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SUBJECT: Evaluation of the Philippine Rural Electrification Program

Attached please find one copy of the subject evaluation entitled:

Nationwide Survey on
Socio-Economic Impact of Rural Electrification

This evaluation was prepared by the Philippine National Electrification Administration (NEA) with assistance from the US Census Bureau, USAID/Philippines and others.

In order to show the physical and financial context of this rural electrification program, we are including a copy of NEA's Annual Report 1977.

By the end of 1977, approximately 4 million people were being supplied power from this nationwide program. These people had a major role in establishing 78 electric co-ops scattered throughout the country which are now serving them.

A.I.D.'s Development Assistance to this program, beginning in FY 1968 and ending in FY 78, amounts to $89.5 million. At A.I.D.'s urging, the Government of the Philippines sought and is now receiving its external financing requirements for this program from the World Bank and prospectively from the Asian Development Bank.

While the supply lasts, additional copies of these documents are available from Miss Ellen Bailly, 235-8582.

M. M. Pehl
ASIA/PD/EA

Attachments:

A. Distribution List

B. Nationwide Survey on Socio-Economic Impact of Rural Electrification - June 1978

C. National Electrification Administration - Annual Report 1977

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NATIONWIDE SURVEY

ON

SOCIO - ECONOMIC IMPACT

OF

RURAL ELECTRIFICATION

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT
Manila, Philippines

The United States Agency for International Development (USAID) congratulates the National Electrification Administration (NEA) on the publication of this evaluation. In addition to supplying NEA with important data, it provides valuable information on the benefits of rural electrification to a developing country.

We at USAID commend the evaluation section at NEA for the competence and dedication they brought to the study: Miss Emerita Villanueva, who heads the unit; Mr. Edmundo Abad and Miss Perpetua Villadares, her assistants; and Mr. Edmundo Bulatao, under whose direction they work.

USAID is proud to be associated with the rural electrification program in the Philippines and with this evaluation of it. We look forward to a continuation of progress in this effort to bring the benefits of electricity to rural people.

Peter M. Cody

PETER M. CODY
Director

Republika ng Pilipinas
PAMBANSANG PANGASIWAAN NG ELEKTRIPIKASYON
(National Electrification Administration)
Lungsod ng Quezon

Just like all the other development programs of the government, rural electrification is designed at enhancing the quality of life of the Filipinos. To achieve this, however, implementation and monitoring of the program necessitates scientific and well-based studies to determine the actual impact of rural electrification on its beneficiaries, the rural Filipinos. A survey conducted along such line answers this need.

For coming out with a timely study on the socio-economic impact of rural electrification, I wish to commend USAID personnel, the research staff of the Directorate for Franchises and Regulation of Cooperatives of this office, and others who helped in this revealing treatise.

I wish also to acknowledge the efforts of the immediate-past NEA Administrator Col. Pedro G. Dumol, during whose tenure the survey work for this report as well as much of the report itself was substantially completed.

In throwing light on rural electrification in the Philippines, it is our hope that this report will materially assist other countries in deciding what to do as well as what to avoid in pursuing their own programs of rural electrification.

LEONARDO G. COLOSO
Acting Administrator

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PART I

INTRODUCTION

The National Electrification Administration was set up in 1969, replacing the previous Electrification Administration, with a reinforced mandate to provide electric service to the rural population on an "area coverage" basis through rural electric cooperatives.

Under this concept, electric service is to be extended to remote and distant areas, supported by the dense loads and revenues, from more densely-populated central areas. NEA has been assisted in this task by generous budget allocations from the National Treasury as well as by substantial foreign loan assistance, primarily from the United States Government through U.S. Agency for International Development (USAID).

As of January 1978, NEA had organized 96 electric cooperatives distributed among the country's 72 provinces. The ultimate goal of the program is total electrification of the country by 1990. In June 1976, USAID provided a $75,000 grant for a series of economic and social evaluation studies of this program, the highlight of which is this nationwide evaluation survey. Inasmuch as the beneficiaries of the program are rural people, the grant provided for a survey to describe and measure the socio-economic impact of electricity on rural households.

A. SURVEY OBJECTIVES

This study is the first of a series of nationwide surveys, to be repeated every three or five years, to evaluate the Philippine rural electrification program. While the study is exploratory and primarily designed to provide baseline information for future comparison, analysis also focused on socio-economic and attitudinal differences between identifiable groups, impact of electricity on the household, and the management of electric cooperatives.

The main areas of investigations are:

1. sociological characteristics of the household;
2. housing conditions and facilities;
3. coverage, use and cost of electricity;
4. substitute power sources and cost in non-electrified and electrified households;
5. availability, accessibility and use of community facilities;
6. household income;
7. perception of the impact of electricity on the community; and
8. attitude towards and reactions to electricity cost and service.

B. SUMMARY OF MAJOR FINDINGS

The results of the survey shows that:

1. Households served by cooperatives have a lower socio-economic status than those served by other electric utilities.

2. Electrified households have higher socio-economic status than non-electrified households.

3. Cooperative electric utilities are more successful than private electric utilities in terms of availability of service and the number connecting among those accessible to electricity.

4. Cooperative electric utilities are more successful than private electric utilities in penetrating remote areas and servicing "poor" people. They have also reached a significant proportion of food producers.

5. Rural households use electricity primarily for lighting.

6. The strongest perceptions of indirect benefits of electricity were in improved peace and order and increased educational activity.

7. In cooperative areas, neighborhood-sharing is stronger and the benefits of electri-

city to non-electrified households are more widespread than in non-cooperative areas.

8. Approximately half of all electrified households feel that cost of electricity is high. The extent of this opinion, however, is less in cooperative areas than in non-cooperative areas.

9. Electric service interruptions were common in both cooperative areas and non-cooperative areas.

10. Households in cooperative and non-cooperative areas have favorable attitudes towards electric cooperatives.

C. STATEMENT OF LIMITATIONS OF STATISTICAL INFERENCES FROM THE SURVEY ESTIMATES

The estimates in this report are based on a "quasi-experimental design" described in Appendix B. A probability sample of cooperative barrios was selected, and each sample cooperative barrio was matched with a non-cooperative barrio of similar size and electrification status. The households in each sample cooperative barrio and matching non-cooperative barrio were listed and categorized into two strata – electrified and non-electrified. In cooperative barrios a sample of 1,013 electrified households and 1,973 non-electrified households was selected and in non-cooperative barrios a sample of 303 electrified households and 694 non-electrified households was selected. Since the non-cooperative portion of the sample was not selected under scientific rules of probability, the population or universe for the "experimental design" is hence taken to be the collection of households in the sample cooperative and non-cooperative barrios. The observations are inflated to the barrio level to compare estimates in the four "experimental design" strata: cooperative-electrified, cooperative-non-electrified, non-cooperative-electrified and non-cooperative-non-electrified. The non-cooperative portion of the experimental design is not generalizable to the country as a whole.

The standard error described in Appendix B is a measure of the precision of a survey estimate although it does not measure any systematic biases in the data. It should be noted that although the standard error of a survey estimate is a measure of the sampling error, it does not necessarily measure the several important sources of non-sampling error, such as interviewer variability and errors introduced in coding, editing and tabulating the survey data. Standard errors were computed for the "experimental design" estimates in the tables in this report, which are mostly percentages. Table B1 in Appendix B shows the sample size of each "experimental design" stratum and the standard errors for a range of percentage estimates in each stratum. Included in the appendix are the formulas which can be used to calculate the standard errors for the different types of survey estimates. The standard errors for the "experimental design" estimates are small, since each stratum has a fairly large sample size and the over-all sampling rate within the sample barrios is high (7 percent).

PART – II

SOCIO-ECONOMIC COMPARISON OF HOUSEHOLDS IN COOPERATIVE AND NON-COOPERATIVE AREAS

This section focuses on four questions:

A. What are the socio-economic characteristics of cooperative households?

B. How do electrified households in cooperative areas compare with electrified households in non-cooperative areas?

C. How do non-electrified households in cooperative areas compare with non-electrified households in non-cooperative areas?

D. How do electrified households compare with non-electrified households?

Comparisons were made on the basis of 7 socio-economic indicators:

1. Annual net income
2. Educational attainment of household head
3. House and lot ownership
4. Quality of housing materials
5. Number of household items owned
6. Source of drinking water
7. Employment status of household head a week before interview.

A. COOPERATIVE HOUSEHOLDS

Table II–1 Summary Profile: Cooperative Households

1.	Percentage with income below P4,000	51
2.	Median educational attainment of household head	Grade 6
	a. Percentage above grade 6	36
3.	Percentage owning house and lot	33
4.	Percentage with house of heavy/ strong materials	12
5.	Mean number of household items owned	4
	a. percentage with less than 7 household items	82
6.	Percentage with water from central water supply system or artesian well	73
7.	Percentage employed of household heads one week before interview	86

B. COOPERATIVE ELECTRIFIED HOUSEHOLDS AGAINST NON-COOPERATIVE ELECTRIFIED HOUSEHOLDS

Four of the seven indicators show that there is no difference in the socio-economic statuses of cooperative and non-cooperative households. The other three, however indicate that non-cooperative electrified households are better-off.

The indicators which showed differences are:

1. net annual income
2. quality of housing materials
3. number of household items owned

Table II-2 Summary profile: Cooperative Electrified Against Non-Cooperative Electrified, 1977

	Cooperative Electrified Household	Non-Cooperative Electrified Household	Statistical Interpretation
1. Percentage with income below P4,000	28	22	significant difference
2. Median educational attainment of household head	1st year H.S.	1st year H.S.	
a. Percentage above first year H.S.	47	49	no difference
3. Percentage owning house and lot	48	54	no difference
4. Percentage with houses of strong/heavy materials	22	29	significant difference
5. Mean number of household items owned	7	8	significant difference
a. Percentage with less than 7 household items	56	43	significant difference
6. Percentage with water from central water supply system or artesian well	87	89	no difference
7. Percentage of household heads employed one week before interview	82	79	no difference

C. COOPERATIVE NON-ELECTRIFIED HOUSEHOLDS AGAINST NON-COOPERATIVE NON-ELECTRIFIED HOUSEHOLDS

Four of the seven indicators suggest that non-electrified households in non-cooperative areas are better-off than non-electrified households in cooperative areas. Employment status of household head, source of drinking water and quality of housing material showed no differences.

The indicators which showed significant differences are:

1. net annual income
2. educational attainment of household head
3. house and lot ownership
4. number of household items owned

Table II – 3 Summary Profile: Cooperative Non-Electrified Households Against Non-Cooperative Non-Electrified Households, 1977

		Cooperative Non-Electrified Household	Non-Cooperative Non-Electrified Household	Statistical Interpretation
1.	Percentage below P4,000	65%	53%	significant difference
2.	Median educational attainment of household head	Grade 6	Grade 6	
	a. Percentage above Grade 6	24	33	significant difference
3.	Percentage owning house and lot	24	34	significant difference
4.	Percentage with houses of heavy/strong materials	5	6	no difference
5.	Mean number of household items owned	2	3	significant difference
	a. Percentage with less than 7 items	99	96	significant difference
6.	Percentage with water from central water supply system	64	65	no difference
7.	Percentage of household heads employed one week before interview	88	87	no difference

An analysis which has yet to be undertaken and which may prove useful is the classification of electrified households by socio-economic characteristics according to length of time electrified. For newly electrified households this could be a profile of the requirements prior to electrification. For households with longer-term electrification, the profile would perhaps be of living standards developed concurrent with electrification. Presumably, differences will exist. This will be undertaken subsequently.

B. ELECTRIFIED HOUSEHOLDS AGAINST NON-ELECTRIFIED HOUSEHOLDS

Six of seven indicators suggest that electrified households are economically better-off than non-electrified households. On the average, heads of electrified households are better educated, live in better quality houses, own more households items, have more sanitary sources of drinking water, and have larger incomes. A greater proportion of them also own their houses and lots.

Employment rate as defined here is the total number of household heads working divided by the total number of household heads. This study shows that the employment rate for heads of non-electrified households is higher: 88 percent against 81 percent. The lower employment rate for electrified households may be explained by the fact that there is a greater percentage of heads of electrified houses doing housekeeping (See Table A-5). While difference in the age and sex distributions for the two groups may account for this, further investigation is needed.

Table II-4. Summary Profile: Electrified Households Against Non-Electrified Households, 1977

		Electrified Household	Non-Electrified Households	Statistical Interpretation
1.	Percentage with income below P4,000	26	59	Significant Difference
2.	Median educational attainment of household head	1st yr. H.S.	Grade 6	Significant Difference
	a. Percentage above grade 6	82	28	
3.	Percentage owning house and lot	50	29	Significant Difference
4.	Percentage with house of heavy/ strong materials	25	6	Significant Difference
5.	Mean number of household items owned	8	3	Significant Difference
	a. Percentage with less than 7 household items	51	98	
6.	Percentage with water from central water supply system or artesian well	88	64	Significant Difference
7.	Percentage of household heads employed one week before interview	81	88	Significant Difference

PART III

OUTREACH OF ELECTRIC SERVICE

While Part II dealt primarily with differences among various sub-groups on the basis of socio-economic indicators, Part III focuses on the extent and operation of the electrification program. Of specific interest to program administrators are questions regarding:

1. geographical coverage of electric service;
2. proportion electrified among those accessible to electricity; and
3. extent of electric service among the "poor" and among food producers.

