planning, but the percentage of all currently married women in the particular age bracket from electrified homes, or from non-electrified homes. It was felt this type of percentage would be more useful here.) The overall differences in percentages (between acceptors and between continuing users) are significantly different at beyond .01 by binomial probability.

The table just seen also contains a very interesting column labelled "Per Cent Attrition." This column shows, in terms of all currently married women, ever-users plus never-users, the percentage loss or attrition between acceptors and those who continue to use family planning. Comparing columns of women with electricity and of women without electricity, one

finds an overall difference of 5 per cent in attrition, but larger differences for ages 25 to 39. Filipino couples are anxious to have one or two children as soon after marriage as possible. Otherwise they are taunted by relatives and friends as "unable." This is likely to be at ages 15-24. After that, if motivation presents itself, they may be interested in family planning. Sixty per cent of all currently married women 25-49 with electrification were in the 25-39 bracket age group, and 67 per cent of the women without electrified residences. Thus these age groups, where the differences are large, are precisely the more important groups for fertility level. In these groups one would also expect women to be more likely to conceive than at ages 40-49 when complete or partial sterility has become more common.

This data set presents strong, although not completely conclusive, evidence of a causal influence of rural electrification upon level of fertility. It is fairly conclusive evidence of negative association of rural electrification with fertility level.

Most family planning users had begun to practise family planning after 1969, all but 11.5 per cent. This is not surprising since the national family planning program only began to reach the rural health centers after 1969.

Methods of Family Planning

Forty per cent of the drop-outs from family planning practise had used the anovulant pill whereas only 18 per cent of the current users relied upon this method, among women with electrified homes. Thirty-three per cent of the drop-outs had used the IUD, whereas only 20 per cent of the continuing users practised this method. Ten per cent of the drop-outs had used rhythm (5.4 calendar, 4.3 sympto-thermal) but 23 per cent (16.4 calendar, 6.4 sympto-thermal) of the continuing users. Two per cent of the drop-outs had used the condom, whereas 8 per cent of the continuing users made this their choice. Finally, none of the drop-outs had been ligated, but 17 per cent of the continuing users had resorted to this means. These are the main features of the data. They reveal from the methods chosen a fairly strong desire to avoid conception.

For the women from non-electrified homes, 52 per cent of the drop-outs had used the pill, 24 per cent the IUD, 6 per cent the condom, and 3 per cent had used calendar rhythm. The methods of current users were the pill (27 per cent), the IUD (16 per cent), the condom (9 per cent), rhythm (16 per cent: 13.5 per cent calendar rhythm, 2.6 per cent sympto-thermal rhythm), and ligation (12 per cent). These methods also show a rather strong intention of avoiding pregnancy.

Income and Family Planning

If the hypothesis of difficulties in making repayments on loans for electrification and electrical goods is in fact verified, large percentages of persons with low income levels should have turned to family planning to curtail expenses. In fact, such data present a crucial test of these hypotheses. Data were gathered to examine these hypotheses. They are for ever users of family planning. If the poverty line is placed at \$8,000 a year (less than \$667 a month, about \$89 in 1979 values) and the level of absolute poverty at about \$6,000 a year (\$500 a month, about \$67 at 1979 values), one may inquire what percentages of households earned below and above the level of \$8,000. The percentage data of acceptors by four broad income categories are:

Ever Users of Family Planning

<u>Annual Income</u>	<u>Electrified Homes</u>
Below \$6,000	54.5
\$6,000-7,999	13.1
\$8,000-9,999	10.3
\$10,000 or more	22.1
<u>All Incomes</u>	<u>100.0</u>

It is clear from this table that a large majority of persons (67.6 per cent) who had electrified their homes and were using family planning, were below the poverty line. In fact, a majority (54.5 per cent) were below the level of absolute poverty. It is evident that they would in fact have trouble paying the loan installments while keeping up with monthly electricity bills. This table therefore supports the view that such families turned to family planning, among other reasons perhaps, to help them keep up with their regular payments. It is hard to believe their minds would not make such a connection.

Examination of a table of data for current users of family planning leads to the same conclusions. The data are this time percentages of current users of family planning by annual income.

Electrified Homes

<u>Income Category</u>	<u>Currently Married Women (15 - 49)</u>	<u>Attrition of Users</u>
Below \$6,000	52.5	32
\$6,000-7,999	14.6	22
\$8,000-9,999	9.1	38
<u>\$10,000 or more</u>	<u>23.8</u>	<u>25</u>
	<u>100.0</u>	<u>30</u>

Again 67.1 per cent of all current users are poor (52.5 per cent below ¥6,000 a year). These are the families currently using planning, thus pursuing family planning in a serious way. Note that the rate of attrition (drop-outs/acceptors x 100) shows that most of the acceptors had kept up their planning, and that lowest attrition was in one of the two poverty categories.

Reasons for Practising Family Planning

Respondents from electrified residences, who had ever used family planning, were asked why they had decided to use family planning. The answers to this open-ended question were:

1. Wishes to avoid a child at this time (spacing)	38.2
2. Wanted no more children	34.9
3. Economic/financial reasons	17.3
4. Future security	4.2
5. Health	7.2
6. Work/employment	1.9
7. Irrelevant response	1.3
	<u>100.0</u>

As can be seen, the first three and the sixth answers, totalling 92.3 per cent of all answers, are supportive of the hypotheses that these women wished to meet expenses at this time through avoidance of child-bearing and through taking employment or continuing to work.

Further light on family planning practise can be gleaned from the answers of respondents who had terminated family planning to an open-ended question on why they had ceased to practise. Answers for the most part reveal reasons not negating strong motivation to practise planning, but offering what might appear to these respondents as even stronger personal or family reasons for stopping (health, sterility, method problems):

1. Fear of side effects	62.4
2. Felt like stopping	7.5
3. No more need (sterility/absence of one of the couple)	9.7
4. Method problems (hard to learn, travel to get supplies, husband objects, method failure)	10.8
5. Wanted another child	6.4
6. No response	3.2
	<u>100.0</u>
All response	100.0

This section on family planning is brought to a close by presenting data on number of ever users by age. They reveal that use was heavily concentrated within ages 25-44.

<u>Age Group</u>	<u>Electrified Homes</u>		<u>Non-Electrified Homes</u>	
	<u>Currently Married Women Ever Using Family Planning</u>		<u>Currently Married Women Ever Using Family Planning</u>	
	<u>Number</u>	<u>Per Cent</u>	<u>Number</u>	<u>Per Cent</u>
15-19	2	0.6	12	2.8
20-24	27	8.3	61	14.3
25-29	73	22.4	96	22.6
30-34	67	20.6	93	21.8
35-39	65	19.9	87	20.4
40-44	62	19.0	54	12.7
45-49	30	9.2	23	5.4
15-49	326	100.0	426	100.0

CONCLUSION

These income, employment, and family planning data seem to the present writer to furnish strong proof not only for the association of rural electrification with level of fertility but for the causal influence of electrification upon fertility.

These data show an increase in income of the electrified western segment over the non-electrified northeast which in the 1960's had greater income. They show larger incomes in electrified homes of the west than in non-electrified homes and link this difference to greater productivity of electrified farms, to family businesses made possible or more productive because of electricity, to the greater employment opportunities in the western than in the northeastern segment, and to the possibility of women daytime workers doing housework at night.

The data also show that repayment of debts for electrification and for bills connected with it would be difficult for poor families, and would require extra and long-continued effort on their part. This effort would motivate them to seek employment or other further income-producing activities (night work at home or other family business) which would augment their income and help them thus meet the pressures of bills. It would also incline them to look for ways to economize and cut costs. Among these, it was suggested, they would inevitably think of delayed marriage for adolescents and young adults, and of family planning for household head and wife.

In fact, the data show significantly larger per cents of ever-users and of current users of family planning among those who had installed electricity in their homes, than among those who had not. Further analysis of these data in terms of income, reveals large numbers of low-income earners, truly poor families, among family planning acceptors and continuing users. The types of methods used attests to the seriousness of their purpose of avoiding conception.

It is for these reasons that the present writer believes that the evidence is strong for attributing the decline in fertility noted in the beginning of this chapter to the influence of rural electrification. It should be pointed out however that the evidence, while strong, is not conclusive for the design reasons already pointed out. A Quasi-Before and After study design does not have sufficient control over the experimental variable (rural electrification in this case) to be able to answer all objections to an interpretation of the evidence which it gathers. Nevertheless, it can under certain conditions of the data studied present quite strong, if not completely cogent, evidence of causal influence. This was, for example, the way in which earlier studies causally associating cigarette smoking with lung cancer built up evidence for a causal connection between the two, to the point where funds finally were made available for a true Before and After study design of this strongly indicated relationship. Similarly, if funds could be made available, a true before and after study of the effects of rural electrification upon income, employment, and fertility can now be done on the basis of the present study. The before aspect has already been carried out in the northeastern segment (NORESCO II) of Misamis Oriental Province in this study. It only remains now to study the same northeastern segment at several points of later time after the installation of the NORESCO II infrastructure in 1979-80, and to compare whatever development take place in the same segment with its conditions in 1978 (when this Before study was undertaken). Such a study should not prove expensive.

ADDENDUM

More material pertinent to Chapter III is available, and can be supplied to researchers and other interested parties upon request. A small copying and mailing charge may be levied in proportion to the bulk of the materials furnished.

Appendix A presents some of these materials.

MULTIVARIATE ANALYSIS

INTRODUCTION

This chapter turns attention to multivariate analysis in an endeavor to obtain further information about the association of rural electrification with income, employment, and family planning. The methodology selected is multiple regression. Non-quantitative data were quantified by expressing them as dummy variables.¹

Annual Household Income: Cash Plus Real

Nine factors were examined in this regression equation for relationship to annual cash-and-real income. Three of these nine variables were placed in the equation for control purposes. If not controlled, they might interfere with operations of the variables of interest, masking their association with income, either by an undue degree of association, exaggerating the relation of electrification, or of other variables, to income, or by attributing to other variables what in fact is due to electrification or to this other variable.

Variables of special interest here as explanatory factors are occupational status of males and females, highest grade completed by household head and female household head (e.g., wife of household head), electrification of the home, and family planning continuation status.

The total (simple) correlation coefficients of these six explanatory factors with income were:

Occupational Status, Males	-.166	Grade Completed, Wife	.237
Occupational Status, Females	-.148	Electrification	.249
Grade Completed, H.H. Head	.263	Family Pl. Continuance	.066

Occupational status for males was a dummy variable dichotomizing occupation into farmers and other occupations. The farmers were given the code number 1 and other occupations the number 0. For females, the status was a dummy variable assigning the code number 1 to housewives and 0 to other occupations. Thus the minus coefficients indicate positive association between non-farm occupation and between non-housewife status, with income. Grade completed for both sexes and electrification are moderately associated with income. Family planning continuation is associated only to a less degree.

¹Sincere thanks are expressed to Dr. Michael A. Costello and to Dr. Amanda N. Te who programmed the data for the multiple regressions and then supervised the work at the computing centers. Mistakes of interpretation, if such occur, should be attributed, not to them, but to the author.

The problem of multicollinearity needs consideration in multiple regression analysis. If explanatory variables are intercorrelated to an extreme degree (such that the correlation is 1.00 or - 1.00 or near such figures), estimates of slope cannot be computed at all. If they are highly intercorrelated (e.g., .85 or above), the values of b or beta coefficients may or not be appreciably affected, depending upon the particular variables of interest to the researcher (i.e., their high or non-high intercorrelation with others), but the variances of the b 's and betas may be affected, producing larger estimates of variance than the actual (but unknown) variances. This problem however is likely to be less serious in regressions based upon large samples like the present research (2234 cases). In such cases, where significance for particular b 's and betas of interest does not appear, the further test should be made of an F test of these coefficients. This may show that although none of the individual b 's appears to be significant, the set as a group is significant, and that multicollinearity has prevented this from becoming apparent in some, at least, of the individual cases.

In the present regression, only two of the explanatory variables are even moderately high in level of intercorrelation, highest grade completed of household head and highest grade completed of wife (or surrogate) of household head. These correlated at .66. The remaining variables intercorrelated with others of the set at relatively low levels. Highest intercorrelations of the others were: occupational status of males and females (.30), electrification with highest grade completed of household head (.33), and family planning continuation with highest grade completed of female head of household (.25). Multicollinearity was not a serious concern therefore for the present regression.

