

4920321  
PO-AAA-082  
ISN=44401

17

PHILIPPINES RURAL ELECTRIFICATION EVALUATION:  
Preliminary Results of the 1980 Household Survey

ADVANCE COPY

Comments or questions concerning this report  
should be directed to:

William C. Menth  
Chief, Developmental Research and  
Analysis Branch  
U.S. Bureau of the Census  
(301) 763-1192

Mailing address:

William Menth, Room 310  
International Statistical Programs  
Center  
Bureau of the Census  
Washington, D.C. 20233

March 19, 1981

## TABLE OF CONTENTS

<u>Contents</u>	<u>Page</u>
I. Introduction and Executive Summary. . . . .	1
II. Description of the Philippines Rural Electrification Program. . . . .	6
A. Initial Stages of Electrification Program . . . . .	6
B. The First Pilot Projects of VRESCO and MORESCO. . . . .	8
C. The Later AID Loans . . . . .	10
D. The Role of Cooperatives. . . . .	10
E. References. . . . .	13
III. Major Findings in the Preliminary Survey Results. . . . .	14
A. Variables Considered in the Preliminary Tabulations . . . . .	14
B. Who Has Been Connected? . . . . .	16
1. NEA Service Area Coverage . . . . .	16
2. Coverage of Rural Areas . . . . .	17
3. Coverage of the Poor. . . . .	17
C. Who has not been connected? . . . . .	19
1. Nonelectrified Households in Towns Electrified by NEA Cooperatives . . . . .	19
2. Households in Areas That Are Not Yet Electrified. . . . .	21
D. How is Electricity Being Used?. . . . .	24
1. Lighting. . . . .	24
2. Reading at Night. . . . .	24
3. Use of Appliances . . . . .	25

E.	Opinions of Respondents About Quality of Service . . . . .	26
1.	Overall Degree of Satisfaction . . . . .	26
2.	Reliability and Responsivenss of Service Requests. . . . .	29
IV.	Description of the Survey and Future Survey Activities . . . . .	31
A.	Introduction . . . . .	31
B.	Description of the Surveys . . . . .	32
1.	1980 Household Survey. . . . .	32
2.	1977 Household Survey. . . . .	33
C.	Institutional and Survey Development . . . . .	34
D.	Survey Implementation. . . . .	36

APPENDICES

A.	Glossary of Terms and Concepts	A-1
B.	Statistical Tables	B-1
C.	The Relations of Income and House Construction	C-1
D.	Sample Design for the 1980 Household Survey	D-1
E.	Purposes of the Philippine Rural Electrification Program (as stated in the successive loan documents)	E-1

## I. Introduction and Executive Summary

As part of the fifth rural electrification loan to the Philippines, grant funding was provided to the Philippines National Electrification Administration (NEA) (the implementing agency) to conduct a project level evaluation that would provide insights into the household impact of the rural electrification programs in the Philippines. The U.S. Bureau of the Census, as part of its long standing relation with AID, provided training and technical support to NEA in carrying out the evaluation. To provide data for the evaluation, two large-scale household surveys were conducted. The first survey was conducted in February - March 1977 and a report on the findings was released in June 1978. The second survey, the subject of this report, was conducted in February - March 1980. The information contained in this report is based on early tabulations of the 1980 survey data and represents only a small part of the data collected in that survey. A final report, to be released later this year, will include more extensive results from the 1980 survey and a comparison of the 1980 and 1977 data for selected variables.

The rural electrification program in the Philippines, described in more detail in Section II, began in 1964 with a study by the U.S. National Rural Electric Cooperative Association, which found that, outside Manila, there were about 400 small private and municipal electric utilities that provided limited area coverage for about 8 to 10 hours per day. The small utilities had high costs and low rates of return and were unable to borrow funds from commercial banks. Concluding that electric power was not likely to ever reach the rural areas under these circumstances, the NRECA report recommended a 20-year program, beginning with one or two pilot cooperatives. The pilot cooperatives, MORESCO and VRESKO were largely completed in 1971 and provided many insights into

program alternatives. Based on this experience, the program was redesigned in 1971 to provide a "backbone" system first, rather than attempt wide area coverage immediately. Under the backbone concept, major systems would be set up in selected areas nationwide and would seek to develop a viable financial base in the relatively better-off areas and then extend coverage to other areas.