A. GEOGRAPHICAL COVERAGE

To determine the extent of electric service in terms of physical distance, three indicators were used:

1. urban-rural classification of the household
2. distance of the household from the poblacion
3. location of the household

The first indicator classifies households as being either urban or rural. Any household located within the geographical boundary of the poblacion is considered urban – otherwise it is considered rural. A poblacion is a barrio with the densest development and where the municipal government is located; barrio areas are politically defined.

While this indicator was the simplest to construct, it is also beset with a host of theoretical problems. For example, "urbanity' is not an either–or concept. Generally, the territorial extent of urban development is somewhat continuous, either tapering off gradually the farther away an area is from the center or building up irregularly at sub-centers surrounding the poblacion. Any attempt to impose a cut-off result in loss of valuable information. Also, the urban-rural classification defines urbanity along one aspect only – political jurisdiction and such a definition can be inaccurate. Urban areas as defined can include rural parts; conversely, urban growth often outstrips defined boundaries and encroaches on allegedly rural areas.

The second indicator defines the distance of the household from the poblacion. While this indicator measures urbanity by one aspect only, it none the less revealed certain patterns which suggest that the probability of a household being electrified is somehow related to its distance from the poblacion. It should be pointed out that "distance" is not actual physical distance, but rather the respondent's perception of how far his house is from the poblacion. It would be safe, however, to presume that there is a close correspondence between the two. Another point to consider is that being in the poblacion does not necessarily guarantee that a household is near an electric power line or for that matter, in an energized area. In the sample, three of thirteen poblacions did not have electricity.

The third indicator classified a household as located in one of the following (1) poblacion, (2) a barrio less than 2 kilometers from national highway or (3) a barrios 2 kilometers or more from a national highway – the route also followed by main or "backbone" electric power lines in the provinces. This indicator therefore gives an idea on how far minor lines have been extended from the electric utilities'main power lines.

All indicators suggest that rural electric cooperatives are more successful in providing electricity to remote areas than private electric utilities. This is most apparent with the third indicator – households located in barrios 2 kilometers or more from a provincial highway. Twenty six per cent of households in such barrios in cooperative areas are electrified in contrast to only 2 per cent in non-cooperative areas. The findings are consistent with the notion that electric cooperatives, as development institutions, are more prone to provide service to such areas even if the peso returns are low.

The National Power Corporation is currently implementing a massive program to increase the available supply of electric energy, tapping non-oil sources such as hydro-electric, nuclear, and geothermal. With adequate electric power and with the further expansion of the NPC's power grid, more electric cooperative can be organized and can in turn energize more rural areas.

Table III-1. Percentage of Electrified Households: Households in Rural Areas; Households 5 Kilometers and Over from the Poblacion; and Households in Remote Barrios by Cooperative Status, 1977

		Cooperative Area	Non-Cooperative area
1.	Rural Households	34	28
2.	Households 5 kms and over from poblacion	22	9
3.	Households 2 kms. or more from a provincial highway	26	2

B. PERCENT ELECTRIFIED AMONG THE ACCESSIBLES

An important issue that has a bearing on the financial viability of rural electric utilities is the number connecting among those accessible to electricity. Respondents in energized areas were asked whether it is possible for them to have an electric connection if ever they request for it. A person is classified as accessible if he answers "yes". Total accessible therefore is the number who answered in the affirmative plus the total number of electrified households. Total number of inaccessibles are those who answered "no" to the aforementioned question plus households which are located in non-energized areas.

There are more households accessible to electricity in cooperative areas than in non-cooperative areas: 74 percent as against 54 percent. Furthermore, among accessibles, the proportion electrified in cooperative areas is higher than in non-cooperative areas: 53 percent as against 32 percent. The findings suggest that not only are cooperative utilities reaching more people in terms of availability of electric service but that percentage-wise more people are in fact connecting.

Table III-2. Percentage of Households: Households with Access to Electricity by Cooperative Status, 1977

	Coop Area	Non-Coop Area
Accessible	74	54
Non-accessible	26	46
TOTAL	100	100

Table III-3. Percentage of Accessible Households: Electrified Households by Cooperative Status, 1977

	Coop Area	Non-Coop Area
Electrified	53	32
Non-electrified	47	68
TOTAL	100	100

C. PER CENT ELECTRIFIED AMONG THE "POOR"

Implicit in the concept of rural electric cooperative is the idea that these cooperatives were organized to provide low cost, adequate, and reliable service to a majority of households in rural areas. Since a significant proportion of households in cooperative areas may be considered relatively "poor", the question naturally arises as to whether the cooperative is in fact reaching the poor or instead reaching only a privileged segment of the population.

To ascertain the extent of electrification among the "poor" three indicators were used:

1. net annual income
2. house and lot ownership
3. quality of housing materials

For purposes of this study "poor" means any of the following:

1. annual net income of household is less than P4,000
2. respondent does not own house and lot
3. respondent lives in a house of light or salvaged/scrap materials

The amount of P4,000 net income per year was used as a cut-off point for "poor' and "not poor ' because roughly 50 per cent of the respondents fall below this point.

Table III-4. Percentage of Households: Households with less than P4,000 Net Annual Income; Households Not Owning House and Lot, and Households with Houses of Light and Scrap Materials by Cooperative Status, 1977

		Cooperative Area Percent Electrified	Non-cooperative Area Percent Electrified
1.	Net Annual Income below P4,000	22	16
2.	Household not owning house and lot	37	30
3.	House made of light or salvaged/scrap material	24	14

A statistical test (Z) was performed to find out whether differences exist in the proportion electrified among groups classified as poor in cooperative and non-cooperative areas. All indicators exhibited significant differences at a=.05. Net annual income and quality of housing materials suggest that cooperative electric utilities are more successful than private electric utilities in serving the poor while ownership of house and lot suggests just the opposite.

In central or urbanized areas, the proportion of families living in rented dwellings is generally much higher. If a large proportion of non-cooperative consumers do not own their dwellings, this may mean that the utility is serving poor people; but it may also mean that the utility is serving central or urbanized areas. However, where the dwelling unit is of inferior quality, whether owned or not, no such ambiguity exists. The probability is, such a household is poor. Furthermore, the fact that the statistic with net annual income, a widely accepted indicator of level of living, agrees with the latter, suggests that overall cooperative electric utilities serve more poor people than private electric utilities.

Another approach, presented more extensively in Section III-A, is to consider residents of remote barrios as poor. The assumption needs to be qualified – obviously there are some wealthy households in remote barrios. But the majority of such area residents are poor, and where electric lines serve groups of such houses, then most probably poor people are being served. By this criterion, cooperatives also fare better than non-cooperative systems, having 26 percent of

total consumers from interior barrios as opposed to only 2 percent for non-cooperative systems.

It will be interesting, nevertheless, to see the situation upon re-survey as planned in two year's time. The number of connections previously served by private utilities and taken-over by cooperative, presumably the more affluent, will be constant; however, 'new' cooperative connections will increase considerably. The rate of new connections by cooperative is approximately double that of private systems and these will presumably include many poor people.

D. PERCENT ELECTRIFIED AMONG "FOOD PRODUCERS"

Source of income (a household has on the average 2.7 sources of income) was used as a basis for differentiating "food producers" from "non-food producers". That is, households with income from (1) agricultural industries, (2) farming, (3) livestock and poultry and (4) fishing and hunting were classified as "food producers". Household with income from (1) non-agricultural industries and (2) other sources (out of assets, pensions, etc.) were classified as "non-food producers".

To arrive at total household income accruing from the various activities of the household members, questions on sources of income were asked. Because the original intention was different, getting at the sample of food producers via this question involved a few technical problems. For instance, source of income does not differentiate food production for home consumption from food production for commercial purposes. Secondly, source of income was not differentiated into major or minor sources, which means that a person may engage in backyard farming or raise only one or two pigs and yet be classified as a food producer.

Households with income from livestock and poultry comprise 59 percent of the total sample. Of these, 35 percent are electrified and 65 percent not electrified. The proportion electrified among such households is slightly higher in cooperative areas than in non-cooperative areas: 38 percent as against 32 percent.

The second biggest group of food producers are households with income from farming which comprise one-half of the total sample. One-third of these are electrified. Again, the proportion electrified among such households is slightly higher in cooperative areas than in non-cooperative areas: 36 percent as against 27 percent.

Farming, now with help from electric irrigation system, is a leading source of income of the rural people.

PART IV

BENEFITS OF ELECTRICITY

Introduction

The benefits of electricity that accrue to rural households can be assessed by looking at its uses at home, its utility in household-based businesses, and its effects on the life style of its users. The results of the survey revealed that a significant number of electrified households do not use electricity for common household functions like cooking or ironing. Consequently, use of alternative sources for these household functions and their costs were investigated. In addition, comparison of aggregated cash outlays per month for electricity and other sources of power was made. The following discussion pertain primarily to electrified households, but the indirect benefits of electricity to non-electrified households is also discussed.

A. DIRECT BENEFITS OF ELECTRICITY

Connected households generally exhibited low consumption of electricity. Data from the survey indicate that majority of connected households in cooperative areas use less than 30 KWH per month. The majority of connected households in non-cooperative areas, on the other hand, use less than 40 KWH per month. (See Table IV-1). This could be a confirmation of the findings in the previous sections that economically, electrified non-cooperative households are better-off than their cooperative counterparts.

Table IV-1. Percentage of Electrified Households: Kilowatt-Hour Consumption per Month by Cooperative Status, 1977

Number of Kilowatt Hours	Cooperative Area	Non-Cooperative Area
1 – 10	13	7
11 – 20	34	24
21 – 30	18	14
31 – 40	7	11
41 – 50	5	8
51 – 60	2	4
61 – 70	3	7
71 – 80	3	3
81 – 90	2	3
91 – 100	2	4
101 – 200	8	13
201 – 997	2	3
TOTAL	100	100

1. Household Functions as Affected by Electricity

Rural households use electricity primarily for lighting their homes. Ninety nine percent of cooperative electrified households and 96 percent of non-cooperative electrified households use electricity for lighting. Table IV-2 lists some household functions and the corresponding percentage of households using electricity for such functions. One can see that, for all household functions except for lighting, a higher percentage of non-cooperative households use electricity than cooperative households. This result may be explained by the more recent introduction of electricity in cooperative areas and possibly by the lower standard of living of cooperative electrified households.

Table IV-2. Percentage of Electrified Households: Uses of Electricity for Household Conveniences by Cooperative Status, 1977

Household Functions	Cooperative Areas	Non-Cooperative Areas
Lighting	99	98
Ironing	45	64
Ventilation (Fans)	33	42
Refrigeration	20	34
Cooking	a	1

a – less than 1 percent

2. Recreational Activities of Household Members

Fifty nine percent of respondents in cooperative electrified households and 72 percent of respondents in non-cooperative electrified households watch television. Fifty percent in cooperative areas and 52 percent in non-cooperative areas listen to an electric radio or stereo. In both area, the users of electric radio/stereo and television sets outnumber the owners. (See Table IV-3). This sharing has an added benefit to the rural households: aside from the entertainment provided by television or radio programs, the situation also provides opportunities for social visiting.

Table IV-3. Percentage of Electrified Households: Electric Appliance Owned and Used by Cooperative Status, 1977

Electric Appliances	Cooperative Areas		Non-Cooperative Areas	
	Owners	Users	Owners	Users
Television Set	32	59	48	72
Radio/Stereo	43	50	50	52

Now with electricity, rural folks can now enjoy the conveniences of modern living.

3. Uses of Electricity in Household-based Businesses

Respondents in electrified households were asked whether they use electricity for commercial purposes. While replies to the questions give one an idea how electricity is used aside from ordinary households functions, the statistics used in the following discussion should be clarified. What was computed was total household-based businesses using electricity relative to total electrified households. This ratio is different from the proportion of households with household-based businesses to total sample. This is also different from the proportion of household based businesses using electricity to total household-based businesses. Another thing to consider is that the exact role played by electricity in the operations of the business was not investigated; therefore, effects can only be inferred.

The findings show that 16 percent of electrified households in cooperative areas and 15 percent of those in non-cooperative areas use electricity for commercial purposes. The difference is not significant. Table IV-4 shows the various types of businesses engaged in by the sampled households. The category "others" includes businesses such as production of ice candies, native cakes, copra, pots and handicrafts, furniture, dried fish, rice millers, drillers, photography studios and dental clinics.