The measures used to assay the degree of association of pairs of variables, with the other eight independent variables controlled, were the standardized (beta) and the unstandardized (b or original) slope coefficients. The multiple regression coefficient views the association in two dimensional terms, and states the amount of change in income associated with the amount of change per unit of the particular independent variable while it controls other factors. The original slope coefficient (b) states this relation in terms of the units of income associated with change per unit of the independent variable in question. The beta coefficient is produced by multiplying the b by the standard deviation of the independent variable (e.g., Head's highest grade) and dividing by the standard deviation of the dependent variable (e.g., income). The effect of standardization is to transform the standard deviations of each variable to 1 (unit variance), to make the Y intercept (the regression constant A) always equal to zero, and in addition to make the beta coefficient equivalent to a simple (total) correlation between the dependent variable and the standardized independent variable, but controlling the other explanatory variables for effects upon this association. (It should be understood that when b was used above, the type b meant was the multiple regression b , for example, $b_{12.31567890}$, which means the slope coefficient between the employment status of the household head (variable 2) and income (variable 1), with the other eight independent variables hold constant.)

The beta coefficients are expressed as some proportion of 1.00, and are directly comparable between independent variables, which is not the case for b in which slope is computed in terms of the original values of the various independent variables. Thus the beta coefficient indicates the relative importance of the various independent variables for association with income, while the b coefficient states the per unit change in income associated with the per unit change in the independent variable.

With this introduction, results of the regression are now presented for the explanatory variables of interest. First, the multiple correlation of the nine variables with income was .403, which means that these nine variables explain about 16 per cent of the variation in income. This coefficient was significant at beyond .001. The standardized and unstandardized slope coefficients of the hypothesized explanatory variables were:

<u>Independent Variable</u>	<u>b</u>	<u>beta</u>	<u>Significance</u>
1.) Occupational Status, Males	P 189.1	.008	Not significant
2.) Occupational Status, Females	-P1,815.2	-.079	Beyond .001
3.) H. Grade Completed, H.H. Head	P 390.6	.164	Beyond .001
4.) H. Grade Completed, Wife	P 275.7	.116	Beyond .001
5.) Electrification of Home	P1,838.0	.095	Beyond .001
6.) Family Planning Continuance	P 187.9	.009	Not significant

As can be seen, change per unit of electrified homes was placed last in the regression. It is associated with greatest change in peso value of income and the result was highly significant, even when eight other variables were controlled. This is strong proof for the importance of the association of electrification with income. However, the beta coefficients make it clear that this association is somewhat less than that for grade completed, and standardization of the coefficient reduces somewhat one's first conception of the relationship. Nevertheless, the relationship is real and lasting, even under the impact of the other variables. Family planning continuance and male occupational status did not prove significantly associated with income when contributions to association of the other variables were taken into account.

While grade completed was more highly associated with income for both household head and female household head (wife or her surrogate) than electrification, still a problem of practicability arises in connection with these two variables. The attempt to raise the income level of a people (presumably through some type of free or partially subsidized educational plan) by raising their median or average educational level, would be extremely expensive and would be a long-term operation. Both features militate against its choice as a developmental strategy. On the other hand, rural electrification stands up well on both these features. It can be provided at fairly reasonable levels of infrastructural input, and it can be set up so as to be self-supporting after initial inputs are made. As such, it recommends itself as a developmental strategy from the viewpoint of an income stimulant. These results substantiate those already found in Chapter II upon the association of electrification with income.

Occupational status of females is also associated with higher income. Women who are not merely housewives (i.e., employed women) are significantly related to increased earnings. Since Chapter II has indicated a strong linkage between female gainful activity and rural electrification in terms of more opportunity for better paying jobs, this finding also supports the hypothesis that rural electrification is associated with increased income.

It is also of interest to examine the regression for the behavior of the control variables. Bivariate correlations (simple correlations, zero order coefficients) are also presented (as r_{yx}).

<u>Independent Variables</u>	<u>r</u>	<u>b</u>	<u>beta</u>	<u>Significance</u>
1.) Residence in Poblacion, or Barrio	.216	P2,502.9	.092	Beyond .001
2.) Number of Persons in Household	.144	P543.0	.145	Beyond .001
3.) Age of Household Head	.102	P111.6	.161	Beyond .001

It is clear that these variables do need control. The slope coefficient b indicates a large difference between barrio incomes and poblacion incomes, which if not controlled, could conceivably mask the relationship between the independent variables of interest and income. It also indicates a rather sizable increase in income, per person of household. This may be due to extra work to support the added members. The age variable also indicates that the earnings of persons increase with their age up to some point of maximum productivity and income.

By comparing the association of electrification of the home with income, in the zero order coefficient of correlation, with the association revealed by a multiple regression coefficient obtained while eight other independent variables were held constant each removing from the zero order correlation what is proper to itself as a factor, one finds that multiple regression has reduced the coefficient from .249 to .095 (from 24.9 to 9.5 per cent), about 60 per cent of its original value. Nevertheless, the result is reassuring. When what belongs to other variables has been removed, a solid residue belonging to rural electrification remains. The rural electrification variable stands up well to this test of relative usefulness in a development package as a stimulus of growth and development. It is a practicable component with a real contribution to make. As is evident from the data presented in both the present and the last two chapters, the community effects (employment, production, and health) are at least as important as the household effects of electrification in bringing about a gain in income.

Annual Household Income: Cash

Association with income varies somewhat according to the definition of income used, as the common experience of economic researchers shows. For this reason the associations of the same nine independent variables were also examined in relation to total annual household cash income from all sources. This element of the income definition used in the present section is identical with that used in the last section. The two sets of definitions differ (and

the present section from the preceding) by the exclusion from the present section of estimates of real (non-cash) income received by the household (e.g. cavans of rice from the farm not sold, but consumed by the family). Only cash income is considered in the present section.

The same variables of interest are presented below, but now in relation to annual cash income. The multiple correlation is .442 and is significant at beyond .001. The b and beta coefficients are presented below, together with the total correlation, r, for each variable with cash income.

	<u>r</u>	<u>b</u>	<u>beta</u>	<u>Significance</u>
1.) Occupational Status, Males	-.248	-P1221.5	-.059	Beyond .05
2.) Occupational Status, Females	-.187	-P2020.4	-.096	Beyond .001
3.) H. Grade Completed, Head	.299	P347.3	.160	Beyond .001
4.) H. Grade Completed, Wife	.267	P239.6	.110	Beyond .001
5.) Electrification of the Home	.274	P1699.4	.096	Beyond .001
6.) Family Planning Continuance	.063	P 76.4	.004	Not significant

These results are not very different. With cash income only as dependent variable, both dummy variables (non-farm occupation for males, and not-housewife only for females) were associated more closely with income in both zero order coefficients and in the multiple regression measures. The association of the male dummy variable with income has also become significant. Highest grade completed for household head and for female head of household also in both standardized and unstandardized slope coefficients has moved downwards in value of association by moderate amounts. Electrification has moved downwards for the unstandardized coefficient, b, but has gained slightly in the more important beta coefficient, compared to associations for cash plus real income. Family planning continuation continues to be not significant as regards peso value association, and in fact makes a worse showing here than in the first regression.

These results further support the position that electrification is positively associated with income. They provide similar results whether total cash income or total cash-plus-real income is measured. The similarity of results bolsters confidence in the reliability of the income measures.

The control variables correlated with cash income in the following manner:

<u>Independent Variables</u>	<u>r</u>		<u>beta</u>	<u>Significance</u>
1.) Residence in Poblacion, or Barrio	.277	P3174.7	.128	Beyond .001
2.) Number of Persons in Household	.104	P382.4	.112	Beyond .001
3.) Age of Household Head	.087	P 88.1	.139	Beyond .001

The effects upon control variables of changing the income definition have been mixed. Place of residence has gained in association in all measurements, and its gains have been rather substantial. Possibly the barrio economy tends to be more a barter and less a cash economy than the poblacion economy. In fact, of course, more persons in the poblacion receive monthly cash payments (salaries or wages, income from banks or other investments, and profits from businesses). The income value of additional increases in age and in number of persons declined somewhat from value levels when measured by real plus cash income. Again, however, one is impressed by the importance of including all these variables as controls in the regression. Together they include a sizable amount of variation in their ambits, and this, if not controlled, might well obscure relationships.

Electrification of Household

The next logical step was to regress electrification of household upon income and other variables in similar fashion to the regression which was carried out for income upon electrification and the other variable just examined. The point is to examine association in the opposite direction, i.e., between income as an independent variable with essentially the same other variables and electrification of home as dependent variable, and to see in which direction the association is larger.

Some modifications were made in the other variables however. Both income variables correlated together at .94. One of the two had to be chosen to avoid problems of multicollinearity. Cash was chosen in preference to cash plus real income because both had produced very similar correlations and because reports of cash income seemed likely to be more reliable than reports of cash plus real income. It also was desirable to add several other explanatory variables. These were: educational expectations for children, other development inputs, new business enterprises (since 1970) within limits of the political unit (barrio or municipal poblacion), other recent development inputs made either by the community whether government, or private group, or by the household (a water system, irrigation, electrification of the barrio, hospitals or clinics), and family planning acceptance by the household respondent. Since family planning continuation had not correlated in significant fashion with income, and since it had correlated at .72 with family planning acceptance, continuation was dropped out of the regression because of possible collinearity. Occupational status was also dropped.

Several additions which appeared desirable were also made to the control variables. It seemed necessary in a regression of electrification of home on other variables to control type of housing (strong, light, or intermediate materials), and year of wife's first marriage. It also appeared desirable to substitute age of female household head for age of household head.

Intercorrelations for the explanatory variables of the present regression remained low at the total correlation level, with the sole exception of the association of education of head with education of his wife (.66). Thus serious collinearity was again not a serious problem.

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Highest of these intercorrelations for the newly added variables were:

1. Educational expectations (with highest grade completed, household head)	.34	4. Family planning acceptance (with highest grade completed, wife)	.27
2. Other development inputs (with income)	.12	5. Annual household cash income (with highest grade completed by head)	.30
3. Businesses per capita (with highest grade completed, wife)	.05	6. Highest grade completed, head (with highest grade completed, wife)	.66

The multiple correlation of these variables with electrification of household dwelling unit was .572, which was significant beyond .001. The zero order correlations of the independent variables with electrification, and the slope coefficients were:

<u>Variable</u>	<u>r</u>	<u>b</u>	<u>beta</u>	<u>Significance</u>
1. Educational expectations	.308	.883	.107	Beyond .001
2. Family planning acceptance	.134	.768	.072	Beyond .05
3. Other development inputs	.118	-.267	-.079	Beyond .001
4. Highest grade completed, fem. head	.305	.127	.104	Beyond .01
5. Total annual cash income, household	.275	.232	.041	Beyond .05
6. Businesses per capita population	-.043	-.159	-.035	At .05
7. Type of housing	.493	.144	.329	Beyond .001
8. Place of residence (pob/bar)	.311	.230	.163	Beyond .001
9. Year of first marriage, wife	-.079	-.216	-.069	Beyond .05
10. Age of female household head	.100	.195	.055	Not significant
11. Highest grade completed, head	.329	.972	.079	Beyond .01

The most immediate point of interest is the correlation of annual cash income of the household with electrification of the home. At the zero order level, it had correlated at .28, but at the level of multiple regression, it correlated at only .041. The slope coefficient b was .23, showing low to moderate increase in electrification with P500 unit increases in income. The increase is significant, but small.

The comparison therefore is:

	<u>Income as Independent Variable</u> <u>Electrification as Dependent Variable</u>	<u>Electrification as Independent Variable</u> <u>Income as Dependent Variable</u>
Total Correlation	.28	.27
Beta Coefficient	.04	.10
Significance of <u>b</u>	Beyond .05	Beyond .001

This comparison shows rather clearly that the association between electrification and income is a two-way association. This supports the findings of Chapter 2, and fairly well demolishes the notion that the principal reason why more persons from electrified homes have higher income is because more households that were wealthy had installed electricity in their dwellings. Chapter 2 presented considerable evidence that the effects of electrification had caused an increase in income in homes that had installed electricity, although the data had also showed an association in the opposite direction. The Chapter 2 data indicated that the principal reason for the higher income of households with electrified homes was not simply that they had been wealthier all along.

The present findings confirm this view. They show that the association of electrification as independent variable with income as dependent variable as well as the association of income as independent variable with electrification, persist even when the effects of other relevant variables are taken into consideration. The proof is again not perfect, although it is strong. A somewhat different set of variables were included in the second as compared to the first multiple regression. It would have been better to use exactly the same set of variables in the second regression as the first. Nevertheless, the type of results are persuasive that if such had been done, the outcome would have differed little from the present.¹

The beta coefficient shows that the association of electrification with income is stronger than that of income with electrification, when the first-named is independent variable. The association of electrification as independent with income is also at a higher level of significance.