This approach has allowed for a viable financial structure for cooperatives in first year of operation. Based on the 1979 Cooperative Annual Statistical Report Paper, the 100 energized cooperatives reported the operating revenues of 540 million pesos (about \$72 million) and a net margin (loss) of 3 million pesos (about \$0.4 million)

The operating margin is approximately one-half of one percent of total operating revenue; a remarkable result considering that about half of the cooperatives are less than 3 years old. In addition, 22 million pesos (about \$2.9 million) in loan repayments were made in 1979 and over half of the cooperatives show a positive margin at the end of 1979.

In Section III of this report, the preliminary findings in the analysis of the 1980 survey data are discussed. The data presented are estimates of the total population based on a scientific, stratified sample survey of electrified and nonelectrified households in electrified and nonelectrified areas of the Philippines, excluding the major metropolitan areas. The topics and a summary of the results are:

A. Who has been connected? (from Section III.B.)

Summary: Over 1.1 million households have been connected in towns serviced by 100 cooperatives. Although connection rates are somewhat higher among the relatively higher income groups, a major proportion of the connections have been to poor households and households in remote areas.

Survey Findings:

1. There are 2.7 million households in towns covered by NEA cooperatives.
2. Of these, 1.1 million households have been connected (42 percent).
3. Of these, 312 thousand or 28 percent of those connected are classified as "poor".
4. Of those households connected, 97 thousand are in remote towns, more than 4 kilometers from a main road.

B. Who has not been connected? (from Section III.C.)

Summary: While household connections are continuing at a rate of over 200,000 per year, there are 1.6 million nonconnected households in towns presently serviced by NEA cooperatives and 1.1 million households in towns that did not have electric service as of March 1980.

Survey Findings:

1. Within towns covered by NEA cooperatives, 1.6 million households, or 58 percent, were not connected as of March 1980.

2. About 66 percent of the nonconnected households are classified as "poor."
3. About 1.1 million households are in areas not receiving any electric service as of March 1980. Although those areas are somewhat poorer than the electrified areas, the contrast is not extreme.

C. How are households using electricity? (From Section III.D.)

Summary: Lighting is a nearly universal and immediate use of electricity. Usage of small appliances is extensive. Usage of major appliances range from 13 percent in households electrified for 1 year or less to 40 percent for households electrified for 5 years or more.

Survey Findings:

1. About 96 percent of all households have electric lighting.
2. Perhaps due to the high literacy rate in the Philippines, 79 percent of all households report one or more household member reading at night.
3. Small appliances are used by 70 percent of all households. The percentage ranges from 57 percent for households connected for one year or less to 88 percent for households connected 5 years or more.
4. Major appliances are used by 25 percent of all households. The percentage ranges from 13 percent for households connected for one year or less, to 40 percent for households connected for 5 or more years.

D. Opinions of respondents about quality of service (From Section III.E.)

Summary: Opinion responses are often difficult to interpret due largely to the unknown character of the expectations to which such opinions relate. These findings, therefore, should be used with caution. In general, dissatisfaction with service appears to be fairly low. Some differences are observed when the responses are cross tabulated by income groups. Consumers of NEA cooperative electricity appear to be more satisfied than consumers of electricity from private or municipal systems.

Survey Findings:

1. Overall, only 15 percent of all respondents reported "low" satisfaction with service. Perhaps due to major differences in expectations, 10 percent of the lower social classes reported "low" satisfaction while 17 percent of higher income classes reported "low" satisfaction.
2. For respondents using NEA cooperative power, about 10 percent reported "low" satisfaction; for private and municipal systems, 16 percent reported "low" satisfaction.

Section IV of this report describes the implementation of the 1977 and 1980 survey efforts and the future survey-related activities.