Table IV-4. Percentage of Electrified Households: Commercial Users of Electricity by Cooperative Status, 1977

	Cooperative Areas	Non-Cooperative Areas
No. of Electrified Households	11,386[b]	8,641[b]
No. of Commercial Users	1,841	1,371
Percentage of Commercial Users	16	15
Commercial Users		
1. Variety stores/Grocery	47	28
2. Dress Shop/Tailoring	7	12
3. Piggery/Poultry	7	10
4. Canteen/Restaurant	4	5
5. Auto Mechanic/Welding Shop	4	4
6. Recreation House	3	2
7. Beauty/Barber Shop	a	2
8. Wood/Carpentry Shop	1	a
9. Others	27	37
TOTAL	100	100
(Base)	(1841)	(1371)

a – less than 1 percent

b – weighted sample

The findings in this section show that electricity helps ease the burden of household chores by the use of electric appliances. Electric lights extend the working hours of the households and provide more time for recreation and leisure. Electricity is also used for commercial purposes by small entrepreneurs to augment household income. However, even if electrified households have fully converted to electric lighting and have started to use refrigerators, fans and television sets, they persist in using traditional sources of power for ironing and cooking. In view of this, a digression on the traditional sources of power used by electrified households and the monthly cash outlays for these sources is made in the next section.

B. CASH OUTLAYS AND SOURCES OF POWER OTHER THAN ELECTRICITY

1. Alternative Sources of Power for Cooking, Ironing and Radio

Table IV-2 of the previous section shows that a negligible percentage of electrified households use electricity for cooking. This is because wood is abundant and cheap in rural areas. Forty six percent of electrified households in cooperative areas and 35 percent of those in the non-cooperative areas use wood solely for cooking. The other sources of power used for cooking are liquified petroleum gas (LPG) and kerosene. (See Table IV-5).

Although charcoal-heated irons are inconvenient to use, 54 percent of electrified households in cooperative areas and 35 percent of those in non-cooperative areas use charcoal for ironing. One reason why electrified rural households tolerate the inconveniences of using charcoal is that they spend very little on this source. (See Table IV-6). Other possible reasons are the high cost and high wattages of electric irons.

For radio, 45 percent of electrified households in cooperative areas and 38 percent in non-cooperative areas use battery. Considering the very low KWH consumption of radios and the cost of batteries, the preceding figures are quite high. One reason for this is that battery-powered radios are cheaper and handier to carry than electric radios.

Table IV-5. Percentage of Electrified Households: Alternative Sources of Power Used by Cooperative Status, 1977

Alternative Sources of Power	Cooperative Areas	Non-Cooperative Areas
For cooking:		
Wood only	46	35
LPG Only	15	22
Kerosene Only	6	10
Two or More Sources (Electricity Excluded)	32	28
For ironing:		
Charcoal	54	35
For radio:		
Battery	45	38

The preceeding table consistently shows that a greater percentage of cooperative households use alternative sources of power for household functions than non-cooperative households. Again, this maybe explained by the lower level of living of cooperative households and the more recent introduction of electricity in cooperative areas.

2. **Monthly Cash Outlays for Electricity and Other Sources of Power**

Electrified households in both areas spend more on traditional sources of power than on electricity. Those in cooperative areas spend an average of P24.00 per month for traditional sources and only P11.00 per month for electricity. In non-cooperative areas, electrified households spend P27.00 for traditional sources and P14.00 for electricity. The amount spent for individual sources of power other than electricity do not add up to traditional sources in Table IV-6 because the latter is a weighted median. Where traditional sources of power are abundant and cheap, and where LPG or kerosene is used directly for heat, a cost advantage for electricity is problematical.

Table IV-6. Median Monthly Cash Outlay for Power of Electrified Households by Cooperative Status, 1977

Sources of Power	Cooperative Areas	Non-Cooperative Areas
Electricity	P11.00	P14.00
Traditional sources	24.00	27.00
Wood	6.00	10.00
Kerosene	5.00	8.00
LPG	28.00	28.00
Charcoal	2.00	2.00
Battery	5.00	5.00

C. PERCEIVED BENEFITS OF ELECTRICITY

The benefits of electricity come in various forms. This section on benefits deals primarily with subjective measures as given by the respondents as to the good that electricity has brought them. The following questions were asked:

1. Do you think electricity is good for your area?
2. Would you say that electricity has improved your life?
3. Would you say that the peace and order situation in the area is better/worse since the coming of electricity?
4. Would you say that educational activity in your area has increased/decreased since the coming of the electricity?

Table IV–7 indicates that most non-electrified households, whether cooperative or non-cooperative hold the opinion that electiricity is good for their area. A negligible percentage feel otherwise.

Table IV-7. Percentage of Non-Electrified Households: Attitude Towards Electricity by Cooperative Status, 1977

Responses	Cooperative Areas	Non-Cooperative Areas
Good for the area	99	100
Not good for the area	1	0
TOTAL	100	100

The majority of electrified households say that with the coming of electricity their lives improved a lot. A very small percentage say that their lives improved hardly at all. Moreover, although about the same percentage of cooperative and non-cooperative electrified respondents affirmed that electricity improved their lives, the degree of perceived improvement varies between cooperative and non-cooperative respondents. More of non-cooperative households indicate that their lives improved a lot while more of cooperative household say that their lives improved somewhat. (See Table IV-8). One can only surmise as to the reasons behind these responses. One possible explanation is that non-cooperative areas have had electric service for a longer period of time, an average of seven years compared to the cooperatives average of three years. The point here is that considerably more improvement can take place in seven years than in three.

Regardless of cooperative and electrification status, the bulk of households indicated improved peace and order with the coming of electricity. Non-electrified households, whether in cooperative or non-cooperative areas, are almost as positive as electrified households on this point. (See Table IV-9)

Table IV-8. Percentage of Electrified Households: Degree of Life Improvement Brought About by Electricity by Cooperative Status, 1977

Response	Cooperative Area	Non-Cooperative Area
Improved a lot	55	74
Improved Somewhat	40	22
Hardly improved at all	4	3
No opinion/do not know	1	1
Total	100	100

Table IV-9. Percentage of Respondents: Perception of Change in the Peace and Order Situation with the Coming of Electricity by Cooperative and Electrification Status, 1977

Response	Cooperative Area		Non-Cooperative Area	
	Elect.	Non-Elect.	Elect.	Non-Elect.
Better	84	78	84	80
Same	14	19	16	18
Worse	1	a	a	a
No Opinion	1	3	a	2
TOTAL	100	100	100	100

a = less than 1 percent

Most households, regardless of cooperative or electrification status, indicated an increase in educational activity with the coming of electricity. Two-thirds of non-electrified households and three-fourths of electrified households expressed this opinion. (See Table IV-10)

The subjective opinions of the respondents draw a favorable picture for electrification. As perceived by them, the benefits of electricity come in the way of improved life conditions, improved peace and order, and increased educational activity.

Data on the actual number of school houses, hospital's and clinics electrified and the number of street lights are not available nor the number of respondents who make use of these facilities. However, the responses of our interviewees on the questions given below can give us an idea of the electrification status of public schools, hospitals and/or clinics and of the presence of street lights in the areas surveyed.

1. Is the public school, hospital or clinic nearest your barrio electrified?
2. Does the street where you live have street lights?

The reader should be cautioned about the interpretation of the tables on these two questions. The figure 67 percent in Table IV-11 does not mean that 67 percent of public schools in cooperative barrios surveyed are electrified; rather that 67 percent of electrified households in cooperative areas surveyed said that the public school nearest their barrio is electrified. It may mean that two-thirds of electrified areas have an electrified public school nearby, though this data still has to be checked area by area. (See Table IV-11)

TABLE IV-10. Percentage of Respondents: Perception of Change in Educational Activity by Cooperative and Electrification Status, 1977

Response	Cooperative Area		Non-Cooperative Area	
	Elect.	Non-Elect.	Elect.	Non-Elect.
Increased	75	67	81	66
Same	20	23	14	24
Decreased	1	1	a	a
No Opinion/Do not know	4	9	5	10
T O T A L	100	100	100	100

Table IV-11. Percentage of Respondents: Electrification Status of Public School nearest Barrio by Cooperative and Electrification Status, 1977

Response	Cooperative Area		Non-Cooperative Area	
	Elect.	Non-Elect.	Elect.	Non-Elect.
Yes (Electrified)	67	46	83	29
No (Not Electrified)	30	50	12	70
Do not Know/No Response	3	4	5	2
T O T A L	100	100	100	100

Three points should be brought out. First, household and school house electrification generally go hand in hand. This may explain the more positive response among electrified households. Second, more school houses appear to be electrified in non-cooperative than in cooperative areas. This is consistent with the finding of longer-term electrification in non-cooperative areas, and with the possibility of greater urbanity of such areas. Third, electrification in non-cooperative areas is more concentrated. This is shown in the greater disparity between "yes" responses for electrified and non-electrified households in non-cooperative areas — a ratio of 3:1. In cooperative areas the ratio is 3:2 indicating perhaps more dispersed electrification with pockets of unelectrified households interspersed with electrified households and near electrified school houses. NEA's special program to electrify schoolhouses may also have resulted in schoolhouse electrification in areas without much household electrification.

The analysis for hospitals or clinics is basically the same. It seems that proportionately more medical institutions are electrified than schoolhouses. It is possible that this goes hand in hand with household electrification, especially with respect to the small barrio public health clinics. In some cases, however, considering that some clinics are not permanently staffed, the "nearest hospital" is located in the poblacion and is more likely electrified.

Somewhat more respondents in cooperative areas report electrification of nearby hospitals or clinics. This is especially true among non-electrified respondents. As with schoolhouses, this may indicate a wider spread of cooperative physical facilities, and may confirm the notion that cooperative service penetrate a broader population base.

Table IV-12. Percentage of Respondents: Electrification Status of Nearest Hospital/Clinic by Cooperative and Electrification Status, 1977

	Cooperative Area		Non-Cooperative Area	
Response	Elect.	Non-Elect.	Elect.	Non-Elect.
Yes (Electrified)	93	86	92	55
No (Not Electrified)	6	12	6	44
Do not Know/No Response	1	2	2	1
T O T A L	100	100	100	100

A greater percentage of electrified than non-electrified households in both cooperative and non-cooperative areas have indicated that street lights are present within their vicinity. This is of course to be expected. But it is significant to note that there are more of non-cooperative than cooperative electrified households who say that their streets are lighted. If in actuality, non-cooperative areas have more street lights than cooperative areas, it is most likely that the length of electrification can explain the difference.

Table IV-13. Percentage of Households: Presence of Street Lights by Cooperative and Electirification Status, 1977

	Cooperative Area		Non-Cooperative Area	
Response	Elect.	Non-Elect.	Elect.	Non-Elect.
With Street Lights	68	36	74	31
Without Street Lights	32	62	26	69
T O T A L	100	100	100	100

Use of electric appliances are not confined to electrified households. Non-electrified households also use the electric appliances of their neighbors as the survey results reveal. In this sense they too benefit directly from electrification. (See following tables).

In comparing the appliance usage of cooperative and non-cooperative non-electrified households, an interesting pattern is revealed. For all appliance types, the percentage usage of cooperative non-electrified households exceeds that of non-cooperative non-electrified households. This suggests that in cooperative areas neighborhood sharing is stronger and consequently the benefits of electricity to cooperative non-users are greater.

For all appliance types, the proportion of cooperative electrified households owning such appliances is smaller than that of non-cooperative households. This result is consistent with the notion that the cooperative areas reach a broader segment of the population and indeed a broader base of poor people.

Table IV-14. Percentage of Households: Usage of Electric Appliances by Cooperative and Electrification Status, 1977

Type of Appliances	Cooperative Area		Non-Cooperative Area	
	Elect.	Non-Elect.	Elect.	Non-Elect.
1. Electric TV set	59	32	72	20
2. Electric flat iron	53	10	72	7
3. Electric radio/stereo	50	13	52	11
4. Electric fan	33	7	42	3
5. Electric refrigerator	31	6	38	5
6. Electric stove/range	7	4	11	1
7. Electric water pump	6	3	10	1

Table IV-15. Percentage of Households: Ownership of Electric Appliances by Cooperative and Electrification Status, 1977

1. Electric flat iron	47	1	70	3
2. Electric radio/stereo›	43	2	50	6
3. Electric TV set	32	1	48	2
4. Electric fan	27	a	40	2
5. Electric refrigerator	24	a	34	1
6. Electric stove/range	6	a	10	1
7. Electric water pump	4	a	9	a

a = less than 1 percent

PART V

MANAGEMENT OF THE PROGRAM

A. COST OF ELECTRICITY

The following questions were asked to determine prevailing views on cost of electricity;

1. Do you find cost of electricity in your area: low, just about right, or high?
2. If the cost of electricity increased and your monthly bill were doubled, would you: disconnect right away, try to reduce consumption, not change consumption or what?
3. If your household could have electricity at a cost of P25.00 per month, would you: definitely connect, may or may not connect, or definitely not connect?
4. If your household could have electricity at a cost of P10.00 per month, would you: definitely connect, may or may not connect, definitely not connect?