Several other aspects of the regression are of interest. Clearly type of dwelling unit has considerable relationship to electrification. This may be both related to electricity as well as to the dwelling unit. COMSCO I would have been understandably reluctant to electrify homes where frailty of structure might trigger short circuits and possible fires. Residents themselves might fear this and in addition feel that their type home would make electricity more expensive because shoring up of the building might be necessary. Place of residence (barrio or poblacion) was another control variable that exhibited considerable association with electrification of the home. This may result from the non-availability of electricity in some barrios or parts of barrios, whereas electricity was available in all.

¹The reason the variables were changed is explained above. At that time the changes seemed reasonable. Only after all regressions had been completed and analyzed, was the desirability of repeating the first regression with simple interchange of income and electrification as dependent variable so apparent. At that time, however, all available computer funds had been expended. (Grant funds had been exhausted before the running of the regressions, and the UNCU had carried them out from its own resources.) It is hoped that additional funding can be made available to carry out further multivariate analysis.

poblacions. None of the other control variables exhibited much individual association with electrification, although in sum their effects were not insignificant.

The negative association of new business per capita was at first sight surprising. On second thought however this result was not so strange. Businesses tend to locate where populations are larger. Thus the ratio of number of businesses to population size may be actually larger in places with a much smaller population even though the larger place with a much larger population has considerably more businesses. A better measure by hindsight might have been simple number of businesses per political unit for the present purpose.

The negative correlation of other development inputs in the multiple regression is surprising. One might have expected that persons who had benefitted from other infrastructures would be more open to electrification of their homes. Just possibly the answer lies in the continuing costs to such persons of other inputs such as irrigation fees, water fees, and various amortization costs (for the irrigation pump and reservoir, etc.), because of which they did not wish at this time to undertake home electrification.

That homes where the respondent had accepted family planning should also be homes which have been electrified supports the findings of Chapter 3 of a relationship between these two variables, which Chapter 3 interpreted as a means-end relationship, i.e., family planning as a means to pay for electrification of the home through savings on the costs of another child at this time.

The strong correlation of educational expectations of parents for their children with electrification of the home furnishes one of the important insights coming from this regression. In retrospect, if parents are concerned about the education of their children, one might well expect them strongly to desire electrification of the home so that their children would be enabled to study seriously at night. While the relationship between occupational status of males, which is the ratio of farmers to persons engaged in non-farm occupations, was not significant, the negative direction of the correlation is quite interesting. It is some evidence that farmers are less interested in electrification of their homes (with such aspects as the home study of their children, etc., at stake) than non-farmers.

In conclusion, this set of regressions has provided rather strong support for the association of electrification as independent variable with household income as dependent variable that was one of the main findings of Chapter 2. The relationship has stood up well to the test of multivariate analysis.

Employment

This section follows up the last by attempting further to examine by multivariate analysis the findings of Chapter 2. In that chapter after evidence had been found for association and causal flow from electrification to income, the association of both these variables with employment was investigated and found to be strong. The present inquiry now examines this last relationship by multiple regression techniques.

Employment, the dependent variable in this regression, was operationalized for present purposes as working in a family or non-family business enterprise distinct from the family farm, if any. Number of such employed persons was divided by the population of the particular political unit (poblacion or barrio) concerned, to derive a per capita measure. Hereafter this variable will be referred to as employment per capita. The two independent variables of particular interest, electrification and income, were defined (a) as percentage of dwelling units electrified out of total dwelling units of political unit (specific poblacion or barrio), and (b) as average annual cash household income of political unit. These variables hereafter will be simply referred to as percentage electrified and average cash income.

Other explanatory variables were children ever born per woman of political unit, other development inputs (defined as previously), and non-farm, non-family businesses per capita of population of political unit. Control variables used were: place of residence (poblacion or barrio), and level of education, defined as average education of household head in the political unit. The first of these intercorrelated at .24 with average cash income of households in political unit and the second with average cash income of households at .81.

Highest intercorrelations of the explanatory variables were:

1. Average cash household income in political unit	.74	3. Other development inputs (with place of residence)	.53
(with place of residence)		4. Percentage electrified (with average education of household head)	.60
2. Children ever born (with average education of household head)	-.32		
		5. Businesses per capita (with perc. electr.)	.20

The intercorrelation of income and residential site is moderately strong. However, it was felt that this association would not appreciably affect the computation of b 's or betas or the magnitude of the variance in view of the moderate degree of association and of the number of cases in the regression, 2234. The two control variables however were highly intercorrelated with several other variables, but it seemed desirable to include them nevertheless. (They seemed more likely to obscure relationships by lack of control by their omission than to affect results by influencing variation.)

The multiple correlation coefficient of employed persons per capita with seven independent variables, significant beyond .001, was .771, which means that these variables explain about 59 per cent of the variation in employed persons per political unit.

Results for the zero order correlations of the specific variables and for the slope coefficients were:

<u>Variable</u>	<u>r</u>	<u>b</u>	<u>beta</u>	<u>Significance</u>
1. Average cash income	.617	.239	.401	Beyond .001
2. Percentage electrified	.431	.848	.136	Beyond .001
3. Children ever born	-.325	-.691	-.220	Beyond .001
4. Other development inputs	.316	-.212	-.161	Beyond .001
5. Business per capita	-.013	-.587	-.033	Beyond .05
6. Place of residence	.708	.306	.551	Beyond .001
7. Education of household head	.585	-.282	-.230	Beyond .001

The relation between electrification and income on the one hand and employment on the other hand is strong on the basis of this table. The direction of association shown is from electrification of home to employment and from income to employment, although **logically** the causality seems to flow mainly in the opposite direction, i.e., from employment to income. This reverse association is probably due to the fact that persons with higher income are usually employed persons.

Other relationships are rather as expected. Number of children over born inhibits employment of household head in off-farm enterprise. This possibly is simply because number of children correlates highly with low educational level. Persons with limited educational attainments usually find it more difficult to obtain employment in business than persons with higher educational qualifications. The other development inputs variable correlates negatively with off-farm employment, possibly because many making such inputs are farmers (using irrigation, etc.). Businesses per capita of the political unit do not correlate well with employment per capita surprisingly enough. The business variable may suffer from operationalization problems, judging by the previous regression.

Place of residence and education of household head, control variables, correlate highly with employment. This is understandable; persons living in the poblacion are closer to the market for new jobs, when such become available. Persons residing far out in the barrios may not even hear of a job opportunity before it is already filled. And some particular level of education may be a necessary qualification for consideration in connection with many specific employment opportunities in business.

Both association with employment, place of residence and education of household head showed a high degree of significance despite high inter-correlation at the zero order level with other independent variables. This may be due to largeness of sample or other reasons.

With this regression, the check upon Chapter 2 conclusions by multivariate analysis is complete. The multivariate analysis supports the findings of Chapter 2 quite strongly. The preceding section found clear association between electrification and income, and the present section has found strong association between both electrification and income as independent variables and employment as dependent variable, even after other relevant factors had been controlled. The multiple regression analysis has turned up no data that would seem to question these relationships, and on the other hand its findings support the Chapter 2 interpretation of the bivariate data. It appears therefore that the MORESCO I rural electrification project has provided a continuing stimulus to the western segment of Misamis Oriental Province which has provided employment opportunities and has raised income. Both community electrification and household electrification have been found associated with such increased income. Apparently, community electrification attracted new businesses to locate in the western segment, while household electrification stimulated households to strive to increase cash income in order to pay off electrification loan costs, electric current, and electric appliance bills. In order to do so, members of the household apparently attempted to produce more on their farms by added work and/or family businesses, and/or took jobs promoted by the community electrification.

Brief summaries of other regressions carried out in connection with these two sections will be found in Appendix B. Interested parties may write to the Research Institute for further details about these.

Fertility

Family planning acceptance. Chapter 3 presented data strongly suggesting linkages between electrification of the home in the MORESCO I area and family planning, especially in electrified homes with low levels of income. The present section attempts to examine these relationships in the light of multivariate analysis. The first aspect of family planning examined was acceptance. The following explanatory variables were incorporated into the regression with family planning acceptance as dependent variable.

- | | |
|--|---|
| 1. Highest grade completed of wife | 6. Percentage of respondents spontaneously mentioning electrification of home as reason for family planning (economy) |
| 2. Percent of all dwelling units electrified in the political unit | 7. Annual household cash income |
| 3. Electrification of respondent's dwelling unit | 8. Number of children ever born |
| 4. Number of deceased children | 9. Other development inputs |
| 5. Educational expectations for children | 10. Type housing (social status) |
| | 11. Women working .9 km. from home |
| | 12. Women working at or near home |
| | 13. Employed persons per capita |

In addition, several variables were added for control purposes. These were:

- | | |
|--------------------------------------|--|
| 14. Year of marriage, wife | 18. Highest grade completed of household head |
| 15. Calendar year of last live birth | 19. Businesses per capita |
| 16. Rural health unit is electrified | 20. Number of day-care centers in political unit |
| 17. Age, female head of household | 21. Place of residence |

Highest intercorrelations of these variables at the level of total correlation were:

<u>Variable</u>	<u>r</u>	<u>Correlated With</u>	<u>Variable</u>	<u>r</u>	<u>Correlated With</u>
Perc. electrif.	.43	Employed per c.	Other devel. inputs	.53	Bar/pob resid
No. dec. child.	.58	Child. ever born	Type housing	.49	Elect of home
Ed exp fr child	.29	Housing type	Employed p. capita	.71	Bar/pob resid
H. grade, wife	.66	H. grade, head	Working woman, salary at/near home	.33	H. Gr. Comp f hhh
Spont. mention of electr, reason for fan.pl.	.06	D.u. electrified	.9 km/more away	.26	H Gr Comp f hhh
RHU electrified	.52	Place of resid.	Occ. status, male	-.39	Bar/pob resid
Du electrified	.49	Type housing	Bus per capita	.20	Percent du's conn
Child ever born	.58	Children, dec.	Ann hh cash income	.46	Housing type
Yr last live birth	-.39	Age, female hhh	Bar/pobl residence	.71	Employed per cap.
H grade hh head	.66	H grade, wife	No. day-cr centers	.36	Other dev inputs
			Age, female hh head	-.80	Year married, fem household head
			Year married, f hhh	-.80	Age, fem hh head

Several of these intercorrelations are high. Grade completed of male and female household heads correlated at .66; employed persons per capita of the barrio or poblacion population correlated at .71 with place of residence in barrio or poblacion, and age of female head of household correlated at .80 with her age when first married.

The present writer believes that a correlation of .66 between educational attainment of the two household heads should cause negligible loss of precision in estimating both the beta coefficients and their variances in a sample of 2234 cases. The same can be said for the association at .71 of employed persons per capita with residence in barrio or poblacion. The correlation of age, female household head with her own age at first marriage is more troublesome, because at .80 it is in the range of high intercorrelation. Nevertheless, both variables were included. Both seemed important control variables for examination of the association of alleged explanatory variables with family planning acceptance. The large volume of cases, it was felt, would dampen down untoward effects of this pair. In fact, although year of marriage did not correlate significantly with family planning acceptance, age of female head

was correlated at beyond .001 and the beta coefficient was relatively large, -.170. This seems to show that effects of this one high correlation were not very disturbing to the multiple regression operations.

The multiple correlation of the 22 independent variables was .459. Thus the 22 variables explained about 21 per cent of the variation in family planning acceptance. The following table shows, through the b and beta coefficients, the part which each independent variable played in this overall association. The total correlation coefficient r, between each variable and acceptance of family planning, is also shown for comparative purposes.

<u>Variable</u>	<u>r</u>	<u>b</u>	<u>beta</u>	<u>Sign.</u>	<u>Variable</u>	<u>r</u>	<u>b</u>	<u>beta</u>	<u>Sign.</u>
Year of marriage	.320	.002	.057	--	Age fem. head	-.315	-.006	-.170	.001
Year of l. birth	.313	.004	.195	.001	Du electrified	.134	.054	.057	.05
H. grade c., wife	.273	.007	.057	.05	Dec. l. born chil	-.160	-.036	-.096	.001
Du's connect., %	.144	.188	.126	.001	Ed expectns chil	.106	.003	.043	.05
Fam. pl to pay elec	.060	.511	.046	.05	Wrlng womn near	.043	-.066	-.022	--
Rur hlth unit elec	.021	-.036	-.037	--	Womn wrkng away	.069	.059	.013	--
H gr compl of head	.247	.005	.047	--	Hhead a farmer	-.121	-.023	-.021	--
Child ever born	-.054	.008	.059	.05	Bus per capita	-.025	-.077	-.018	--
Other dev inputs	-.004	-.001	-.041	--	Day care centrs	.050	.009	.009	--
Type housing	.087	.015	.037	--	Ann cash income	.069	.000	.008	--
Employed per cap.	.055	-.071	-.030	--	Resid in pob.	.057	.006	.004	--

The important associations (in terms of beta coefficients) with family planning acceptance - the dependent variable, in order of relative magnitude, were year of last birth, age of couple (indicated by wife's age), percentage of dwelling units in political unit connected to the NC1300 electricity grid, number of deceased but live-born children, number of children ever born, electrification of respondent's dwelling unit, highest grade completed of wife, spontaneous specification by respondent of electricity as motivation of family planning acceptance, and the couple's expectations concerning education of their children. Most of these associations were positive, that is, the larger the positive measure of the independent variable, the greater the indicated proportion of respondents accepting family planning. The exceptions were age of couple, number of deceased children, and number of children ever born (this latter at the level of total correlation only) which were negatively associated with acceptance of family planning.