Approximately half of the electrified households have the opinion that electricity cost is high. If anything, this response is surprisingly low. An overall impression, given the inflation of recent years, is that most consumers consider most prices of goods as high. More non-cooperative than cooperative households find electricity expensive 58 percent against 46 percent (See Table V-1)

Three out of four electrified households intend to reduce consumption if cost of electricity were to double. Perhaps It would have been more useful to ask for estimated, measured reactions to smaller changes in cost; as it is, this finding is not surprising. It is perhaps a useful indicator that energy conservation through pricing policies can be effective. (See Table V-2)

Table V-1. Percentage of Electrified Households: Opinion on Cost of Electricity by Cooperative Status, 1977

Response	All Areas	Cooperative	Non-Cooperative
Low	4	4	3
About right	44	48	38
High	51	46	58
Do not know	1	2	1
TOTAL	100	100	100

Table V-2. Percentage of Electrified Households: Reaction to Doubling of Electricity Cost by Cooperative Status, 1977

Response	All Areas	Cooperative	Non-Cooperative
Disconnect right away	16	14	17
Reduce consumption	73	75	72
Not change consumption	6	7	5
Do not know	5	4	6
TOTAL	100	100	100

Questions on cost of electricity when posed to non-electrified households are of equal interest. The Philippine program's long-term projections, after all, involve practically 100 per cent coverage based on present households. It is interesting therefore to know whether for a given cost these households would connect or not. Results are tabulated below.

Table V-3. Percentage of Non-Electrified Households: Willingness to Connect to Electricity Given a Minimum Monthly Bill of P10, P25 by Cooperative Status, 1977

Response	Cooperative Area		Non-Cooperative Area	
	P10	P25	P10	P25
Will definitely connect	34	12	41	9
Will definitely not connect	31	24	28	29
May or may not connect	28	57	24	56
Do not know	7	7	7	6
TOTAL	100	100	100	100

Cost of electricity has a greater bearing on the decision of whether or not to take electric service for households in cooperative areas. At a P10 monthly bill only 3 percent more cooperative households will connect than will definitely not connect. For non-cooperative households, those that will connect are 13 percent more, a little less than double those not connecting. At a P25 monthly bill, 12 percent more cooperative houlseholds will definitely not connect than will connect. For non-cooperative households, 20 percent more will definitely not connect than connect.

The fairly large percentages of those not connecting at various cost levels in both areas are not necessarily alarming. For one thing, cooperative minimum bills are generally below P10 and way below P25.00. As electricity becomes more widespread, its demonstrated usefulness and convenience will tend to lower resistance.

B. QUALITY OF ELECTRIC SERVICE

For an indication of the quality of electric service rendered by NEA electric cooperatives and private utilities, the following questions were asked of heads of electrified households:

1. How many times has electric service been interrupted in the past 30 days? (month before the interview)
2. How long did the interruption usually last?
3. Is the response to request for repair service prompt or not?
4. Is bill collection regular or not?

On the basis of responses to the first two questions, one facet of perceived quality of service can be evaluated. The median frequency of service interruptions is the same for cooperative and non-cooperative areas (four times a month), and the median length of service interruption for both areas is also the same (two hours). On the other hand, 23 percent of cooperative consumers experienced more than ten brown-outs in the past month against only 4 percent for non-cooperative consumers. On length of brownouts, however, the distinction is less. Sixteen per cent of cooperative consumers estimated an average duration of ten hours or more against 11 percent for non-cooperative consumers. Moreover three per cent of non-cooperative consumers estimated average duration at more than 24 hours, while only 1 percent for cooperative consumers estimated the same. (See Table V-5)

Table V-4. Percentage of Electrified Households: Number of times Electric Service was Interrupted the Month before Interview by Cooperative Status, 1977

Frequency of Interruptions	Cooperative Area	Non-Cooperative Area
No interruptions	a	a
1 to 2 times	38	43
3 to 4 times	26	29
5 to 10 times	13	24
11 to 15 times	5	2
16 to 20 times	2	0
21 to 25 times	1	0
26 to 30 times	12	1
More than 30 times	2	1
Do not know	1	a
T O T A L	100.	100

a = less than 1 percent

Table V-5. Percentage of Electrified Households: Perception of Usual Length of Electric Service Interruption by Cooperative Status, 1977

Length of Interruption	Cooperative Area	Non-Cooperative Area
1 hour or less	38	50
2 hours	17	18
3 hours	9	6
4 hours	7	4
5 to 6 hours	7	9
7 to 9 hours	6	2
10 to 12 hours	13	5
13 to 18 hours	a	1
19 to 24 hours	2	2
More than 24 hours	1	3
Don't know/No response	a	a
T O T A L	100	100

a = less than 1 percent

The irregularity of service illustrated by the foregoing tables is not really typical of Philippine electric systems, either cooperative or non-cooperative. Two-thirds of electric utilities in the areas sampled obtain power from the National Power Corporation. The survey period (January–March, 1977) was at the height of the dry season and the National Power Corporation experienced a thirty-year low in the water level of its hydro-electric dam reservoirs, its main power source. Generation capacity was down to only 36 percent of peak load and NPC implemented multi-regional brown-outs lasting from 6 to 8 hours per day.

The balance of cooperative areas utilized diesel generation. Typically these are small U.S. excess property units or units taken over from previous operators; in toto, interim and rapidly obsolescing plants. This situation, coupled with the continuously expanding cooperative loads, probably accounts for the higher incidence of cooperative brown-outs at the higher frequencies. Several self-generating cooperatives, in fact operate on a scheduled rotating brown-outs' system among the various feeders. Large, permanent generating units are either under installation or on order; in the meantime frequent brown-outs continue. Another cause of interruptions in cooperative systems is the presence of old, often substandard and generally over-loaded distribution facilities in 12 of 27 cooperative towns surveyed. "Notoriously poor service" has been both a legal and practical basis for take-over of private and municipal systems and because such systems are not yet fully rehabilitated, quality of service suffers.

On the other three questions bearing on quality of service, the cooperatives secured a somewhat more favorable rating than non-cooperative utilities. A greater number of cooperative consumers considered repair service prompt, over-all service as reliable, and bill collection regular. It can be noted that for these questions, the physical element in terms of power source or facilities is of lesser importance than the human or management element.

Table V-6. Percentage of Households: Opinion on the Quality of Electric Service by by Cooperative Status, 1977

Opinion on the Quality of Electric Service	Cooperative Area	Non-Cooperative Area
Response to request for repair service is PROMPT	60	59
Service is RELIABLE	73	70
Bill collection is REGULAR	87	85

C. ATTITUDE TOWARDS ELECTRIC COOPERATIVES

Of special interest to NEA in terms of management information feedback are consumer's perceptions of electric cooperatives. The following were asked of all respondents.

1. Do you have an electric cooperative in your town?
2. If so, would you say that the electric cooperative is giving adequate and reliable service or not?
3. How would you rate your degree of confidence in the management of your NEA cooperative: high, fair or low?
4. How would you rate your degree of satisfaction with the performance of the NEA cooperative: high, fair, or low?

Respondents in non-cooperative areas were asked this question.

5. Do you want an electric cooperative to serve your town?

In cooperative areas, eight out of ten electrified households and six out of ten of the non-electrified households know that the electric utility serving their town is an "electric cooperative". Many other households, according to interviewers' report, knew the acronym of the cooperative name, e.g. MORESCO, but are unaware

that it is a cooperative. Some respondents asked interviewers to explain what an "electric cooperative" is. In non-cooperative areas it is interesting to note that 11 percent of the households claimed than an electric cooperative was providing service in their area.

Cooperative consumers feel positive toward their cooperatives: eight out of ten electrified households said that service was adequate and reliable. In addition, from 80 to 90 percent are satisfied with cooperative performance and have confidence in cooperative management.

In non-cooperative areas, eight out of ten electrified households and nine out of ten non-electrified households would want an electric cooperative to serve their town. This is another indication of the favorable response of the rural population to the cooperative electrification program. (See Tables V-7, 8, 9)

These findings are significant, indicating that as far as consumers are concerned, cooperatives provide better service. A direct comparison of cooperative and non-cooperative would be less reliable for this evaluation, because the "glamour" or "favorable image" currently surrounding cooperatives may tend to bias the result.

Table V-7. Percentage of Cooperative Households: Response to the question, "Is the Cooperative giving adequate and reliable service?" by Electrification Status, 1977

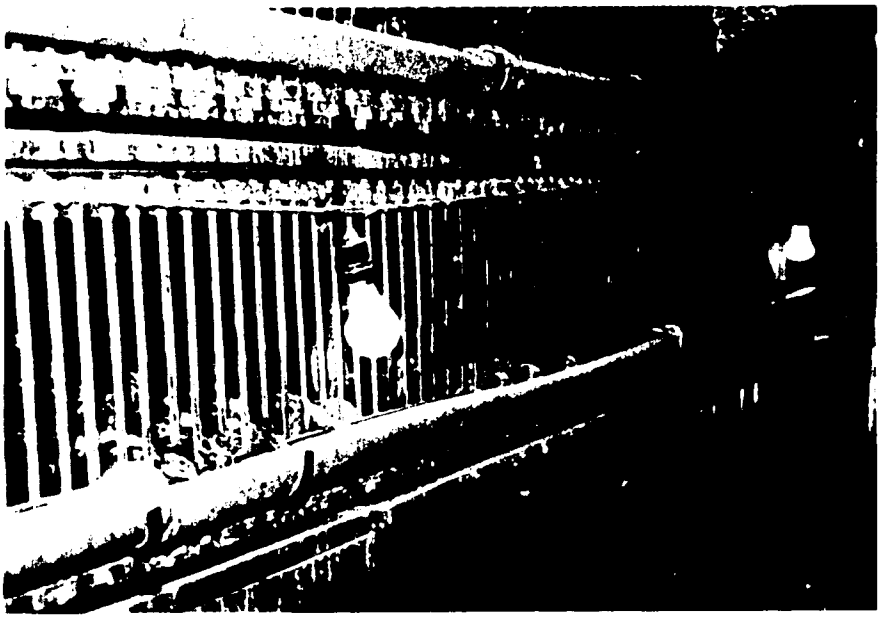
	COOPERATIVE AREAS	
Responses	Electrified Households	Non-Electrified Households
Yes	82	64
No	12	7
Don't know	6	39
TOTAL	100	100

Table V-8. Percentage of Electrified Households in Cooperative Areas and their Rating of the NEA Cooperative serving the Town, 1977

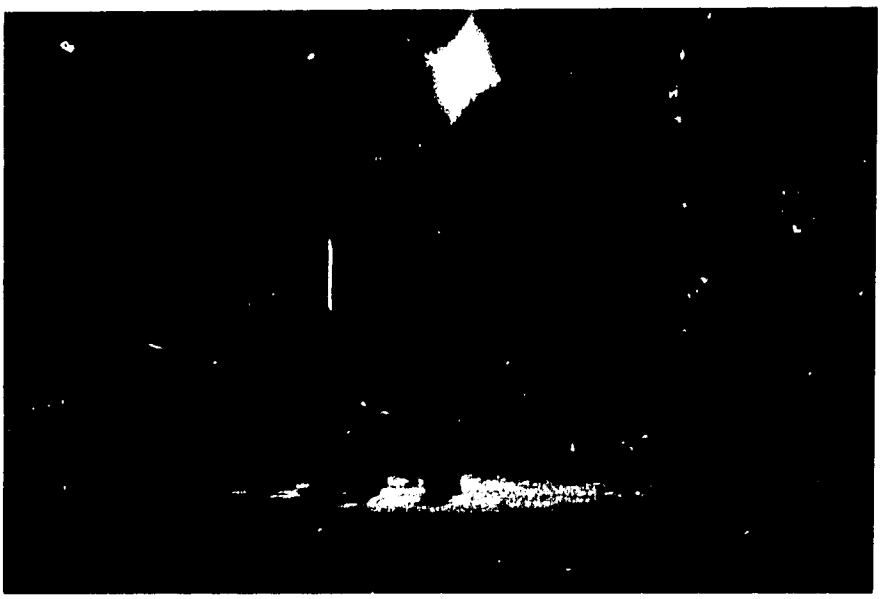
Rating	Degree of Satisfaction with Coop Performance	Degree of Confidence in Coop Management
High	24	27
Fair	62	61
Low	9	8
DK/No opinion	5	4
TOTAL	100	100