Age of couple probably is negatively correlated with acceptance of family planning because of the proximity of couples in their 40's to the menopause (at or beyond), while the negative correlation of number of deceased children may indicate that couples are trying to replace a deceased child in at least some cases.

Variables of greater concern for the present inquiry are highest grade completed by wife, parents' expectations concerning children's education, and electricity factors. However, it is noteworthy that the data suggest that raising the level of health services to the point where infant mortality

(the largest factor in the death rates of children) is substantially lowered, would encourage greater use of family planning. Year of last birth and number of children ever born are themselves dependent upon use of family planning, but change in regard to these would come about through family planning only as a means. Motivation must come from other sources.

The associations of parents' expectations for education of children, and highest grade completed by wife with family planning acceptance are interesting as they suggest that one effect of education or of educational desires is limitation or at least spacing of children in order to make possible better educational opportunities for children already living or planned.

The impact of rural electrification upon family planning acceptance distinguished by the multiple regression equation has registered as three separate and distinct contributions to association. These are the community aspect, represented by the per cent of dwelling units electrified out of all dwelling units in the political unit (specific barrio or poblacion); the individual household aspect, represented by whether respondent's own particular home had been electrified; and the electrification repayment aspect, represented by the spontaneous specification by respondent of repayment of electrification costs and/or of appliance and monthly current bills as motivation for acceptance of family planning.

Of these, the largest contribution to association comes from the community aspect, which also made the largest contribution to association of all explanatory variables as distinguished from control variables, explaining by itself alone about two percent of the variation in family planning acceptance, when other factors are controlled. Whether respondent's household was electrified added another appreciable chunk to association, as did specification of electrification as motivation for family planning acceptance, adding to a total relative association (beta) of approximately .22.

While this association is not very large, it is made up of three items, each significantly distinct from zero, which are effects of an infrastructure that can be put in place for predictable and manageable costs, qualifications not possessed by other items in the regression. These other items either are not manageable (age, year of last birth, number of children already born, number of children already deceased) or are manageable only at prohibitive costs (raising mean or median grade levels, or expectations of grade levels for children). These results support the findings of Chapter 3 by showing a significant relation between fertility and electrification, and add to the contributions of Chapter 3 by providing a clear distinction and specification of the community and household effects of electrification upon fertility. They show the importance of both, and reveal in part the motivational effects of electrification for practice of family planning.

An additional regression of acceptance on independent variables was performed by entering in a new regression only nine of the above independent variables, namely, year of last live birth, highest grade completed of household head, per cent of du's connected to 60-1300 I grid, age of wife,

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electrification of the rural health unit, electrification of respondent's home, and number of deceased liveborn children. Highest intercorrelations at the zero order level of these variables with one another are all considerably less than those already shown with the larger variable set. These are:

1. Calendar year of last birth (with age of fem. hh head)	-.39	5. Number of liveborn dec. childn (with highest grade completed, household head)	.23
2. Percentage of connected d.u.'s (with local rural health unit is electrified)	.43	6. Highest grade completed, hh head (with highest grade compl., wife)	.66
3. Age, female household head (with calendar year of last birth)	-.39	7. Local rural health unit electrified (with highest grade completed, head)	.52
4. Respondent's d.u. is electrified	.39	8. Highest grade completed, wife (with highest grade compl. head)	.66
		9. Place of residence (barrio, pobl.) (with rural health unit electrified)	.52

Results of this regression were:

<u>Variable</u>	<u>r</u>	<u>b</u>	<u>beta</u>	<u>Significance</u>
1. Year of last birth	.246	.003	.210	Beyond .001
2. Highest grade, head	.211	.015	.109	Beyond .05
3. Per cent connected in political unit	.169	.265	.211	Beyond .001
4. Age, female household head	-.224	-.002	-.087	Not signif.
5. The rural health unit is electrified	-.011	-.379	-.093	Near but .05
6. Respondent's d.u. electrified	.116	.091	.090	At .05
7. Number of deceased liveborn children	-.116	-.022	-.075	Not signif.
8. Place of residence	-.004	-.092	-.055	Not signif.
9. Highest grade, wife	.222	.006	.052	Not signif.

This arrangement of the stepwise regression procedure, shows that per cent of dwelling units connected in the specific poblacion or barrio actually contributes substantially to overall association if it is entered earlier into the regression than was the case in the previous regression. The electrification of the rural health unit, and the electrification of respondent's home also exhibited larger beta coefficients. The multiple rho for this equation was .402 and was significant beyond .01. It is interesting that of the nine variables only the electrification variables showed large unstandardized slope coefficients in addition to large betas.

The large beta coefficients in this regression indicate again a fairly strong positive association between electrification (both community and household aspects) and level of fertility through regulation of birth by family planning acceptance. This association adds depth and background to the data cited in

Chapter 3, which indicated a decline in the fertility level of the MORSCO I segment of Misamis Oriental.

Family planning continuation. Family planning acceptance is a first step in limitation of births. But unless acceptance of a method is followed by continuing usage of family planning, fertility is unlikely to be greatly affected by mere family planning acceptance. The present section deals with family planning continuation, by which is meant continuing usage by the respondent either of the family planning method accepted when she began practise of family planning, or another method, as of date of interview.

In this regression only six independent variables were used which had a significant multiple correlation of .353 with continuation (beyond .001). These variables and their highest intercorrelations at zero order level were:

<u>Variable</u>		<u>Variable</u>	
1. Highest grade, head (with highest grade completed, wife)	.66	4. Number of deceased children (with age female head)	.32
2. Highest grade, wife (with highest grade completed of head)	.66	5. Per cent connected (with d.u. electrified)	.39
3. Age, female household head (with highest grade completed of wife)	.35	6. D.u. electrified (with per cent electrified)	.39
		7. Year of last live birth (with year of marriage)	-.52

The total correlations of these variables with the dependent variable, family planning continuation, and their slope coefficients were:

<u>Variable</u>	<u>r</u>	<u>b</u>	<u>beta</u>	<u>Significance</u>
1. Highest grade complete, wife	.246	.008	.075	Beyond .01
2. Calendar year of last birth	.220	.003	.157	Beyond .001
3. Age, female household head	-.213	-.004	-.127	Beyond .001
4. D.u. of respondent is electrified	.127	.067	.075	Beyond .01
5. Highest grade completed, head	.228	.008	.075	Beyond .01
6. Number of live born children deceased	-.134	-.022	-.062	Beyond .01
7. Per cent d.u.'s connected in political unit	.110	.079	.056	Beyond .05

When the other six independent variables have been controlled, these data show that a modest but significant correlation still remains between family planning continuation, on the one hand, and on the other hand, electrification of respondent's home (beyond .01) and per cent of d.u.'s in the specific barangay or poblacion which had been connected to the MORSCO I

grid (beyond .05). The two electricity betas sum to .131, a not inconsiderable association between them with family planning continuation.

Calendar years are of course larger, the more recent they are. Thus a positive correlation of calendar year of last live birth with continuation suggests that spacing children may be an important motivation for continuing usage. However, this insight does not further inform one why respondents wished to space children. It is helpful to know from other variables that repayment of electrification costs is one of these motivations.

Age is again found negatively associated with family planning. This is to be expected. Women who believe that they are sterile or nearly sterile will no longer see need for continuing usage of family planning. This belief is found more among women near age 50 than among young married women.

Highest grade completed of household head and wife were each moderately associated with family planning continuation. This reflects a well-known association between family planning usage and education which has appeared in a great many researches in many, many different countries of the world.

A second regression of family planning continuation on similar independent variables was made. As in the second regression of family planning acceptance, so too here per cent of dwelling units connected to the IOMESCO grid was placed in second position ahead of its place (fourth) when ranked by magnitude of total correlation with continuation (a usual procedure for stepwise regression). Additionally, children ever born, which ranked fifth in magnitude of total correlation was moved up to fourth place as a demographic variable whose association with family planning continuation might be of interest. Highest grade completed of household head was relegated to fifth place. Otherwise, variables were entered in their usual stepwise order.

The variable, number of children deceased, was exchanged with number of children ever born in order to compare these two for their association with continuing use of family planning. Annual cash income of household was added because family planning continuation was expected to correlate moderately well with this variable. Previously, it had been entered very late, step #21, in the large first regression of acceptance, and therefore had had little chance to explain much variation in the multiple correlation. It was entered in step six of the present regression. Finally, the variable, other development inputs, was added to the regression to observe the behavior of this variable when electrification of dwelling unit of respondent was omitted from the regression. It would then be competing only with community aspects of electrification for association with continuing use of family planning.

Intercorrelations of these independent variables were quite low, the highest of which was .40, the correlation of age of female head of household with the number of children she had borne. These intercorrelations were:

Age, female hh head (with children ever born)	.40	Children ever born (with age, female hh head)	.40
Per cent of d.u.'s connected (with highest grade compl., head)	.30	Highest grade completed, head (with annual cash inc.)	.30
Calendar year of last birth (with age, female hh head)	.39	Ann. cash income, hh (with highest grade completed, head)	.30
Other devel. inputs (with per cent connected)	.24		

The multiple correlation coefficient of these seven variables with continuing use of family planning was .311, which was significant beyond .01.

The regression coefficients and the other data for the individual variables were:

<u>Variable</u>	<u>r</u>	<u>b</u>	<u>beta</u>	<u>Significance</u>
1. Age, female household head	-.211	-.002	-.086	Not significant
2. Per cent connected d.u.'s	.098	.112	.111	Beyond .05
3. Calendar year of last birth	.183	.002	.186	Beyond .001
4. Children ever born	-.094	-.010	-.111	Not significant
5. Highest grade completed, head	.160	.010	.093	Beyond .05
6. Annual cash income, household	.076	.000	.072	Not significant
7. Other development inputs	-.042	-.002	-.067	Not significant

The showing of income and other development inputs was disappointing. They were not significantly associated with continuance of family planning. Neither was number of children ever born or age of female head of household. Highest grade completed of household head and calendar year of last live birth both were significantly and positively correlated as was to be expected. As for acceptance, the correlation with continuing use of percentage of dwelling units electrified was larger with the earlier insertion of this variable into the equation. The result reemphasizes the relative importance of electrification in a package of development inputs to be chosen at least partly for presumed effects upon population size and growth through impact upon fertility.

Children ever born. A regression of children ever born on several variables was carried out on the data in order to investigate the relationships of eight variables in a predominately Christian but Bisaya population of the southern Philippines. Electrification and other development inputs were not included among the variables. Other factors were of greater interest for the present examination.

The highest intercorrelations of these variables¹ were:

Age, female household head (with year of marriage)	-.80	Head is a farmer (with educational expectation)	-.22
Family planning acceptance (with fam. planning continuation)	.72	Business per capita (with age, female household head)	.08
Wife employed, near or at home	-.18		

The intercorrelations of age and year of marriage, and of acceptance with continuing use of family planning, were high but not thought likely to raise serious difficulties for the regression because of the large number of cases in the sample (2234).

Results of this regression were a multiple correlation of .498 which was significantly related to number of children ever born at beyond .001, as well as the following slope coefficients (total correlations are also presented):

<u>Variable</u>	<u>r</u>	<u>b</u>	<u>beta</u>	<u>Significance</u>
Age, female household head	.395	0.117	.531	Beyond .001
Educational expectations, couple	-.160	-0.113	-.206	Beyond .001
Head is a farmer	.053	1.387	.112	Beyond .01
Wife employed near or at home for salary/wages	.095	4.215	.116	Beyond .01
Family planning acceptance	-.008	1.316	.147	Beyond .01
Family planning continuation	-.094	-1.274	-.114	Beyond .05
Business per capita of political unit	-.061	-4.028	-.074	Not significant
Year of marriage	-.242	0.019	.103	not significant

Age is of course positively and significantly correlated with number of liveborn children. Among other but more interesting positive correlations is that of persons who are farmers with number of live births. The correlation is fairly large and quite strongly significant. While not surprising because farmers have built-in interests in more labor and therefore more children on the farm, and are commonly believed to have higher fertility than non-farmers, still it is of interest that the data confirm this belief.

Somewhat surprising is the strong positive relation between number of children born alive and employment of wife for salary or wages in non-farm or extra-farm business. The contrast here is with woman working for from home (more than .9 kilometers away) and with woman not working for salary or wages.

¹Variables not listed separately are intercorrelated most highly with their correlate listed above, as shown for the correlate.

Apparently, working near or at home for salary or wages is associated with more, rather than with less children in the Boresco I area. While these data do not show it, working farther away seems to be in fact associated with fewer children. It is suggested that this distinction of distance to work is one to take account of in research upon employment effects on Filipino women's fertility.

Another interesting aspect of this regression is the failure of year of marriage to correlate significantly with children ever born, despite the strong positive correlation of age with number of children. The beta was only .103 and positive at that. On the basis of the showing of the age variable, one might have expected that calendar year of marriage would correlate negatively and strongly with children ever born. That is, larger calendar years are more recent years, and therefore earlier-married women would be expected to have larger numbers of children - a negative correlation. Such a negative association is found in the total correlation coefficient (-.242).

Why this relation did not appear is an interesting question. One may speculate that the speed with which Filipino newly-weds try to have their first child and, if the first is a girl, sometimes their second child, may furnish part of the answer. There is a strong compulsion, after marriage, to have the first child within 15 months or less, to prove that the couple "can have children". Much "teasing" of both spouses by friends and relatives transpires if marriage is not soon followed by the first pregnancy. Another aspect that may contribute to this effect is the way older newly-weds appear to try to reach desired family size before menopause begins. Both these aspects would tend to obscure the relation of year of marriage to size of family.

Educational aspiration of parents for children was strongly and negatively associated with children ever born. Parents who have high aspirations for their children's education will have to invest considerable capital upon the education of each child. Therefore these aspirations will motivate them to limit the size of their family. While often elder sons or daughters are made responsible for paying all or part of such educational costs, nevertheless parents must pay for the elder son's or daughter's education, and probably some share of the younger children's education also.

The contrast of the associations of children ever born with both family planning acceptance and with family planning continuance is also quite interesting. The slope coefficients of acceptance with number of children are positive and substantial, as well as highly significant. (The small negative total correlation of .009 is not significant.) On the other hand, the slope coefficients of continuance and its total correlation with number of children are all significant, negative, and also substantial.

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At first sight, the result seems contradictory but further reflection suggests that the difference may be sited in the type and number of women or couples who claim to have been acceptors (truly or not) and who have dropped out. First of all, many acceptors apparently turn to family planning only after they have had many children and wish no more. This would explain the positive association of this variable with children ever born. Secondly, persons who have planned their family, spacing their children at intervals desired by themselves, are more likely to have fewer children at any particular time of interview and also to be continuing users. A further speculation may be worth further research. It may be that more of the women who begin to practise family planning only after they have borne as many children as they believe their income can support, and who want no more children (avoiders therefore, not spacers), drop out from practise of family planning. One large recent British study has found for the pill that risks for smokers or for older women are greater. If so, presumably, experienced side effects are also more troublesome and upsetting. The same may be true of other methods, also. If so, such behavior would explain the two associations. These two associations deserve further investigation.

Another interesting aspect is the relation of employment per capita (of the population of the particular poblacion or barrio) to continuation of family planning: the more business per capita the less the number of children ever born. This result suggests in a largely rural environment that some kind of community effect of business presses toward lower fertility. This is another research lead which deserves further study.

CONCLUSION

This chapter has studied the data of Chapters 2 and 3 in the light of multivariate analysis. Chapter 2 findings led to the conclusion of that chapter that the rural electrification of RCT-ESCO I had not only been associated with, but had caused increases in business enterprise, employment, production, and income in its area of electrification - the 10 municipalities of Misamis Oriental Province west of Cagayan de Oro City. Because of weaknesses in the logical design of a quasi-before-and-after field experiment, the conclusion, while fairly strong, is not compelling. Analysis of the Chapter 3 data led to the conclusion that electrification both directly and indirectly (through the effects of employment and increased income) had been associated with a decrease in fertility, and in fact had been a partial cause of this decrease. This causal conclusion, while quite strong, is also not compelling, and for the same reasons of design.

The present chapter has examined these associations which rest upon bivariate analysis in the light of multivariate methods, using multiple regression as the method of study. All the main associations found in Chapters 2 and 3 have stood up well to this multivariate inquiry. In addition, the multivariate analysis has contributed new insights into ways by which

these associations have operated. Electrification was found to influence income directly (through efforts to increase income to pay larger debts for installation, monthly electricity bills, and appliances), and indirectly both community-wise by attracting business and thus increasing employment possibilities, and householdwise through the salary or wages of household members who took such new jobs. Electrification was also found to relate to fertility in both a community manner (evidenced by the lower fertility of communities with larger percentages of electrified dwelling units in the political unit, in comparison with other communities), and in a household manner (evidenced by the lower fertility of households with electrified dwelling units). In addition, electrification as a conscious motivational aspect (repayment of debts) was found to make a distinctive and significant contribution to a decline in fertility level. The indicators of Chapter IV of decline in fertility were family planning acceptance and continuation. In addition, however, Chapter 3 had shown a significant and very large difference in age at first marriage for women belonging to households residing in electrified dwelling units. One of the recognized large components of current Philippine fertility levels by general agreement of demographers is age at first marriage. Age at first marriage is generally conceded to have played an important role in the evolution of Philippine fertility between 1945 and the present time.

In summary, the findings of Chapters 2 and 3 have been amplified and supported by the findings of the present chapter on multivariate analysis.

Further multiple regressions were carried out upon the rural electrification data which are not reported here because of time pressures on the present writer. Appendix B will briefly describe these regressions, and interested parties are encouraged to write to the author for a xerox copy of specific regression results and/or for other material relating to these.¹

¹A modest charge for costs may have to be made in filling these requests.

I M P L I C A T I O N S

QUALIFICATIONS RELATING TO THE MORESCO EXPERIENCE

Development planners should bear in mind several features of the MORESCO I rural electrification which limit somewhat generalization of its results to other parts of the Philippines, or to other countries, especially countries with quite different cultural patterns.

Specific factors of the MORESCO I complex which may not be found in other electrification projects which have affected results in the MORESCO I are:

1. Source of electricity. The MORESCO I electricity is provided from a large-scale hydroelectric power grid at Maria Cristina, Lanao del Norte Province, which/produced by an exceptionally efficient, low cost hydroelectric power system design. Thus MORESCO I has been able to purchase its 50 megawatts of power from the National Power Corporation at low cost. The cost of providing similar quantities of oil-based diesel electric power would be considerably greater. /is

2. Flow of electricity. The supply of current has been very reliable. Blackouts (and "brownouts") have been relatively rare. This reliability has greatly affected the attractive powers of MORESCO I electrification for business and industry. The present writer has visited projects where power of attraction for business and industry was almost at zero because of frequent and unpredictable blackouts and brownouts planned for various reasons by the project administration, or occasioned by break-down of power facilities (especially small-scale power facilities). MORESCO I has capitalized upon its reliable power supply, and service to household and commercial consumers has been a chief concern. Business and industry feel they can rely upon adequate lighting and power current with few interruptions.

3. From a technical viewpoint, the current which the MORESCO has supplied is, and has been acceptably uniform. Because of the large-scale Maria Cristina grid (there are several plants at Maria Cristina, all owned by the government), a very constant pattern of cycles per second (60 herz) has been maintained and good constancy in voltage supplied (220). While some voltage drop may occur at peak hours and sometimes a voltage rise when a very large user suddenly turns off at the conclusion of a workday, voltage changes are usually relatively small and within tolerable ranges for most machines and other electrical devices. This again has been a large factor in the attraction of business and industry.

4. MORESCO I policy has made maintenance and depreciation of equipment pay for themselves. It has avoided even the appearance that electricity is a government handout. Prices for installation and power have been kept relatively low, but customers must pay for installation and current supply costs. MORESCO has been generous in loans to customers on easy terms for installation costs. But their credit administrators have insisted upon regular payments. Persons who did not satisfy obligations over three months found their current turned off. While this policy has been strictly administered, it was very even-handedly carried out during the period studied (1971-June, 1979). As a result, most customers paid their loans and monthly current bills regularly.

5. The top personnel serving as professional staff of the MORESCO I (as opposed to laymen serving as volunteers in the cooperative activities) have rendered high quality service. General Dumol, chief administrator of the rural electrification program up to almost 1979, is a tireless and incorruptible public servant. He obtained superior personnel for MORESCO I, had them adequately trained, and required that their work live up to high standards of public service. Mr. Nelson Salla, the local MORESCO I Administrator, has profited by his training with Nam and Dumol, and has distinguished himself by a consistently high level of service and performance.

This type of personnel and of government service is not easy to duplicate, especially in East and Southeast Asia where traditions as a rule have not emphasized such levels of performance in public service. It remains to be seen, with the inevitable change in administrators and personnel that takes place with the passage of time, whether MORESCO I and its counterpart, MORESCO II, now set up in the provincial northeast, can duplicate MORESCO I's past record in their future activities. However, whatever changes time may bring, the experience of MORESCO I, 1971-79, shows that a corruption-free and very efficient public electrification service is possible.

The fertility effects of MORESCO I seem to rest upon several bases. The people were in general very poor. And in the hot, moist climate of the wet tropics they greatly desired the clean, cool, and convenient illumination of electricity as contrasted to the hot, messy oil lamps they had had to put up with. Their desire for electricity motivated them to go to great lengths to get it, whereas their poverty made it necessary to plan and to economize. With family planning services set up in every municipal poblacion by the government, it was natural that they should turn to family planning as a means to help them cut costs so as to be able to meet better the regular

¹ Credit for setting up of credit aspects of the cooperative must be shared with Mr. Charles Nam, a rural electrification expert brought in by the Government and the USAID, who worked vigorously to set up the credit system, stressing the service aspect and a friendly, helpful atmosphere, together with an insistent demand for regular payments.

payments on their installation loans, their monthly electricity bills, and other expenses simultaneously. If electricity had been a free, government hand-out, or if they had been less impoverished, such motivation to practise family planning would not have been present.

GENERALIZATION

Much of the effectiveness and impact of the MORESCO I rural electric service has been based upon planning, personnel, power source, implementation of policy, and service orientation.

How generalizable is the MORESCO I case to other parts of the Philippines? And beyond that to other parts of the world? Is MORESCO I a local variety of result, unable to withstand transplantation in other climes and people, in other value settings and in other ways of life? Do its technical and staff assets rule out generalizability?

This is a question which cannot be answered easily. Many aspects would incline one to argue for one or the other side of the question. The present writer suggests that several dimensions of MORESCO I history must be kept in mind in any serious attempt to generalize from the MORESCO I experience.

First, the experience of MORESCO I has demonstrated that a rural electrification input can function as a highly efficient component of a package of development inputs that a developing country might consider getting in place in less developed areas of its territory, or which foreign assistance development agencies might wish to include in overseas assistance programs to developing nations.

Secondly, the energy crisis brought on by increasing costs of oil, has made highly advantageous easy access to large reserves of hydro-electric power. This advantage has been basic to MORESCO I development. Nevertheless, given the intensity of desire in the rural Philippines for bright, cool clean, and convenient electricity, one might reasonably argue that people would be willing to pay more for electricity than the MORESCO I charge, provided that the price is competitive with oil illumination, and provided that this electric service is reliable (few blackouts or brownouts and reasonable constancy in volts and cycles). This latter feature may be difficult to supply in cooperatives dependent upon smaller installations.

Third, the strict policy administration of MORESCO I in demanding regular payment appears to be a duplicable feature, which should be incorporated in rural electrification projects.

Fourth, whether government can provide personnel of high dedication and scrupulous honesty is an imponderable until the identity of the government is specified. MORESCO I profited by being the first Philippine rural

electrification project, and by the administration of men like Dunol, Ham, and Eballe. One can imagine that not all Philippine electrification projects have benefitted to the same extent from their own administrators. Foreign countries in different stages of development, and with radically different sets of values and cultural patterns might or might not be able to duplicate such staff for all or some electrification projects. In general, however, a people get the kind of public servants they deserve in terms of willingness to exert efforts and to demand accountability from their officials.

Nevertheless, the MORESCO I experience seems generalizable if one can provide electricity at prices at least competitive with oil, gas or other illuminants, if people have to pay for installation in their homes and for household electricity consumption, if people/poor enough, for such payment to are be difficult, and if the project gets honest, able, and devoted administrators.