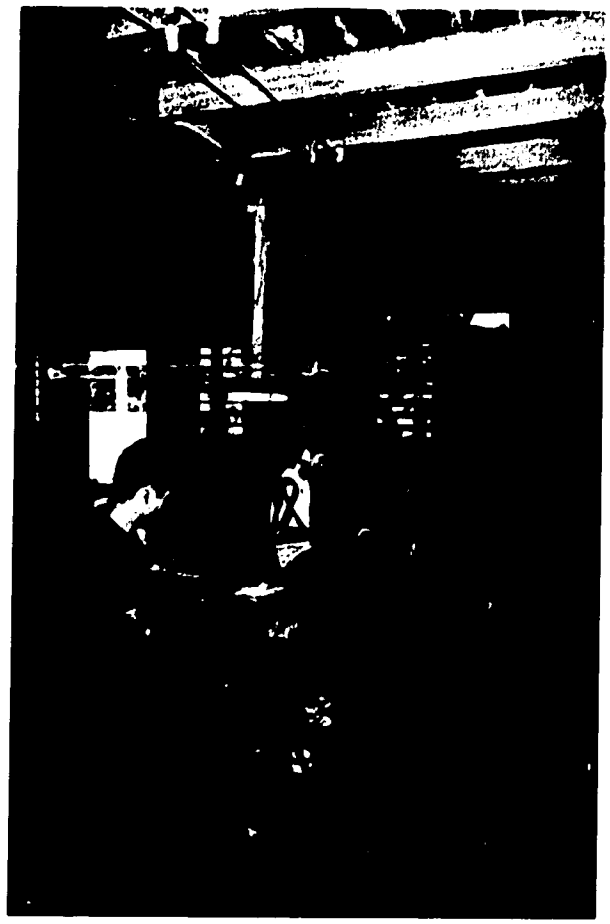
Table V-9. Percentage of Households in Non-Cooperative Areas: Response to the question, "Would you like to have an electric cooperative serve your town?" by Electrification Status, 1977

	NON-COOPERATIVE AREAS	
Response	Electrified HH	Non-Electrified HH
Yes	81	90
No	9	2
Don't know	10	8
TOTAL	100	100



Aside from the lighting up of homes, the electrification program proves to be very helpful in supplementing rural income and conveniences like poultry raising, water system, illumination of playgrounds. . . .





. . . . and giving additional job opportunities like welding and machine shop work, and irrigation for increased harvest.

PART VI

APPENDICES

APPENDIX A – SPECIAL TOPICS: USE OF FAMILY PLANNING METHODS/INCIDENCE OF PREGNANCY, MIGRATION AND EMPLOYMENT

It has been argued by rural electrification proponents that electricity helps decrease the fertility rate and rural to urban migration, and increases availability of jobs. To test these arguments, questions on fertility, migration and employment were included in the survey.

1. USE OF FAMILY PLANNING METHODS AND INCIDENCE OF PREGNANCY

It was pointed out in one report[1] that practice of family planning is somehow related to electrification status. To clarify this issue respondents were asked if any member of their household practiced family planning methods, either natural or artificial, and if so, to number them. The responses were then tabulated against cooperative and electrification status.

While responses to the question indicate that use of a family planning method is related to electrification status, certain qualifications relevant to the question asked of the respondents must be made before any conclusions are established. First, no attempt was made to differentiate uses of effective methods such as the IUD, the pill, and sterilization for users of less effective methods such as rhythm and coitus interruptus. Secondly, users were not differentiated as to whether or not they are registered in a Population Commission recognized family planning clinic.

Table A-1 shows that there is a greater proportion of electrified households with at least one member practicing family planning than non-electrified households. The difference is statistically significant.

Table A-1. Percentage of Households: Use of Family Planning Methods by Cooperative and Electrification Status, 1977

Use of Family Planning Method	All Areas		Cooperative Area		Non-Cooperative Area	
	Elect.	Non-Elect.	Elect.	Non-Elect.	Elect.	Non-Elect.
User	22	19	21	19	22	18
Non-User	78	81	79	81	78	82
Total	100	100	100	100	100	100

[1] See Madigan et, al, *An Evaluative Study of the Misamis Oriental I Rural Electric Service Cooperative Inc. 1976*

Aside from the practice of family planning, the incidence of pregnancy was also investigated. Respondents were asked whether any female member of the household got pregnant in the past 12 months. Although this is a straight forward question, the responses would have been more meaningful had live births been asked instead. Nevertheless, it would be safe to assume that there is a close correspondence between the two. Table A-2 shows that in the aggregate, electrified households experienced less pregnancies than non-electrified households: 17 percent as against 23 percent.

2. MIGRATION

Only a small proportion (7 percent) of total households had the experience of somebody moving into their houses. Most migrants in the sample do not live far from where they used to live. For instance, Table A-4 shows that roughly three out of four migrants did not leave their barrio. It is clear that a great bulk of migratory movements is intra-provincial.

Table A-2. Percentage of Households: Incidence of Reported Pregnancy the Past 12 months by Cooperative and Electrification Status, 1977

Pregnancy Status	All Areas		Cooperative Area		Non-Cooperative Areas	
	Elect.	Non-Elect.	Elect.	Non-Elect.	Elect.	Non-Elect
With reported pregnancy	17	23	16	24	19	21
With no reported pregnancy	83	77	84	76	81	79
TOTAL	100	100	100	100	100	100

Table A-3. Percentage of Households: Households with at Least One Migrant by Cooperative and Electrification Status, 1977

Migrant Status of Household	All Areas		Cooperative Areas		Non-Cooperative Areas	
	Elect.	Non-Elect	Elec.	Non-Elect.	Elect.	Non-Elect.
Household with at least 1 migrant	9	5	9	5	8	5
Household with no migrant	91	95	91	95	92	95
TOTAL	100	100	100	100	100	100

Table A-4. Percentage of Households with Migrants: Place of Origin of Migrants by Cooperative and Electrification status, 1977

Place of Origin	Cooperative Areas		Non-Cooperative Areas	
	Elect.	Non-Elect.	Elect.	Non-Elect.
Another House in the same barrio	17	21	37	39
Another Barrio in the same town	22	10	13	18
Another Town	32	20	24	19
Another Province	23	41	23	24
Elsewhere	5	7	3	0
TOTAL	100	100	100	100

3. EMPLOYMENT

The labor status of household heads the week before the interview was asked and categorized into: working in the barrio, working in the poblacion, working elsewhere, looking for work, going to school, housekeeping and unable to work. The findings show that 85 percent of household heads in both areas were gainfully employed. The national figure of 93 percent of the labor force employed (fully and partially) from the Bureau of Census and Statistics Survey of Households taken on August 1972, is higher but not fully comparable. The Census definition covers only persons interested in working, excluding housekeeper and old, retired persons and it includes other persons in the household who may have a different degree of employability than the household head. In this study, the rate of employment is defined as total working by total household heads. The five year difference in the survey dates (1972 vs. 1977) is another important factor to consider. In the two areas, the distribution of workers according to their place of work follows the same pattern: the greatest number work in the barrios, followed by those who work in the poblacion and last by those who work elsewhere such as in another town or province.

In the cooperative areas, a higher percentage of non-electrified household heads – 88 percent – were working whereas only 81 percent of electrified household heads were working. This is also the case in non-cooperative areas where 87 percent of heads of non-electrified households were working and only 80 percent of electrified household heads were gainfully employed.

Table A 5. Percentage of Household Heads: Employment Status by Cooperative and Electrification Status, 1977

Employment Status	Cooperative Areas			Non-Cooperative Areas		
	Total Hhs.	Elect. Hhs.	N-Elect. Hhs.	Total Hhs.	Elect. Hhs.	N-Elect Hhs.
Gainfully employed	85	81	88	85	80	87
Working in a barrio	51	39	57	52	40	57
Working in a Poblacion	21	24	20	20	23	18
Working elsewhere	13	18	11	13	17	12
Looking for work	a	1	a	a	a	a
Going to school	a	a	a	a	a	a
Housekeeping	6	8	4	6	10	4
Unable to work	9	10	8	9	10	9
TOTAL	100	100	100	100	100	100

a = less than 1 percent

APPENDIX B – METHODOLOGY

1. Sampling Design

Data was gathered using a structured questionnaire. A national sample was drawn from the population of Philippine households from the cooperative areas. Barrios from this sample were matched with barrios from non-cooperative areas. Households were classified into four categories: Cooperative-electrified; cooperative-non-electrified; non-cooperative-electrified; and non-cooperative-non-electrified. Cooperative barrios were matched to the cooperative sample barrios on the basis of the latter's population. The following is a detailed description of the sampling procedure.

A) Sample drawn from Cooperative Areas (3000 households)

First Stage: Selection of Cooperatives

1) All NEA cooperatives were divided into six strata. The basis for stratification was according to Philippine regional division.
2) Two cooperatives were selected per stratum by PPS (Probability Proportionate to Size). Size is defined as the number of households covered by the cooperative.

3) The cooperatives selected were:

1. BECO I in Bulacan
2. LUELCO in La Union
3. PANELCO in Western Pangasinan
4) ZAMECO in Zambales
5) FLECO in Laguna
6) QUEZELCO in Quezon
7) CANORECO in Camarines Norte
8) ILECO in Iloilo
9) LEYECO in Leyte
10) ZAMCELCO in Zamboanga City
11) LASURECO in Lanao del Sur
12) LANECO in Lanao del Norte

4) Two cooperatives, VRESCO in Negros Occidental and MORESCO I in Misamis Oriental were selected to be self-representing cooperatives. These two are NEA's pilot cooperatives.

Second Stage: Selection of Towns Per Sample Cooperative

1) The towns covered by the sample cooperatives were ranked by percent electrification before they were selected. This was done to group similar towns (similar in terms of percent electrification) next to each other and to ensure a well-represented sample from highly electrified – to non-electrified towns. Data used was the sample cooperative's status of house connections per town as of May 1976.

2) A cooperative's service area was considered as one cluster and two towns were selected per coop by PPS. A total of 27 towns was selected. All of the towns selected were electrified.

Third Stage: Selection of Barrios Per Sample Town

1) The barrios covered by the sample towns were ranked by percent electrification before they were selected. Since there were quite a number of non-electrified barrios, the barrios were again ranked according to their population. The average of these two ranks was taken to obtain the barrio's final rank. This was done so as to group barrios with similar characteristics together and to get a representative sample from each group. Data used was NCSO's preliminary report on the number of households per barrio in 1975 and the sample coop's status of house connections per barrio as of October 1976.

2) A town was considered as one cluster and four barrios were selected per town by PPS. A total of 107 barrios were selected, 68 of which were electrified.

Fourth Stage: Selection of Households Per Sample Barrio

1) The households in the sample barrios

were stratified into electrified and non-electrified ones.

2) To obtain the sample allocation per barrio, a sampling rate for electrified and non-electrified households was computed as follows:

   a. The total number of electrified households was divided by the total number of households to get the percentage of electrified households.
   b. The percentage of electrified households was multiplied to 3000, the sample size of co-op areas, to obtain the total number of electrified households in the sample.
   c. The product from b was divided by the total number of electrified households to get the sampling rate for electrified households.
   d. This sampling rate was multiplied to the number of electrified households of each sample barrio to get the quota for electrified households per sample barrio.
   e. The same procedure (a to d) was followed to get the quota for non-electrified households per sample barrio.

3). 1020 electrified households and 1980 non-electrified households were selected.

4) An actual listing of households was done in the field for each sample barrio. Then households were selected by using systematic random sampling. Households were arranged according to the listing direction specified by the field supervisors. Electrified households had their own random start and sampling interval, different from those of non-electrified households. The non-cooperative sample was drawn by first selecting barrios from non-cooperative areas within the same province (except for two cases) whose population, urban-rural characteristics and electrification status matched with the barrios sampled in the cooperative areas. Then using the same procedure followed in cooperative areas, 309 electrified households and 696 non-electrified households were selected.

B. Sample drawn from Non Co-op Areas (1000 households)

Matching Scheme

1) To get the non-coop sample, the province of each selected cooperative was stratified into co-op towns, non-co-op towns and non-energized towns. The non-co-op towns were matched to the co-op towns on the basis of population size, status of electrification, percent of urban population and geographical proximity. This resulted in 2 or 3 non co-op towns being taken as possible matches for a co-op town. The first of the non co-op towns (arranged alphabetically) was taken and its barrios were matched to the barrios of the co-op town under consideration by simple random sampling without replacement. The basis for selection of a non co-op barrio was its population approaching within 20 percent of a given co-op barrio's population. This resulted in any one of the following cases:

   a. All the Co-op sample barrios find their match in the first non-coop town taken.
   b. Not all the co-op sample barrios find their match and the next non co-op town in the list is taken and the same procedure is followed in finding matching non co-op barrios.
   c. There is no matching barrio in the town and the second non co-op town is taken and the same procedure is followed until matching non co-op barrios are found.

Sample allocation for non-coop barrios

1) The procedure for getting the sample allocation for coop barrios was followed in getting the sample allocation for non co-op barrios.

2) 309 electrified households and 696 non-electrified households were selected.