EVALUATION

The MORESCO I rural electrification project has had dysfunctions. The water to turn Maria Cristina turbines flows from Lake Lanao down a short and quick-flowing water course, the Agus River, to the sea. The inhabitants of the Lake, mostly Moslem Maranaos by ethnic origin, claim that the government in order to expedite passage of the water has cleared any obstacles to its rapid flow and that as a result the lake has already sunken several feet from its former level, leaving many lakeside farms formerly irrigable by lake water high and dry. Government technicians deny this, stating that they have only made better use of water that was already flowing into the river from the lake, and blaming any decline in water level on a severe earthquake which occurred some years ago, as well as on other factors like overlogging with damage to the watershed, and on erosion with run-off. Whatever the facts are, the number of power plants of large capacity planned is five, of which three are already in operation, each with several water turbines of large mega-watt capacity generating power for the Mindanao grid. MORESCO I like Cagayan de Oro City, draws its power from the output of these turbines driven by water flowing from Lake Lanao.

Another dysfunction of MORESCO I is the relative disadvantage to which the electricity it provides puts persons of those localities which cannot be reached by power lines because of lack of roads usable by maintenance vehicles, or because of unavailable rights of way. The populations of such barrios (mostly inland, isolated mountain localities) fall further and further behind the educational and cultural levels of the more fortunate electrified barrios and poblacions, and in employment opportunities, and in medical services available. Thus a widening gap is developing between people of the more isolated inland barrios and people of the valleys and coastal plains. An approach to helping such disadvantaged peoples might be made by a liberal scholarship and student support policy carried out by the government in behalf of children from such isolated places.

Nevertheless, in net balance, the RINCU evaluating team judges that the advantages which rural electrification has brought to the western ten municipalities of Misamis Oriental have far outweighed its dysfunctions. Their opinion is that NORESCO I electrification has had large community effects on business, employment, agricultural production (crops and animals), and income. In addition, in their judgment, in various ways it has stimulated increased household income, and has provided motivation for delayed marriage and for the practise of family planning, with a resulting decline in fertility.

In addition, NORESCO I electrification has upgraded education by making it possible for students to study and for faculty to prepare lessons at night, by providing steady, bright, cool, clean, and convenient light with great reliability. At the same time it has stimulated night-time civic, social, and religious activities. Many church denominations now hold services at night after the heat of the day has passed. Medical care has been facilitated by the opening of two substantial hospitals in Iuitao poblacion after the electrification of this locality, and by the refrigeration, sterilization, and operating room facilities which electrification has made possible in many municipalities.

RECOMMENDATIONS

1. Where hydroelectric power is available in large quantities and where technical skill and equipment can make possible reliable service at consistent cycle and voltage levels, rural electrification should be carefully considered for selection as one of the principal options of a rural development package. Such an item is likely, if properly successful, to have large multiplier effects.
2. Where the people are poor, the power should nevertheless not be provided as a government dole. The people should shoulder costs of the maintenance and depreciation of the infrastructural inputs, if not of the original cost of these items (power lines, large transformers, power line stanchions, etc.), and also costs of home installation and of electricity.
3. Service should be as reliable as possible in order to attract business and industry, and special concessions should be made to business in terms of taxation, of land acquisition, and of building permits, with care however for the human rights of the peoples concerned.
4. Loans on easy terms (six to eighteen months to repay) should be made to households in barrios in order to enable them to electrify their homes. Collections should be made monthly of loan repayments and of monthly power bills, and the electricity of persons in default for three months or more should be turned off in an even-handed manner.

5. To the extent possible, dedicated personnel should be sought for professional and lower level staff of the electric service utility. Accountability for financial and other administrative aspects should be required of staff by the central electrification office. As far as they can, rural electrification professional staff should endeavor to discourage local cliques from assuming important positions in the voluntary organization of the cooperative, if these would likely turn the rural electricity service to private advantage and profit rather than to the common good.

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APPENDIX A

This appendix contains additional tables belonging to the extensive tabular material relating to Chapter III which was prepared for this chapter. Additional tables not shown here are also available and persons interested in particular crossclassifications not presented here or in the text are welcome to write and inquire whether they are available. Data preparation has been quite extensive.

A list of tables contained in this appendix follows:

1. Birth Rates, July 1, 1978-June 30, 1979, Western Visayas Oriental Province, Per 1000 Ever Married Women, Dual Record Project. (p. 116)
2. Distribution of Currently Married Women, 15-49, by Work Experience and Present Family Planning Status, Western Visayas Oriental, 1979. (p.116)
3. Distribution of Currently Married Women 15-49 by Work Experience in 1970, and 1975 and After 1975, Western Visayas Oriental, 1979. (p. 117)
4. Distribution of Currently Married Women with Work Experience, 15-49 Years of Age, by Year They Began Working. (p. 117)
5. Distribution by Perceived Advantages of Employment of Employed Currently Married Women, 15-49 Years of Age, by Employment Status, Western Visayas Oriental, 1979, First Mentioned Advantage. (p. 117)
6. Distribution of Currently Married Women with Work Experience, by Response to Questions: Is It Easy to Obtain Household Helpers to Watch Your House and Children While You Work? Easy to Obtain Such Help from Parents and/or Other Relatives? Do You Usually Leave Your Infant and/or Small Children with Relatives at Your Home or Elsewhere While You Work? (Currently Married Women Who Have Worked, 15-49 Years of Age, 1979). (p. 118)
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8. Distribution of All Respondents by Electrification of Home, by Income Level, and by Perception of a Better Family Life Now Than in 1969 with Regard to Food, Clothes, Health, and in General. (p.119)
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10. Distribution of All Respondents with Electrified Homes by Response to Question as to Whether Expenses Were Relatively Greater in 1970 Than in 1978 for Specified Items. (p. 120)

11. Distribution of All Respondents with Non-Electrified Homes by Response to Question as to Whether Expenses Were Relatively Greater in 1970 Than in 1978 for Specified Items. (p. 121)
12. Distribution of Respondents with Electrified Homes by Spontaneous First Response to Question About Advantages and Disadvantages of Electrification to the Family, Western Misamis Oriental, 1979. (p. 122)
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Table 1. Birth Rates, July 1, 1978-June 30, 1979, Western Misamis Oriental Province, Per 1000 Ever Married Women, Dual Record Project

	15-19	20-24	25-29	30-34	35-39	40-44	45-49	15-49	TFR
Electrified D.U.'s	569.3	630.4	346.0	225.2	192.0	82.4	19.6	240.3	10.3
Non-Electri- fied D.U.'s	547.6	559.9	364.0	380.4	186.0	81.2	33.2	294.4	10.8

Table 2. Distribution of Currently Married Women, 15-49, by Work Experience and Present Family Planning Status, Western Misamis Oriental, 1979

Work Experience	Current Users	Previously	Never Users	No Response	Totals
Currently Working	98	28	109	0	235
No Longer Working	21	6	17	0	44
Never Worked	406	159	766	1	1,332
All Experiences	525	193	892	1	1,611

These data are available by age-group; and for children ever-born, by work experience and age.

Table 3. Distribution of Currently Married Women 15-49 by Work Experience in 1970, and 1975 and After 1975, Western Misamis Oriental, 1979

Work Experience	In Family Business		Outside Work		Worked After 1975		Totals	
	Yes	No	Yes	No	Yes	No	Working	Not
							How	Working
Worked in 1970	70	(1469)	27	(1513)	138	(1146)	(235)	(1611)
Worked in 1975	2	(1537)	44	(1496)	189	(1095)	(235)	(1611)
	72	1539	71	1540	327	1204	235	1611

Table 4. Distribution of Currently Married Women with Work Experience, 15-49 Years of Age, by Year They Began Working

Year	Before 1960	1960-69	1970-71	1972-74	1975-77	1978-79	Year Unknown	Sum
Women	14	59	39	43	71	46	7	279

Table 5. Distribution by Perceived Advantages of Employment of Employed Currently Married Women, 15-49 Years of Age, by Employment Status, Western Misamis Oriental, 1979, First Mentioned Advantage

Advantage Mentioned	Currently Working	Previously Working	Sums
1. Additional family income	105	12	117
2. Helping husband meet family economic needs	87	16	103
3. Help pay children's education	10	1	11
4. Self-fulfillment, experience in business, teaching children	4	8	12
5. Able to purchase appliances	4	1	5
6. Help and service to others, increase circle of friends, enjoyment of work	4	0	4
7. Enjoy medicare/other benefits	1	0	1
8. No advantages, or none mentioned	18	6	24
9. No response	2	0	2
ALL Advantages First Mentioned	235	44	279

Table 6. Distribution of Currently Married Women with Work Experience, by Response to Questions: Is it Easy to Obtain Household Helpers to Watch Your House and Children While You Work? Easy to Obtain Such Help from Parents and/or Other Relatives? Do You Usually Leave Your Infant and/or Small Children with Relatives at Your Home or Elsewhere While You Work? (Currently Married Women Who Have Worked, 15-49 Years of Age, 1979)

	Currently Working					Previously Working				
	Yes	No	NR	NA	Sums	Yes	No	NR	NA	Sums
Household Helper	38	194	1	2	235	5	35	0	4	44
Parents and/or Relatives	54	162	0	19	235	14	24	0	6	44
With Relatives	25	153	0	57	235	6	21	0	17	44

NR : No Response

NA : Not Applicable (No such relatives here or children)

Table 7. Distribution of Currently Married Women with Work Experience, 1979, by Response to Question: Is it Easier Now to Obtain Household Help Than in 1976? Than in 1970?

	Currently Working						Previously Working					
	Yes	No	Same	NR	NA	Sums	Yes	No	Same	NR	NA	Sums
Than in 1976	5	170	56	1	3	235	3	33	6	0	2	44
Than in 1970	7	178	77	1	2	235	4	32	6	0	2	44

Table 8. Distribution of All Respondents by Electrification of Home, by Income Level, and by Perception of a Better Family Life Now Than in 1969 with Regard to Food, Clothes, Health, and in General

Income from Main Occupation	Electrified Home				Non-Electrified				Sums
	Better	About Same	Worse	Other	Better	About Same	Worse	Other	
Below \$4,000	78	152	141	1	154	496	470	9	1,501
\$4,000-7,999	60	103	109	2	49	98	87	3	511
\$8,000 +	39	55	50	0	18	46	25	0	233
All Incomes	177	310	300	3	221	640	582	12	2,245

Table 9. Distribution of All Respondents by Electrification of Home, by Income Level, and by Perception of a Better Family Life Now Than in 1975 with Regard to Food, Clothes, Health, and in General

Income from Main Occupation	Electrified Home				Non-Electrified				Sums
	Better	About Same	Worse	Other	Better	About Same	Worse	Other	
Below \$4,000	75	173	124	0	175	509	440	5	1,501
\$4,000-\$7,999	65	109	98	2	52	103	81	1	511
\$8,000 +	47	56	40	1	15	51	23	0	233
All Incomes	187	338	262	3	242	663	544	6	2,245

Table 10. Distribution of All Respondents with Electrified Homes by Response to Question as to Whether Expenses Were Relatively Greater in 1970 Than in 1978 for Specified Items

Expenses Relatively Greater in 1970 Than in 1978?	Yes Greater in '70	No, Same	No, Less in '70	NR	NA	Sums
For: Food	213	291	286	0	0	790
Housing	161	341	278	0	10	790
Health Services	177	370	240	0	3	790
Sicknesses	190	374	224	0	2	790
Education	171	284	313	0	22	790
Clothing	215	302	273	0	0	790
Home Improvements	125	352	279	0	34	790
Debt Repayments	97	291	314	0	88	790
Mean Response	169	325	276	0	20	790

Table 11. Distribution of All Respondents with Non-Electrified Homes by Response to Question as to Whether Expenses were Relatively Greater in 1970 Than in 1978 for Specified Items

Expenses Relatively Greater in 1970 Than in 1978	Yes Greater in '70	No, Same	No, Less in '70	NR	NA	Sums
For: Food	378	538	538	1	0	1155
Housing	283	609	544	1	18	1155
Health Services	322	646	476	1	10	1155
Sicknesses	299	680	469	1	6	1155
Education	275	541	595	1	43	1155
Clothing	370	557	527	1	0	1155
Home Improvements	238	613	540	1	63	1155
Debt Payments	190	572	592	1	100	1155
Mean Response	294	594	535	1	30	1155

Table 12. Distribution of Respondents with Electrified Homes by Spontaneous First Response to Question About Advantages and Disadvantages of Electrification to the Family, Western Misamis Oriental, 1979