2. Questionnaire Design

After the survey objectives were defined, socio-economic indicators and other variables of interest to the survey were operationally defined. Dummy tables were then constructed,tabulating cooperative and electrification status of households against each of these variables. Questions had been formulated in such a way that each table had a corresponding question or set of questions. An in-depth treatment of household income was made so that a major portion of the questionnaire dealt with gross income, net income, and cost of operation and other expenses.

3. Field Operations and Procedures

The contracted research agency fielded 9 field supervisors and 67 interviewers. The 4,000 interviews took one and a half months to accomplish. The respondents in the study were the household heads, or in their absence, the housewives. Replacement of sample households was not allowed so that if both household head and spouse were absent during the first visit, provisions were made for three call-backs. If on the third call-back there was still no interview, the sample household was given up as a loss. There were 17 losses. Rigid controls were instituted during the field work to ensure the accuracy of the data. The interviewers were thoroughly screened and at least 10 percent of their work was supervised, spot-checked or back-checked. The accomplished questionnaires were edited at least twice. There was also a computer edit for "range" and "logic" checks.

4. Analysis

Using the dummy tables, a list of null hypotheses was formulated and appropriate statistical tests were identified and eventually applied. Statistical tests used were the Chi-square at the .05 level of significance.

NEA was assisted by consultants from the U.S. Bureau of Census in preparing the research design and instruments of the survey. A quasi-experimental design was used. Sample barrios covered by electric cooperatives were matched with "control barrios" in non-cooperative areas on the basis of population size, urbanity, and percentage of electrification. Data used for drawing samples were the NCSO's 1975 Preliminary Report on Population and NEA records. The personal interview method was used and a structured questionnaire was constructed for this purpose (See Appendix D). A private research agency was contracted to collect, process and tabulate data according to NEA's specifications. The tabulated data were then analyzed and interpreted by the NEA staff with the help of two Filipino consultants.

5. **Weighting and Limitations of Statistical Inference**

A) National Cooperative Weights

The co-op sample of households is a probability sample from all the cooperative areas in the Philippines and was selected using a stratified four stage design. Therefore it would be possible to make statistical inferences to the national cooperative population from the survey data after weighting each observation by the inverse of its probability of selection. The cooperatives were divided into six non-self-representing (NSR) strata, and two self-representing (SR) strata of one cooperative each (VRESCO in Negros Occidental and MORESCO in Misamis Oriental). In the six NSR cooperative strata the primary sampling units (p.s.u.'s) or cooperatives, as well as the second and third stage units (towns and barrios) were selected with probability proportional to size, where size is

defined as the number of households. Two cooperatives were selected per NSR stratum, two towns per cooperative, four barrios per town, and then a sample of electrified and non-electrified households were selected within each sample barrio. The "national" weight (for expanding the data to the national level) of a sample household from an NSR cooperative would be the inverse of its probability of selection at each stage, or:

$$1.\quad W_{hijkl} = \frac{N_h}{2N_{hi}} \times \frac{N_{hi}}{2N_{hij}} \times \frac{N_{hij}}{4N_{hijk}} \times \frac{N_{hijkl}}{n_{hijkl}} = \frac{N_h}{16N_{hijk}} \times \frac{N_{hijkl}}{n_{hijkl}}$$

where:

N_h total number of cooperative household in statum h

N_{hi} total number of households in sample p.s.u. (coop) i

N_{hij} total number of households in sample town j

N_{hijk} total number of households in sample barrio k

N_{hijkl} total number of households from barrio k in electrification category z, where

l = 1 for electrified households
l = 2 for non-electrified households

n_{hijkl} number of sample households from kth barrio in electrification category z.

Formula (1) for W_{hijkl} is consistent with the sampling procedures specified for the six NSR coop strata. However, the sample coop Zamboanga City only consisted of one town. Therefore, for the sample households in this cooperative, formula (1) for W_{hijkl} is multiplied by 2. Also, only 3 barrios were selected from the sample town Mercedes in the Camarines Norte Coop. Therefore, for the sample households in Mercedes, the weight in (1) is adjusted by a fractor of 4/3.

There were three stages of sampling in the SR coop strata, and the P.S.u.'s for these strata are towns. The "national" weight of a sample household from one of these strata is the following:

$$2)\quad W_{hikl} = \frac{N_h}{2N_{hi}} \times \frac{N_{hi}}{4N_{hik}} \times \frac{N_{hikl}}{n_{hikl}} = \frac{N_h}{8N_{hik}} \times \frac{N_{hikl}}{n_{hikl}}$$

where:

N_h total number of households in stratum (coop) h

N_{hi} total number of households in sample p.s.u. (town) i

N_{hik} total number of households in sample barrio k

N_{hijkl} total number of households from barrio k in electrification category l.

n_{hikl} number of sample households from barrio k in electrification category l.

B. Non-Cooperative Sample and "Experimental Design" Weights.

After the coooperative sample barrios were selected, each was matched to a corresponding non-cooperative barrio in a "quasi-experimental design" for comparing survey estimates for the two types of barrios. The sample of non-cooperative barrios is not necessarily a probability sample from the national non-cooperative population, and there are no non-cooperrative "national" weights. Therefore non-cooperative survey estimates cannot be used to make statistical inferences to the non-cooperative population of the country

For the "quasi-experimental design", the sample of cooperative barrios and the matched non-cooperative barrios were treated as the "population". Therefore the "experimental design" weights are used to weight up the sample households to the barrio level. The experimental design weight for a sample household is the inverse of its probability of selection within the barrio and electirfication group, or:

3) $W(e.d.)_{kl} = \frac{N_{kl}}{n_{kl}}$, where:

$N_{kl} \rightarrow$ total number of households in barrio k and electrification group l,

with l = 1 for electrified households
l = 2 for non-electrified households

$n_{kl} \rightarrow$ number of sample households in barrio k and electrification group l

By computing survey estimates based on these weights, statistical inferences can be made to the sample barrios so that the estimates for the four different "experimental design" strata (cooperative-electrified, cooperative-non-electrified, non-cooperative-electrified and non-cooperative-non-electrified) can be compared and tested for statistically significant differences.

6. Standard Error and How It Should Be Used

The estimates in this report are based on a sample survey and therefore have two types of possible errors: sampling and non-sampling. The standard (or sampling) error of a survey estimate is a measure of the variation among the estimates from all possible samples (using the same sampling design and sample size) and is therefore a measure of the precision with which an estimate from this particular sample approximates the average result from all possible samples. The estimator used to compute the standard error may also partially measure the effect of certain non-sampling errors, such as interviewer variability and error introduced in coding, editing and tabulating the data. However, it does not measure any systematic biases in the data and caution should be used when examining certain estimates which are more subject to bias (such as estimates of net income). The relative standard error, or coefficient of variation, is defined as the standard error of the estimate divided by the expected value of the estimate. By examining the coefficients of variation of different estimates (or different levels of disaggregation), one can compare the relative precisions of these estimates.

A simple way of interpreting the standard error is in terms of a confidence interval. This is an interval estimate which includes the average of the estimates from all possible samples with a certain stated probability or confidence. The interval from one standard error below the estimate calculated from a particular sample to one standard error above the estimate has a 68% probability of including the average of the estimates from all possible samples. In a similar way, the 90%, 95%, and 99% confidence intervals for any type of estimate, $\hat{b}$ (such as a total, mean, median, proportion, ratio, etc.), can be obtained as follows:

4) $\hat{b} \pm t\ [s.e.\ (\hat{b})]$,

where: t = 1.64 for a 90% confidence interval,
t = 1.96 for a 95% confidence interval,
t = 2.58 for a 99% confidence interval,
and s.e. $(\hat{b})$ = standard error of estimate $\hat{b}$.

It is frequently of interest to examine the estimated difference between strata for some characteristic, such as $\hat{b}1 - \hat{b}2$. Use of the confidence intervals for such an estimated difference enables one to determine whether the apparent difference can be attributable merely to sampling variability.

The confidence interval of $\hat{b}_1 - \hat{b}_2$, is given by the following:

5) $(\hat{b}_1 - \hat{b}_2) \pm t \cdot \sqrt{[s.e.\ (\hat{b}_1)]^2 + [s.e.\ (\hat{b}_2)]^2}$

where t is the same as defined in (4). If the confidence interval of a difference between two estimates does not include the value 0, one can conclude that this difference is statistically significance at the particular level of significance used.

The test of significance for most estimates of differences are presented in the form of confidence intervals, which provide more information than simply whether or not the differences are statistically significant. A confidence interval can also indicate the size and direction of the difference, which is important.

Calculation of Standard Errors for Survey Estimates

A) Standard Errors for National Cooperative Estimates

Estimates of standard errors can be calculated for different types of national cooperative survey estimates, such as totals, averages and ratios, using the "ultimate cluster method".

The estimator for the standard error of the survey estimate of a cooperative total $\hat{Y}$ would be the following:

$$6)\quad \text{s.e.}\ (\hat{Y}) = \sqrt{\sum_{h=1}^{8} (\hat{Y}_{h1} - \hat{Y}_{h2})^2}\ , \text{ where:}$$

$$\hat{Y}_{hi} = \sum_{j=1}^{2} \sum_{k=1}^{4} \sum_{l=1}^{2} W_{hijkl} \sum_{z=1}^{n_{hijkl}} Y_{hijklz}$$

for h=1, 2, . . . 6
(NSR coop strata)

$Y_{hijkl\,z}$ ⟶ observed value of variable Y for the z-th household in electrification category l in barrio k, town j, p.s.u. (cooperative) i and stratum h;

and $$\hat{Y}_{hi} = \sum_{k=1}^{4} \sum_{l=1}^{2} W_{hikl} \sum_{z=1}^{n_{hikl}} Y_{hiklz}$$

for h=7, 8 (SR coop strata)

Y_{hiklz} observed value of variable Y for the z-th household in electrification category l in barrio k, p.s.u. (town) i and stratum (cooperative) h.;

The ultimate cluster estimator for the standard error of a ratio $\hat{Y}/\hat{X}$ would be the following:

$$7)\quad \text{s.e.}\left(\frac{\hat{Y}}{\hat{X}}\right) = \sqrt{\frac{1}{\hat{X}^2} \sum_{h=1}^{8} \left[(\hat{Y}_{h1} - \hat{Y}_{h2})^2 + \left(\frac{\hat{Y}}{\hat{X}}\right)^2 (\hat{X}_{h1} - \hat{X}_{h2})^2 - 2\left(\frac{\hat{Y}}{\hat{X}}\right)(\hat{Y}_{h1} - \hat{Y}_{h2})(\hat{X}_{h1} - \hat{X}_{h2})\right]}$$

where $\hat{X}_{hi}$ is computed in the same way as $\hat{Y}_{hi}$.

The variance estimate for an average can also be computed using formula (7), where $\hat{X}$ is simply the sum of the household weights. In the case of separate national estimates for cooperative electrified and non-electrified households, the variance for a total $\hat{Y}_{(l)}$, or a ratio, $\hat{Y}_{(l)}/\hat{X}_{(l)}$, would be calculated in the same way, with the p.s.u. estimates $\hat{Y}_{hi(l)}$ and $\hat{X}_{hi(l)}$ being computed for fixed l.

B. Standard Errors for Experimental Design Estimates.

Standard errors have been estimated for most of the "experimental design" estimates (for inference to the sample barrios) in the data tables, using the formulas specified below for each type of estimate. The standard errors for other estimates (based on the "experimental design" weights) can be computed using these formulas, depending on the type of estimate.

Proportions or percentages

Most of the experimental design estimates in the tabulations are percentages. The formula for the standard error of a percentage estimate for "experimental design" stratum h(h = 1 for cooperative-electrified households, h = 2 for cooperative-non-electrified households, h = 3 for non-cooperative-electrified households and h = 4 for non-cooperative-non-electrified households), is the following:

$$8)\quad \text{s.e.}\ (\hat{P}_h) = \sqrt{\sum_{i=1}^{m} \left(\frac{N_{hi}}{n_h}\right)^2 \left(\frac{N_{hi} - n_{hi}}{N_{hi}}\right) \frac{P_{hi}\ (100 - P_{hi})}{n_{hi}}}$$

where:

N_h = total number of households in "experimental design" stratum h.

N_{hi} = total number of households in the i-th barrio of "experimental design" stratum h.

n_{hi} = number of sample households in the i-th barrio of "experimental design" stratum h.

P_{hi} = percentage estimate for the i-th barrio of "experimental design" stratum h.

m = number of barrios in each stratum.

Assuming that the percentage P_{hi} for each barrio is close to the stratum percentage P_h, formula (8) can be simplified into the form of the standard error of a percentage estimate from a simple random sample, multiplied by a constant.

$$9)\quad s.e.(\hat{p}_h) = \sqrt{D_h \cdot \frac{P_h(100P_h)}{n_h}}, \quad \text{where:}$$

$$D_h = \frac{n_h}{N_h^2} \sum_{i=1}^{m} \frac{N_{hi}(N_{hi} - n_{hi})}{n_{hi}}$$

n_h number of sample households in "experimental design" stratum h.

The factor D_h takes into account both the effect of the differential barrio weights and the finite population correction factor. The standard errors for the percentage estimates in the tabulations were computed by formula (9) using the following values for D_h: $D_1=1.5$, $D_2=1.3$, $D_3=1.04$, $D_4=1.06$.

Table B1 shows the sample size of each "exerimental design" stratum and the standard errors for a range of percentage estimates in each stratum.

Table B-1. Standard Errors for a Range of Percentage Estimates by "Experimental Design Stratum" and Sample Size.

	STRATA			
Sample Size of Stratum (n_h)	Coop Electrified 1013	Coop Non-Electrified 1973	Non-Coop Electrified 303	Non-Coop-Electrified 694
Percentage Estimates (%)	Standard Errors			
5 or 95	.8	.6	1.3	.9
10 or 90	1.2	.8	1.8	1.2
15 or 85	1.4	.9	2.1	1.4
20 or 80	1.5	1.0	2.3	1.6
25 or 75	1.7	1.1	2.5	1.7
30 or 70	1.8	1.2	2.7	1.8
35 or 65	1.8	1.2	2.8	1.9
40 or 60	1.9	1.3	2.9	1.9
45 or 55	1.9	1.3	2.9	1.9
50	1.9	1.3	2.9	2.0

The estimator for the standard error of a percentage estimate $\hat{p}'$ for combined "experimental design" strata (for example, cooperative-electrified combined with cooperative non-electrified) is the following:

$$10)\quad s.e.(\hat{p}') = \sqrt{\sum_h \left[\frac{N_h}{N'} \; s.e.(\hat{p}_h)\right]^2}$$

where the sum in formula (10) is over the strata which are combined; N' is the total number of households in the combined strata.

Means or Averages

The standard error for "experimental design" estimates of means (averages) can also be computed using a (weighted) simple random sample formula multiplied by the factor $\sqrt{D_h}$ described above. The (weighted) simple random sample formula for the standard error of a mean $\bar{x}_h$ in stratum h is:

$$11)\quad s.e._{srs}(\bar{x}_h = \sqrt{\frac{\sum_{i=1}^{n_h} W_{hi}(x_{hi} - \bar{x}_h)^2}{n_h \sum_{i=1}^{n_h} W_{hi}}},$$

Where:

W_{hi} "experimental design" weight of i-th observation in stratum h, defined previously.

x_{hi} = value of variable X for the i-th observation in stratum h.

$$\bar{x}_h = \frac{\sum_{i=1}^{n_h} W_{hi} \quad x_{hi}}{\sum_{i=1}^{n_h} W_{hi}}$$

n_h = number (unweighted) of observations in stratum h.

The SPSS (Statistical Package for the Social Sciences) computer software package for computing variance using weights can be used for calculating $s.e._{srs}(x_h)$, by first multiplying the weight of each observation by the constant $(n_h/\sum_{i=1}^{n_h} W_{hi})$. The $s.e._{srs}(\bar{x}_h)$ should be multiplied by the factor $\sqrt{D_h}$ in order to estimate the standard error of $\bar{x}_h$. The formula for the standard error of the estimate of a mean $\bar{x}'$ for combined "experimental design" strata is the following:

$$12)\quad s.e.(\bar{x}') = \sqrt{\sum_h \left[\frac{N_h}{N'} \quad D_h \quad s.e._{srs}(\bar{x}_h)\right]^2}$$

where the sum in (12) is over the strata which are combined; N′ is the total number of households in the combined strata.

Medians

The tests of significance for differences between two medians were carried out by comparing the 95% confidence intervals for the medians. If these intervals do not overlap, the medians can be considered significantly different at the α 0.05 level (i.e., the confidence level is at least 95%, so this is a conservative test). The confidence interval for a median can be computed based on the confidence interval for a percentage estimate of 50% (which can be obtained using formulas (4) and (9)). The upper and lower bounds for the confidence interval of the medians can then be determined from the corresponding percentiles in the weighted frequency distribution of the variable. For example, in the case of the cooperative-electrified stratum, the 95% confidence interval for p_1 = 50% is (46.2% – 53.8%). The lower bound for the 95% confidence interval for the median of a certain variable would be the value of the 46.2 percentile from the weighted frequency distribution of that variable (which can be obtained using an SPSS program), and the upper bound would be the value of the 53.8 percentile from that distribution.

Table B-2. Percentage of Electrified Households: Kilowatt-Hour Consumption by Cooperative Status, 1977

No. of Kilowatt-Hours	Cooperative Areas Percentage	Cooperative Areas Standard Error	Non-Cooperative Areas Percentage	Non-Cooperative Areas Standard Error
1 – 5	2	.5	1	.4
6 – 10	12	1.2	6	1.4
11 – 20	34	1.8	24	2.5
21 – 30	18	1.5	14	2.0
31 – 50	12	1.2	19	2.4
51 – 90	11	1.2	17	2.2
91 – 200	10	1.2	17	2.2
201 – 997	2	.5	3	.9
TOTAL (Average)	100	(1.1)	100	(1.7)

Table B-3. Percentage of Household Heads: Level of Educational Attainment by Cooperative and Electrification Status, 1977

Educational Level	Cooperative Areas Elect.	SE	Non-Elect.	SE	Non-Cooperative Areas Elect.	SE	Non-Elect.	SE
Grade 1 – 4	21	1.6	40	1.3	24	2.5	34	1.8
Grades 5 – 8	32	1.8	41	1.3	27	2.7	40	1.9
Second Year High School	5	.8	5	.5	5	1.2	2	.6
Third Year High School	4	.8	3	.4	4	1.1	3	.7
Fourth Year High School	16	1.4	8	.7	15	2.1	11	1.2
College	12	1.2	2	.4	18	2.3	5	.8
College and Beyond	10	1.2	1	.3	7	1.5	5	.8
TOTAL (Average)	100	(1.3)	100	(.7)	100	(1.9)	100	(1.1)

SE – Standard Error

Table B-4. Percentage of Households: Quality of Housing Materials by Cooperative and Electrification Status, 1977

Quality of Housing Materials	Cooperative Areas Elect.	SE	Non-Elect.	SE	Non-Cooperative Areas Elect.	SE	Non-Elect.	SE
Heavy	22	1.6	5	.6	29	2.7	6	1.0
Mixed	39	1.9	18	1.0	45	2.9	24	1.7
Light	36	1.8	57	1.3	25	2.6	54	1.9
Barong-barong	3	.7	20	1.0	1	.6	16	1.4
TOTAL (Average)	100	(1.5)	100	(1.0)	100	(2.2)	100	(1.5)

SE – Standard Error

Table B-5. Percentage of Households: Source of Drinking Water by Cooperative and Electrification Status, 1977

Source of Drinking Water	Cooperative Areas Elect.	SE	Non-Elect.	SE	Non-Cooperative Areas Elect.	SE	Non-Elect	SE
Piped	51	1.9	29	1.2	33	2.8	25	1.7
Open Well	9	1.1	25	1.1	3	1.0	20	1.6
Artesian	37	1.9	36	1.2	57	2.9	40	1.9
Spring	1	.4	7	.7	1	.7	10	1.2
River	a	.2	1	.2	0	–	1	.4
Rain Water	1	.3	1	.2	a	.3	2	.5
Piped & Other Sources	1	.4	a	.2	5	1.3	a	.2
Two or More Sources (Exc. piped)	a	.2	1	.3	1	.7	2.	.5
TOTAL (Average)	100	(.8)	100	(.6)	100	(1.4)	102	(1.0)

SE – Standard Error
a – less than 1 percent

Table B-6 Percentage of Household Heads: Age by Cooperative and Electrification Status 1977

Age in Years	Cooperative Areas Elect.	SE	Non-Elect.	SE	Non-Cooperative Areas Elect.	SE	Non-Elect	SE
1 – 5	0		0		0		0	
6 – 10	a	.2	a	.1	a	.3	a	.2
11 – 20	a	.2	a	.2	a	.5	0	
21 – 30	9	1.1	19	1.0	9	1.7	13	1.3
31 – 40	22	1.6	29	1.2	20	2.3	29	1.8
41 – 50	27	1.7	22	1.1	28	2.6	25	1.7
51 – 60	20	1.5	16	.9	22	2.5	19	1.5
61 – 80	21	1.6	13	.9	20	2.4	14	1.3
81 or more	1	.5	1	.2	1	.5	a	.3
TOTAL (Average)	100	(1.0)	100	(.7)	100	(1.6)	100	(1.2)

SE – Standard Error
a – less than 1 percent

Table B-7 Percentage of Households: Income from Wages by Cooperative and Electrification Status 1977

Income in Pesos	Cooperative Areas Elect.	SE	Non-Elect.	SE	Non-Cooperative Areas Elect.	SE	Non-Elect	SE
1 – 500	6	.9	16	1.0	2	.8	12	1.3
501 – 1000	3	.6	14	.9	4	1.1	11	1.2
1001 – 1500	3	.7	9	.8	3	1.0	10	1.1
1501 – 2000	4	.8	7	.7	4	1.2	6	.9
2001 – 4000	20	1.5	29	1.2	21	2.4	24	1.7
4001 – 6000	24	1.7	14	.9	26	2.6	21	1.6
6001 – 8000	12	1.2	4	.5	'10	1.8	7	1.0
8001 – 10000	9	1.1	3	.4	11	1.9	4	.7
10001 – 15000	12	1.3	2	.4	11	1.8	4	.8
15001 – 20000	4	.7	1	.2	7	1.5	1	.2
20001 – 30000	2	.5	1	.1	1	.7	a	.1
30001 – 99997	1	.4	0		a	.4	0	
TOTAL (Average)	100	(.9)	100	(.6)	100	(1.4)	100	(.9)

SE – Standard error
a – less than 1 percent

Table B-8 Percentage of Households: Income from Farming by Cooperative and Electrification Status, 1977

Income in Pesos	Cooperative Areas Elect.	SE	Non-Elect.	SE	Non-Cooperative Areas Elect.	SE	Non-Elect.	SE
1 – 500	40	1.8	37	1.3	30	2.6	25	1.7
501 – 1000	9	1.1	13	.9	12	1.9	13	1.3
1001 – 1500	9	1.1	13	.9	8	1.6	13	1.3
1501 – 2000	5	.8	9	.7	6	1.5	9	1.1
2001 – 4000	15	1.4	17	1.0	17	2.2	21	1.6
4001 – 6000	7	1.0	6	.6	8	1.6	8	1.0
6001 – 8000	4	.8	2	.4	6	1.4	4	.8
8001 – 10000	2	.6	1	.3	4	1.2	2	.5
10001 – 15000	4	.8	1	.3	4	1.2	2	.6
15001 – 20000	1	.3	1	.2	1	.8	1	.4
20001 – 30000	1	.3	0		1	.6	1	.3
30001 – 99997	3	.7	a	.1	3	1.1	1	.4
TOTAL (Average)	100	(.9)	100	(.6)	100	(1.5)	100	.9)

SE – Standard Error
a – less than 1 percent

Table B-9 Percentage of Households: Net Income by Cooperative and Electrification Status, 1977

Income in Pesos	Cooperative Areas Elect.	SE	Non-Elect.	SE	Non-Cooperative Areas Elect.	SE	Non-Elect.	SE
1 – 500	a	.5	4	.6	1	.4	2	.5
501 – 1000	2	.5	10	.8	1	.6	5	.9
1001 – 1500	4	.7	11	.8	2	.9	9	1.1
1501 – 2000	5	.8	9	.7	3	1.0	9	1.1
2001 – 4000	17	1.5	32	1.2	14	2.1	29	1.8
4001 – 6000	16	1.4	17	1.0	19	2.3	18	1.5
6001 – 8000	13	1.3	8	.7	13	2.0	9	1.1
8001 – 10000	10	1.2	4	.5	9	1.7	6	.9
10001 – 15000	15	1.4	4	.5	19	2.3	9	1.1
15001 – 20000	7	1.0	1	.2	9	1.7	2	.6
20001 – 30000	5	.8	a	.2	5	1.3	1	.4
30001 – 99997	6	.9	a	.1	5	1.3	1	.4
TOTAL (Average)	100	(1.0)	100	(.6)	100	(1.8)	100	([illegible]

SE – Standard Error
a – less than 1 percent

APPENDIX C

GLOSSARY

BARRIO – a geographical division and political unit of a municipality

BARRIO ADJACENT TO MAIN ROAD – one that is within 2 kilometers from a national highway.

COOPERATIVE OR COOP AREA – the service or franchise area of a particular NEA electric cooperative.

ELECTRIFIED OR CONNECTED HOUSEHOLD – household being provided with electricity and having a single meter with a service drop at the time of the interview.

FARM OR HOLDING – any parcel of land having a total area of at least 1,000 square meters used for the raising of crops such as palay, corn, fruits, etc. whether or not some parcels are idle temporarily during the year.