Advantages Mentioned		Disadvantages Mentioned	
1. Illumination	370	1. Electrocution hazards	76
2. Lessens fear of darkness	194	2. Fire hazards	60
3. Convenient	71	3. Inconveniences of brown-outs and blackouts	51
4. Night work possible and convenient	43	4. Hard to get to bed early	30
5. More economical		5. Gives rise to social status competition of buying luxury items (appliances and facilities); some will be involved in debts too big for them	8
6. and Less expensive	35	6. Incorrect reading of the electricity meter; overcharges	3
7. Improves living conditions and permits electrical appliances	27	7. High rates (charges) for electricity	2
8. Small business (sari-sari stores, etc.) possible at night	6	8. Irrelevant answers	17
9. Convenient, helpful for poultry, swine production	5	9. No disadvantages	534
10. Fewer women become pregnant	4	10. No response	9
11. Discourages thieves	3		
12. Irrelevant answers	3		
13. No advantages	22		
14. No response	7		
All First Response	790	All First Response	790

Table 13. Distribution of Respondents with Electrified Homes by Spontaneous First Response to Question About Advantages and Disadvantages of Electrification to the Community (Barrio or Poblacion), Western Misamis Oriental, 1979

Advantages Mentioned (Open-ended Question)		Disadvantages Mentioned (Open-ended Question)	
1. Illumination	435	1. Fire hazards	81
2. Construction of modern facilities	114	2. Occasions people oversleeping (staying up too late)	47
3. Establishment of large business/industries	72	3. Occasions gambling and drinking	26
4. Possibility of social activities at night	47	4. Electrocuting hazards	21
5. Better law and order; better security	21	5. Young people roam around, come home late	13
6. Increased income for residents	13	6. Coconuts and other trees are cut down to protect or make way for the power lines, buildings, etc.	12
7. Development of the community (Poblacion/Barrio)	12	7. Its expense	5
8. Work opportunities	6	8. Jealousies over appliances and facilities	1
9. Night school possible	5	9. Irrelevant answers	28
10. A more lively atmosphere	5	10. No disadvantages	547
11. Better poultry/piggery possibilities	1	11. No response	9
12. Irrelevant answer	1		
13. No advantages	47		
14. No response	11		
All First Response	790	All First Response	790

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Table 14. Distribution of Respondents, by Response Spontaneously Relating to Farming, to Open-ended Question on the Effects of Electrification in General, Followed by Response to Open-ended Question Specifically Asking Effects on Farming, Western Misamis Oriental Province, 1979, by Electrification of Home

Effects on Farming	Electrified Homes		Non-Electrified Homes	
	Spontaneous Response	Response to Specific Open-ended Question About Effects on Farming	Spontaneous Response	Response to Specific Open-ended Question About Effects on Farming
1. Makes irrigation of farmland possible	384	0	248	1
2. No grain robbers	91	1	3	2
3. Night work possible	43	4	92	3
4. No water problems	5	2	3	0
5. Can use electricity-dependent machineries	4	0	3	1
6. Larger harvest	3	0	1	0
7. Can lead to use of scientific farming methods	1	0	2	0
8. Irrelevant answers	1	353	202	546
9. No effects on farming	0	174	438	438
10. No response	258	256	463	464
All response	790	790	1,455	1,455

Table 15. Distribution of Respondents, by Response Spontaneously Relating to Jobs and Employment, to Open-ended Question on Effects of Electrification in General, Followed by Response to Open-ended Question Specifically Asking Effects on Jobs and Employment, Western Misamis Oriental Province, 1979, by Electrification of Home.

Effects on Jobs and Employment	Electrified Homes		Non-Electrified Homes	
	Spontaneous Response	Response to Question on Effects on Jobs/ Employment	Spontaneous Response	Response to Question on Effects on Jobs/ Employment
1. Can find night work	226	0	223	3
2. Overtime work now possible	179	10	158	8
3. Convenience for work tasks	69	2	63	3
4. More job opportunities	61	8	105	11
5. Increases employment; more employed than unemployed	23	0	15	0
6. Can save time and effort	10	1	4	2
7. Can increase work output	8	0	3	0
8. No effects on jobs/ employment	97	99	329	329
9. No response/NA	117	670	555	1,099
All response	790	790	1,455	1,455

Table 16. Distribution of Respondents, by Response Spontaneously Relating to Education, to Open-ended Question on Effects of Electrification in General, Followed by Response to Open-ended Question Specifically Asking Effects on Education, Western Misamis Oriental Province, 1979, by Electrification of Home

Effects on Education	Electrified Homes		Non-Electrified Homes	
	Spontaneous Response	Response to Question on Effects on Education	Spontaneous Response	Response to Question on Effects on Education
1. Night schools can be established	248	5	284	1
2. There is light now if a school wishes to hold a ceremony (graduation, etc.) or an entertainments at night (play, etc.)	114	17	150	9
3. Students can study at night	109	7	152	9
4. Establishment of barangay reading centers is possible	28	30	21	40
5. Night meetings are possible	12	0	12	0
6. Working people and poor students (econ.) can attend school at night	9	7	10	7
7. Teachers can prepare well at night, can work out their lesson plans	6	0	1	0
8. Irrelevant answers	11	0	4	3
9. No effects on education	115	115	308	309
10. No response	138	609	513	1,077
All response	790	790	1,455	1,455

Table 17. Distribution of Respondents, by Response Spontaneously Relating to Civic, Religious, and Recreational Activities, to Open-ended Question on Effects of Electrification in General, Followed by Response to Open-ended Question Specifically Asking Effects on Civic, Religious, and Recreational Activities, Western Misamis Oriental Province, 1979,

Effects on Civic, Religious, and Recreational Activities	Electrified Homes		Non-Electrified Homes	
	Spontaneous Response	Response to Specific Question on Religious, etc., Activities	Spontaneous Response	Response to Specific Question on Religious, etc., Activities
1. Can hold activities/meetings, at night	44	235	40	363
2. Many can participate because meetings can be at night, after day's work is over	9	46	8	56
3. Good illumination promotes attendance	6	38	4	72
4. Activities are livelier	5	25	6	38
5. People can go about town at night because there is light	5	5	6	8
6. Sound systems can be used (P.A. and/or other)	4	51	4	87
7. Less expense for activities (kerosene or batteries; expensive)	0	12	0	27
8. No effects on civic, religious, or recreational activities	116	0	262	0
9. No response	601	378	1,125	804
All response	790	790	1,455	1,455

Table 18. Distribution of Respondents by Response Spontaneously Relating to Law and Order to Open-ended Question on Effects of Electrification in General, Followed by Response to Open-ended Question Specifically Asking Effects on Law-and-Order-Related Activities, Western Misamis Oriental Province, 1979

Effects on Activities Related to Law & Order	Response to Open-ended Question on Effects of Electrification in General		Response to Open-ended Question Specifically Asking Effects on Law-and-Order-Related Activities	
	Spontaneous Response	Response to Specific Question on Law and Order	Spontaneous Response	Response to Specific Question on Law and Order
1. Easy to spot thieves, robbers, trouble-makers	55	127	41	129
2. Easier to maintain law and order at night	45	64	35	107
3. Less crime will be committed	21	97	11	135
4. Less hooligans and drunkards	3	113	5	114
5. Safer to go about at night and at home	1	5	0	4
6. Less roughnecks	0	2	1	5
7. Better security because of the light	0	9	0	8
8. No effects on law and order	112	0	340	0
9. No response	553	373	1022	923
All response	790	790	1455	1455

Table 19. Distribution of Respondents by Housing Materials of Their Homes, by Electrification, Western Misamis Oriental, 1979

Housing Materials	Social Rating	Homes			
		Electrified	Non-Electrified		
1. Barong, barong (shanties/shacks)	Very poor	5	0.6	156	10.7
2. Light Materials (Bamboo, sawali, nipa, etc.)	Poor	240	30.4	842	57.9
3. Mixed light and strong materials (e.g. Nipa roofing)	Lower middle or above	387	49.0	426	29.3
4. Strong materials	Middle class or above	157	19.9	30	2.1
5. No response		1	-	1	-
All categories	All ratings	790	100.0	1,455	100.0

Best Available Document

Table 20. Distribution of Respondents by Source of Water Supply of Household, by Electrification, Western Misamis Oriental, 1979

Categories	Electrified Homes			Non-Electrified		
	Main Source	2nd Source	3rd Source	Main Source	2nd Source	3rd Source
1. Piped water from pure source	276	67	2	189	61	1
2. Artesian well	276	66	0	347	103	0
3. Rain water	1	2	0	1	1	0
4. From storage in jars, pots, pails, cans, bamboo tubes (but originally from various other source like 1,2,3,5,6)	141	0	0	375	1	0
5. Open well	64	13	0	475	191	0
6. Other sources, e.g. stream with a big tube	31	1	2	67	29	0
7. No response	1	641	786	1	1,069	1,454
All categories	790	790	790	1,455	1,455	1,455

Table 21. Distribution of Respondents with Piped Water, by Year Started Using System, by Electrification, Western Misamis Oriental, 1979

Years	Homes		Years	Homes	
	Electrified	Non-Electrified		Electrified	Non-Electrified
Before 1970	51	31	1975	27	10
1970	12	10	1976	14	12
1971	6	2	1977	39	42
1972	18	14	1978	24	22
1973	30	11	1979	21	21
1974	32	11	N.R.	1	3
			Not applicable	515	1,266

Table 22. Distribution of Respondents with Electrified Homes by Year of Electricity Installation, Western Misamis Oriental, 1979

Years	Frequency	Years	Frequency
1962-1970	15	1976	68
1971	89	1977	60
1972	220	1978	77
1973	95	1979	28
1974	64	N.R.	10
1975	64	N.A.	1,455
All Respondents			2,245

Table 23. Distribution of Respondents with Electrified Homes by Most Recent Electricity Bill, Western Misamis Oriental, 1979

Peso Value of Bill	Frequency	Peso Value of Bill	Frequency
Below ₱5	12	P 60-64	9
P 5-9	523	65-69	5
10-14	75	70-74	0
15-19	33	75-79	2
20-24	31	80-84	1
25-29	21	85-89	2
30-34	13	90-94	1
35-39	19	95-99	2
40-44	13	100-199	11
45-49	4	200-299	1
50-54	6	300 or more	4
55-59	0	N.R.	2
		N.A.	1455
		All Respondents	2245

Estimates: Mean: ₱17.40; Median: ₱3.66; Variance (crs): ₱1,026.23
SD (crs): ₱32.03; Design Effect: 2.0; PPS Variance: ₱2,053
PPS SD: 45.3.

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Table 24. Distribution of Reported Deaths by Sex and Calendar Year, Western Misamis Oriental, 1979

Time Span	Electrified Homes		Not Electrified		Total
	Male	Female	Male	Female	
Jan. 1 - Dec. 31:					
1977	9	3	5	2	19
1978	4	8	16	13	41
1979 ^a	6	9	6	3	24
	19	20	27	18	84

^aUntil date of interview (May 21-June 23; Median date June 5).

Table 25. Distribution of Reported Deaths by Sex, Age, and Electrification, Western Misamis Oriental, 1979

Age Groups	Electrified Homes		Non-Electrified Homes		Deaths Sums	Population Both Sexes
	Males	Females	Males	Females		
0	3	5	6	6	20/	403
1 - 4	3	3	5	4	15/	1526
5 - 14	1	1	4	2	8/	3935
15 - 34	5	3	2	1	11/	4048
35 - 49	3	2	2	2	9/	1726
50 - 64	2	3	3	3	11/	793
65 Plus	2	3	5	0	10/	355
All ages	19	20	27	18	84	12786

Population aged as of midpoint of period of observation

Table 26. Distribution of Reported Deaths, by Sex, Income, and Electrification, Western Misamis Oriental, 1979

Income Groups	Electrified Homes		Non-Electrified Homes		Sumas	
	Males	Females	Males	Females		
Below ₱6,000	12	5	15	12	47	
₱6,000-7,999	4	6	6	2	18	
₱8,000-9,999	0	1	0	1	2	
₱10,000 Plus	3	8	3	3	17	
All incomes	19	20	27	18	84	12,786

Table 27. Distribution of Sample Population by Age and Sex, by Electricity Present, Western Misamis Oriental

Age Groups	Electrified Homes		Non-Electrified Homes		Totals	
	Males	Females	Males	Females		
0	48	50	150	155	305	
1 - 4	220	196	599	511	1110	
5 - 9	310	351	732	666	1398	
10 - 14	323	359	632	562	1194	
15 - 19	283	294	523	434	957	
20 - 24	175	193	346	312	658	
25 - 29	120	172	299	239	538	
30 - 34	133	119	204	202	406	
35 - 39	101	128	226	189	415	
40 - 44	116	118	175	168	343	
45 - 49	80	99	184	139	326	
50 - 54	67	70	92	94	186	
55 - 59	63	57	86	71	157	
60 - 64	39	46	57	51	108	
65 Plus	76	75	117	87	204	
All ages	2154	2327	4425	3880	8,305	12,786

Population as of median date of interview: June 1979

APPENDIX B

Other multiple regressions were carried out in the analysis of the rural electrification data which are not reported in the foregoing text because of economy of presentation and because results may not have been as pertinent to main research aspects. Some of these regressions however have general demographic interest in their own right.