HOUSE AND LOT OWNERSHIP

a. HOUSE AND LOT – if the respondent or any other occupant of the dwelling unit owns the building where household members are sheltered and and the lot where the unit stands.

b. HOUSE ONLY – if any occupant of the house owns the building where household members are sheltered but not the lot where the building stands; lot is either rented or occupied for free.

c. LOT ONLY – if any occupant of the house owns the lot but not the building.

d. DOES NOT OWN HOUSE AND LOT – if no occupant of the house owns the house and lot. Included here are those who are renting or occupying for free.

HOUSEHOLD – A group of people (one or more families) who sleep in the same dwelling unit and have common arrangement for the preparation and consumption of food. A person living alone (single person household) will be listed as a separate household.

HOUSEHOLD HEAD – a person who is generally the main provider of the household and is responsible for the organization and care of the household.

HOUSEHOLD IMPROVEMENT – renovation done to the house during the past 12 months.

a. MAJOR HOUSE IMPROVEMENT – one which cost P200.00 or more

b. MINOR HOUSE IMPROVEMENT – one which cost less than P200.00

HOUSEHOLD SIZE – number of household members.

HOUSING MATERIALS

a. HEAVY/STRONG – the material used in the construction of the walls are either concrete, including hollow blocks, adobe, stone, bricks or wood. Roofing materials are either galvanized iron, aluminum, fiberglass, asbestos, concrete, or tile.

b. LIGHT – the materials used in the construction of the walls and the roof are either bamboo, sawali, nipa, buri or anahaw.

c. MIXED – This is a combination of heavy and light.

d. SALVAGE/SCRAP – the materials used for the walls and the roof are billboards, salvaged materials, tires, canvas, cartoons, etc.

INTERIOR BARRIO – one that is more than 2 kilometers from a national highway.

NON-COOPERATIVE OR CONTROL AREA – a geographical area not being served by the cooperative but is served by other electric utilities.

NON-ELECTRIFIED or NON-CONNECTED HOUSEHOLDS -- households not being provided with electricity. Also included here are households whose electric service had been cut-off.

POBLACION OR TOWN – the barrio which is generally more urbanized than the other barrios of the municiaplity, is centrally located and the seat of the municipal government.

RESPONDENT – the household head or the housewife who answers the questions and furnishes data for the household

RURAL AREA – barrios outside the poblacion

RURAL RESIDENCE – one found in the rural areas.

SOURCE OF WATER SUPPLY – water for drinking only

URBAN AREA – barrio(s) covered by or in the poblacion

URBAN RESIDENCE – one found in the urban areas

a. PIPED FROM CENTRAL SOURCE
b. OPEN WELL
c. ARTESIAN WELL – hand-powered source and maybe inside or outside the house
d. SPRING – a natural mountain spring
e. RIVER
f. RAIN WATER – one which has been stored in tanks or pails.
g. OTHER SOURCES – 2 or more sources

APPENDIX D

QUESTIONNAIRE

A. CONTROLS

1. Name of Respondent
2. Address
3. Year of Electrification
4. Residence
5. Barrio
6. Municipality
7. Province
8. Location:
   a. Poblacion
   b. Barric adjacent to main road
   c. Barrio interior
9. Area:
   a. Coop-electrified Household
   b. Coop-non-electrified Household
   c. Non-coop-electrified Household
   d. Non-coop-non-electrified Household
10. Size of Household:
    a. Children (under 15)
    b. Adults (15 & over)
11. Date of Connection (if connected)
12. Amount of most recent electric bill for one month
13. KWH consumption for that same month

B. QUESTIONNAIRE

1. What is the name of the head of this household?

2. What are the names of the other household members? Relationship to household head: What is ..... s relationship to the household head?

3. Age: What is ..... 's age on his last birthday?

4. Educational Attainment: What is the highest grade or year of regular school that ..... has completed?

5. What was ..... doing most of last week? If working – where was ..... working: in the barrio, town or or elsewhere?

6. For interviewer only: Year of Electrification of Town

6. a. For members working anywhere in the same municipality: Was he/she employed in his/her main job before (Date of Electrification of Town)

7. Was the business in existence before (Date of electrification of town). (Ask only if business is in the same municipality as residence.)

8. Housing materials: Strong, mixed, light, salvage, or scrap materials. Check by observation.

9. Do you or anyone in your household: ..... own this house and lot? own house only? ..... own neither house nor lot?

10. Has the household done any housing improvement in the past 12 months?

11. (Done some improvement) Did this improvement use up materials, worth at least P200?

12. Where do you get your drinking water supply in this household?

13. What kind of fuel or power do you use for the following functions in your household?

    a. lighting
    b. cooking
    c. ironing
    d. radio
    e. water pumping
    f. refrigeration
    g. power driven tools

14. How much did you spend last month on:

    a. wood
    b. kerosene
    c. charcoal
    d. LPG & battery?

15. Which of the following items do you have in your home?

    a. Electric flat iron
    b. Electric stove/range
    c. Television set (electric)
    d. Electric fan
    e. Refrigerator (electric)
    f. Radio/stereo (plugged-in)
    g. Water pump (electric)
    h. Book (s)
    i. Sewing machine
    j. Bed (elevated)
    k. Book case
    l. Living room set
    m. Dining room set
    n. Clothes closet
    o. Aparador

16. Which of them do you use?

17. Does the street where you live have street lights?

18. How far is the nearest (public school/ hospital or clinic/poblacion) from here?

    18.a. How long does it take to go to (Facility) from here: by bus? by walking? by other means?

19. Was (facility) in existence in your barrio 3 years ago?

20. Does the (Public school, hospital/ clinic, Poblacion) have electricity?

21. Are the following recreational facilities available in your barrio?

    a. Magazines, newspapers
    b. Komiks
    c. Radio
    d. Television
    f. Telegraph
    g. Post Office
    h. Others (specify)

22. Did you or anyone in your household use (Facility) in the past month?

23. Are the recreational facilities available in your barrio?

    a. Park (s)
    b. Basketball court
    c. Bowling alley
    d. Playground
    e. Movie Houses
    f. Pelota court
    g. Billiard/Pool hall
    h. Others (specify)

24. Did you or anyone in your household make use of any of these facilities in the past month?

25. Which of these facilities have electricity?

26. Does any one of the adult members (15 and over) of your household practice any family planning method?

27. Did any of the women in your household between 15 to 45 years of age become pregnant in the past 12 months?

28. Is there anybody aged 15 and over in your household who moved into this house within the past 12 months?

29. Where did (Name) live before _____ in (a) another house in the same barrio (AHSB), (b) another barrio in the same town (ABST), (c) another town (AT) or another province (AP), or elsewhere?

30. Is the area where (Name) lived before electrified or not?

31. Is this area's having electricity a reason for _____'s moving in?

ELECTRIFIED HOUSEHOLDS ONLY

32. When did your household first receive electric service?

33. How many hours per day do you use electricity.

34. How much was your electric bill last month? (check amount from last month's receipt, of possible).

35. How many flourescent bulbs do you have? What about incandescent bulbs?

36. How many other outlets or sockets do you have?

37. Has electric service in your household ever been interrupted in the past 30 days?

(EVER INTERRUPTED ONLY)

38. How many times has it been interrupted in the past 30 days?

39. How long did the interruption usually last?

(FOR ALL ELECTRIFIED HOUSEHOLDS)

40. Is response to request for repair service prompt or not?

41. Is service reliable or not?

42. (FOR COOP AREAS ONLY) How would you rate your degree of confidence in the management of your own cooperative: high, fair, or low?

43. How would you rate your degree of satisfaction with the performance of the NEA cooperative: high, fair or low?

44. Would you like to have additional house bulbs or lights?

45. Would you like to have additional outlets for appliances?

46. Do you find cost of electricity in your area: low, just about right or high?

47. During the past six months, were bill collections regular or irregular?

48. Do you use electricity in your household for commercial purposes?

49. If yes, for what commercial purposes?

50. Would you say that electricity has improved your life a lot, somewhat, or hardly at all?

51. If the cost of electricity increased and your monthly bill were doubled, would you: disconnect right away, try to reduce consumption, not change consumption or what?

52. Would you say that there has been more economic activity or less economic activity in your area since the coming of electricity?

53. Would you say that the peace and order situation in this area is better or worse since the coming of electricity?

54. Would you say that educational activity in your area has increased or decreased since the coming of electricity?

(FOR NON-ELECTRIFIED HOUSEHOLD IN ELECTRIFIED AREAS ONLY) Does this household have

55. Does this household have access to electricity, that is can you have electricity if you request for connection?

56. Do you think electricity is good for your area?

57. If your household could have electricity at a cost of P25 per month, would you: definitely connect, may or may not connect or definitely not connect?

58. If your household could have electricity at a cost of P10 per month, would you: definitely connect, may or may not connect, definitely not connect?

59. (FOR ALL HOUSEHOLDS) Do you have an electric cooperative in your town?

60. Would you say that the electric cooperative is giving adequate and reliable service or not?

61. Would you like to have an electric cooperative serve your town?

62. Would you say that your family lives better or worse than it did 5 years ago?

63. Five years from now, do you think your family will be living better or worse than it does today?

C. INCOME

(INCOME FOR SALARIES AND WAGES)

64. Did any member of your family receive income in cash or kind in:

a. non-agricultural industries
b. agricultural industries
in the past 12 month?

65. What is his/her occupation?

66, How many months did he/she work during the past 12 month?

67. How much did he/she earn per month, on the average, while working, during the past 12 months?

68. (INCOME FROM FARMING) Did anybody in your household cultivate any crops in the past 12 months? If yes, what crops did you grow?

69. What was the total quantity of crop harvested during the past 12 months including the share of others.

70. How much was used by your household and kept for home consumption?

71. How much was sold or bartered for other products?

72. How much went to share of others?

73. How much is the average price per unit of CROP?

(COST OF OPERATION AND OTHER EXPENSES FOR FARMING)

74. How much did you spend for INPUT in the past 12 months?

75. What farm inputs did you use in your farm in the past 12 months?

76. How much did you spend for input in the past 12 months?

77. How many/much INPUT was used?

78. How much is the cost/price per unit of INPUT?

(INCOME FROM LIVESTOCK AND POULTRY PRODUCTS)

79. Did your household raise any livestock or poultry in the past 12 months?

80. How many (head/eggs/pails or bottles) of PRODUCT were raised/laid/obtained in the past 12 months?

81. How many/much was consumed by your household including those retained?

82. How many/much did you sell or exchange for other products?

83. How many died or were lost?

84. What is the average market price of PRODUCT per unit?

(COST OF OPERATION AND OTHER EXPENSES FOR LIVESTOCK AND POULTRY RAISING)

85. What inputs were used in the raising of livestock and/or poultry in the past 12 months?

86. How much did you spend for INPUT in the past 12 months?

87. How many/much INPUT did you use?

88. How much is the cost/price of INPUT per unit?

(INCOME FROM FISHING AND HUNTING)

89. Did anyone in your household go hunting for game animals or go fishing in the past 12 months and sold or used his catch?

90. How many/much (heads or kilos) was caught including the share of others?

91. How much was used for home consumption?

92. How much was sold or exchanged for other products?

93. How much went to share of others and spoilage?

94. What is the average market price of product per unit?

(COST OF OPERATION AND OTHER EXPENSES FOR FINISHING AND HUNTING)

95. What inputs were used to fish and/or hunt in the past 12 months?

96. How much did you spend for INPUT in the past 12 months?

97. How many/much INPUT was used?

98. What is the price per unit of INPUT?

(INCOME FROM THE PRACTICE OF

PROFESSION OR TRADE)

99. Did anyone in your household receive income from the practice of his profession or trade or from his own business in the past 12 months?

100. How many people excluding household members are employed in your business/office?

101. Did you start this business/practice before or after Date of Electrification?

102. How many months did you operate/practice in the past 12 months?

103. What inputs were used in the past 12 months?

104. Howv much was the average monthly income from business/profession for the period that you operated in the past 12 months?

(COST OF OPERATIONS AND OTHER EXPENSES FOR THE PRACTICE OF PROFESSION, TRADE, AND BUSINESS)

105. What inputs were used in the past 12 months?

106. How much did you spend for INPUT in your office/business in the past 12 months?

107. How many/much INPUT was used?

108. How much was the price per unit of INPUT?

(INCOME FROM OTHER SOURCES)

109. Did your household receive income from any other sources not previously mentioned in the past 12 months?

110. How many months did you receive income from this source in the past 12 months?

(COST OF OPERATIONS AND OTHER EXPENSES FOR THE SOURCES OF INCOME)

111. What was the average income per month (or the total income, if irregular or lump sum income) received from different sources?

112. What inputs were used in the past 12 months?

113. How much did you spend for INPUT in the past 12 months?

114. How many/much INPUT were used?

115. How much is the cost per unit of INPUT?