These regressions (not treated in the text) are described here. Readers interested in particular regressions may write for xerox copy of the numerical regression results.

The variables used in the regressions are first described here:

<u>Variable Number</u>	<u>Description of Variable</u>
1.	Number of barrios/barangays/sitios in this political unit (barrio/barangay/poblacion) which have not yet been electrified
2.	Number of irrigation systems in this political unit (p.u.)
3.	Number of water systems in this political unit (p.u.) constructed since January, 1970
4.	Number of businesses or enterprises in this p.u. which started or came here since January 1, 1971, which
5.	Number of businesses or enterprises in this p.u. which started or came here since January 1, 1971, which employ 1-9 persons exclusive of employer and family
6.	The local rural health unit is electrified (Yes 1, No 0)
7.	Night school classes are regularly taught/held here in this p.u. (Yes 1, No 0)
8.	One or more Day Care centers for children are found in this political unit (hereafter, p.u.). (Yes, No. Hereafter, understood for this type variable.)
9.	Total of persons employed in business or enterprise
10.	One or more clinics/hospitals excluding governmental rural health unit is found in p.u.
11.	Total of households (hh) connected to NORESCO electricity in this p.u.

<u>Variable Number</u>	<u>Description of Variable</u>
12.	Total of hh disconnected for delinquent payments in p.u.
13.	Number of persons belonging to household(i) in p.u.(j)
14.	Total annual real household income (cash and in kind) of hh(i) in pu(j)
15.	Total annual cash household income of hh(i) in pu(j)
16.	Occupation of husband/household head(i) in pu (j)
17.	Age at last birthday of husband/household head (hereafter denoted as h/hhh) (i) in pu(j)
18.	Highest grade completed of h/hhh (i) in pu(j)
19.	Electricity has been installed in dwelling unit (i) of pu(j)
20.	Age at last birthday of female hh head
21.	Highest grade completed of female hh head
22.	Social prestige category of employed woman (high, middle, low)
23.	This married woman is employed for salary/wages?
24.	This employed, married woman works more than .98 kilometers from home
25.	Total live born children borne by married woman respondent (or by wife if husband must be interviewed in default of wife)
26.	Respondent (currently married woman, 15-49 years of age) has accepted family planning
27.	Respondent is continuing to use family planning when not having a planned birth. (Respondent has permanently stopped practise of family planning: 0; Respondent has not permanently stopped practise: 1)
28.	Respondent spontaneously mentioned cost of electricity (installation, monthly current bills, and/or appliances) as reason for her practise of family planning when asked open-ended question on reason for family planning

<u>Variable Number</u>	<u>Description of Variable</u>
29.	Respondent mentioned cost of electricity as reason for her practise of family planning in answer to a second question inquiring whether "any of these /following/ were important" reasons why you and your husband also began practising family planning
30.	Expected grade level for her male children, if any
31.	Expected grade level for her female children, if any
32.	Year of marriage
33.	Number of children born alive now deceased
34.	Calendar year of birth of last child
35.	Materials of walls and floor of dwelling unit (Lower status type-light; middle status type-mixed; upper status type-strong)
36.	Type toilet facilities, if any
37.	Average present weekly family expenditures for food in pesos, this year
38.	Annual expenditures on health services, family, last year
39.	Monthly average family expenditures on education, this year
40.	Annual family expenditures on clothing, last year
41.	Number of deaths in household, January 1, 1977 to date of interview
Zoner:	Respondent resides in poblacion (1) or in barrio (0)
16R	Household head's occupation is farmer/agricultural (1) or non-farmer/non-agricultural (0)
22R	Female household head/wife is housewife solely (1), or is also engaged in business (0)
POP	Number of persons in zone (specific poblacion or barrio)
LBPC	Variable 4/POP. Large businesses per capita (employs 10 or more, exclusive of owner's family)

<u>Variable Number</u>	<u>Description of Variable</u>
SBPC	Variable 5/POP. Small business per capita (employs less than 10 exclusive of owner's family)
EPPC	Variable 9/POP employed persons per capita
PIERCON	Percent of households whose dwelling units are connected to MORESCO I electricity in zone
PIERDCON	Variable 12/Var 11. Percent of households with disconnected d.u.'s in zone
Housewife	Variable 23=0; Var 24=0 Wife not employed for salary; not working .9 km or more from home
Wife 01	Variable 23=1; Var 24=0 Wife employed for salary; not working .9 km or more from home
Wife 02	Variable 23=1; Var 24=1 Wife employed for salary and working .9 km or more from home
EDMX	Variable 30 + Variable 31 Parents expectations for education of children
BUSI	Variable 4 + Variable 5
BUSIPC	Busi/POP
Housing	Materials + toilet facilities (Var 35 + Var 36)
Othdvin	Index of Other Development Inputs (Variable 1 + Var 2 + Var 3 + Var 10)
Total Exp	Total household expenditures: for year 1978
Per Exp	Food expenditures for year 1978 or percent of total hh expenditures
Perexph	Health expenditures for year 1978 or percent of total hh expenditures
Perexpe	Education expenditures for year 1978 or percent of total hh expenditures
Perexpc	Clothing expenditures for year 1978 or percent of total hh expenditures

<u>Variable Number</u>	<u>Description of Variable</u>
Ave 1	Average income in specific zone
Ave 3	Average education of hh head in specific zone
Ave 5	Average children ever born in specific zone
HSAC	Highest schooling aspiration for children. (Takes highest of parents' aspirations for their boys and for their girls)

<u>Dependent Variable</u>	<u>Independent Variables</u>	<u>Multiple R</u>	<u>Signif. Beyond</u>
INCOME			
1. Annual real hh income (Cash and kind)	27, Zoner, 13, 16R, 18, 17, 22R, 21, 19	.403	.001
2. Same	Zoner, 13, 18, 17, 22R, 21, 19	.403	.001
3. Same	27, Zoner, 13, 18, 17, 22R, 21, 19	.403	.001
4. Annual cash hh income	27, Zoner, 13, 16R, 18, 17, 22R, 21, 19	.442	.001
ELECTRICITY			
5. Respondent's home is electrified (Var. 19) (Step-wise Regr.)	Housing, EDEX, Zoner, 21, 32, 26, Othdvin, 18, 15, BUSINCC, 20, 28, EPPG, 13, 34, 27, Wife 01, 16R, 25, Zoner, Ave 1, Ave 3, Ave 5.	.573	.001
6. Number of d.u.'s connected to MORESCO (Var. 11)	Zoner, Ave 1, Ave 3, Ave 5	.883	.001
7. Number of d.u.'s previously connected, now disconnected (Var. 12)	Zoner, Ave 1, Ave 3, Ave 5	.795	.001
8. Percentage of du's connected to MORESCO I electricity in zone (PERCON)	Ave 3, Ave 5, Zoner, Ave 1	.607	.001

<u>Dependent Variables</u>	<u>Independent Variables in Positional Order</u>	<u>Multiple R</u>	<u>Significance</u>
9. Percentage of du's disconnected in zone	Ave 3, Ave 5, Zoner, Ave 1	.109	Beyond .001
10. Small businesses per capita in zone (SBPG)	Ave 3, Othdvin, Ave 1, Zoner, Ave 5, PERCON	.686	Beyond .001
11. Large businesses per capita in zone (LBPC)	PERCON, Ave 3, Othdvin, Zoner, Ave 1, Ave 5	.336	Beyond .001
12. Businesses per capita in zone (Busipc)	PERCON, Zoner, Ave 1, Ave 3, Ave 5, Othdvin	.315	Beyond .001
13. Businesses employing 10 or more persons (Var 04)	PERCON, Zoner, Ave 1, Ave 3, Ave 5, Othdvin	.341	Beyond .001
14. Businesses employing less than 10 persons (Var 05)	Othdvin, Zoner, Ave 1, Ave 3, P, Ave 5	.889	Beyond .001
15. No. of persons employed in business (Var 09)	Zoner, Ave 1, Ave 5, Ave 3, Othdvin, PERCON, Busipc	.905	Beyond .001
FERTILITY			
16. Family Planning Acceptance	34, 18, PERCON, 20, 6, 19, 33, Zoner, 21, EDEX, Busipc, 15, 16R, 25, 32, Othdvin, Housing, EPPC, 8, Wife 2	.413	Beyond .001
17. Continuing Use of Family Planning	21, 34, 20, 19, 18, 33, PERCON, Othdvin, EDEX, 28, Zoner, 6, Wife 01, 8, 16R, Housing, 32, Wife 02, EPPC, 25, 15, Busipc	.335	Beyond .001
18. Same	20, PERCON, 34, 25, 18, 15, Othdvin, 8, Housing, 21, 33, Zoner, EPPC, 6, 16R, Busipc, Wife 02, 32, EDEX	.335	Not Signif.

<u>Dependent Variables</u>	<u>Independent Variables in Positional Order</u>	<u>Multiple R</u>	<u>Significance</u>
19. Calendar Year of Last Birth	32, 25, 26, 20, 33, 8, 21, Wife 02, 16R, Housing, Busipc, 27, 18, Othdvin, 15, 19, 6, PERCON, EDEX, Wife 01, Zoner, EPPC, 28	.725	Beyond .001
20. Same	32, 25, 20, 33, 27, 16R, 21, EDEX, 19, Housing, Othdvin, Zoner, 6, 26, Busipc, 18, PERCON, 15, Wife 02, EPPC, 08	.760	Beyond .001
21. Children Ever Born	20, EDEX, 26, 16R, 21, Housing, 18, 27, 8, Othdvin, 32, 15, Wife 01, Busipc, Wife 02, PERCON, 19, 6, EPPC, Zoner, 28	.457	Beyond .001
22. Same	20, EDEX, 16R, Wife 02, 26, 27, Busipc, 32, 18, Housing, 21, EPPC, Othdvin, Zoner, 8, PERCON, 15, 6	.510	Beyond .001
<u>MORTALITY</u>			
23. Number of Deaths in Household	38, 21, PERCON, Busipc, Wife 02, 3, 10, 19, 37, 26, 15, EPPC, 16R, 25, Zoner, 6, 18, 27, Wife 01	.126	Not Signif. Signif. up to end of var. 19, stepwise
<u>EDUCATIONAL EXPECTATIONS</u>			
24. Expected Grade for Male Children	18, 19, Housing, 20, 21, 25, 26, Wife 02, 15, Othdvin, 6, 8, 33, Wife 01, 27, 16R, 32, Busipc, 7, Zoner, PERCON	.454	Beyond .001
25. Expected Grade for Female Children	18, 19, 20, 21, 25, Housing, 8, 6, 27, Wife 02, EPPC, 15, Wife 01, 16R, 32, 26, Othdvin, 7, Zoner, Busipc, PERCON, 33	.396	Beyond .001
26. Educational Expectations for Male and Female Children (EDEX)	18, 19, 20, 21, 25, Housing, 27, Wife 02, 6, 8, 15, Othdvin, Wife 01, 26, EPPC, 16R, 33, 7, Zoner, PERCON	.468	Beyond .001

<u>Dependent Variables</u>	<u>Independent Variables</u>	<u>Multiple R</u>	<u>Significance</u>
<u>HOUSEHOLD EXPENDITURES</u>			
<u>Food:</u>			
27. Total HH Expenditures Per Annum for Food	14, 13, 18, 19, Zoner, 21, 22R, 13 ² (13SQ) 14 ² , 27	.655	Beyond .001
28. Total HH Expenditures Per Annum for Food	14, 14 ² , Zoner, 13, 18, 22R, 21, 19	.652	Beyond .001
29. Same	14, 14 ² Zoner, 13, 18, 22R, 21, 19, 13 ²	.654	Beyond .001
30. Same	15, Zoner, 13, 18, 22R, 21, 19, 13 ² , 27, 15 ²	.657	Beyond .001
31. Same	15 ² , Zoner, 13, 18, 22R, 21, 19, 15	.655	Beyond .001
32. Same	15 ² , Zoner, 13, 18, 22R, 21, 19, 13 ² , 15	.657	Beyond .001
<u>Education:</u>			
33. Percent of Total HH Expenditures Per Annum Spent on Education	15, 25, HSAG, 18, 19, 17, 16R, 27, Zoner, 22R	.395	Beyond .001
34. Same	14, 15, HSAG, 18, 19, 17, 16R, 27, Zoner, 22R	.396	Beyond .001
35. Same	Total HH Expenditures for Food, 25, HSAG, 18, 15, 19, 16R, 17, 27, Zoner	.418	Beyond .001
36. Same	Total Expenditures for Food, 25, HSAG, 14, 18, 19, 16R, 17, 27, Zoner, 22R	.419	Beyond .001

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