## II. Description of the Philippines Rural Electrification Program

### A. Initial Stages of Electrification Program:

AID's involvement in rural electrification in the Philippines began with a survey visit by a team from NRECA (The National Rural Electric Cooperative Association) of the U.S. in 1964. As part of a study of six Asian countries, they found that, outside of Manila, households were served by about 400 small private utility or municipal electric power systems. These small-scale utilities, many of which did not have access to electricity from the National Power Corporation and generated their own power, were characterized as having high costs and low rates of return and as being unable to borrow funds from commercial banks. Theoretically, the Electrification Administration of the Philippine government was authorized to make low interest rate loans to these utilities, but in practice, it never did. Consequently, the private and municipal systems were unable to extend their service areas much beyond the market centers of the municipalities that they served and were not able to provide more than six to twelve hours of service per day. (See reference #1). Only about 8 to 10 percent of the population outside the major metropolitan areas had any sort of electrical service. The NRECA power survey team concluded that, under existing conditions, it was unlikely that rural areas would soon be served by electric power. Among other things, the NRECA report recommended that one or two pilot projects for rural cooperative electrification be started and that a twenty-year program (1965 to 1984) be undertaken to serve forty percent of all rural households. It is well worth noting that the goal of serving forty percent

of all households outside the metropolitan areas was met by 1980 when coverage passed 1.2 million families and seven million people.

In 1967, NRECA carried out some loan feasibility and engineering studies. (See references #2 and #3). After much debate, these led to the approval to the two pilot projects in 1968 of VRESCO (Victorias Rural Electric Service Cooperative) and MORESCO (Misamis Oriental Rural Electric Cooperative). VRESCO was a small system on a sugarcane producing island in the Visayas that generated its own power. (See references #4 and #5). MORESCO was located on the big southern island of Mindanao and would be involved only in the distribution of very cheap power produced by the giant Maria Cristina hydro-electric project of the National Power Company (NPC). (See reference #6). Much of the construction for these two projects was completed by late 1971. AID funds accounted for about 83 percent of the pilot project costs of \$4.2 million.

Before construction for the pilot projects was complete, AID made further loans to the Government of the Philippines to establish 36 more cooperatives (\$19.4 million) and to finance the costs of NRECA and Stanley (engineering) consulting services (\$600,000). (See references #7, 8 and 9). In later years, AID made four more loans for further expansion of the rural electrification system (See references #10, 11, 12 and 13). In total, the eight AID loans over a ten-year period amounted to over 92 million dollars (including less than one million in grants for the consulting services).

This represents close to 25 percent of the total electrification program costs and about 45 percent of all AID loans to the Philippines during the period 1962 to 1977, excluding PL480 funds.

#### B. The First Pilot Projects of VRESCO and MORESCO

The electrification program started with pilot projects because, while the national and local leadership in the Philippines expressed strong interest in rural electrification, the rural Philippines had seen very few effective cooperative programs carried out despite many attempts. The goals of VRESCO and MORESCO were to demonstrate the feasibility of large-scale area coverage and electric power cooperatives for the Philippines (the goals of these projects are set forth in Appendix A and in references #3, 4, 5 and 6.) Concerns in this demonstration included financial viability of the cooperatives and the building of the technical, managerial and organizational institutions necessary to start a nationwide program. As part of this early effort, the existing Electrification Administration, which was not considered to be capable of carrying out a major new electrification program, was replaced by a new institution. The National Electrification Administration (NEA) was established in 1969 and has continued to be the major force behind the physical and organizational accomplishments of the last decade.

The pilot projects encountered a number of difficulties that subsequently led to a reorientation of the program. The difficulties included problems in meeting construction deadlines, paying back the first installments on loans, cost overruns, and so forth. Another concern was that average consumption

lagged well behind projections. On the positive side, the number of consumers connected exceeded projections and the projects, particularly, MORESCO, which had a full-time NRECA advisor, did show that they could serve the project area and develop strong management.

While AID and NEA continued with rapid expansion of the program, the difficulties of the early projects led to major modifications of the way an area would be electrified. These included tighter management of construction, the employment of an expatriate engineering firm in developing plans for the full nationwide program, insistence on competitive bidding for engineering and construction jobs, extensive training of all staff, and most importantly the substitution of the "backbone" system for total area coverage. A backbone system would try to service a cooperative area by starting with the municipal center (poblacion) and the people living along or close to the major roads. Once the backbone was completed the area would be gradually covered. This tended to cover the richer families first and provided a more viable financial structure in the early years of the cooperatives. It should be noted that most cooperatives expected very rapid rates of expansion in their plans for the years after the backbone was completed.

### C. The Later AID Loans

After the pilot cooperatives, the next step was the formation of 36 more cooperatives, strengthening the NEA organization, and preparing a national set of policies and plans for rural electrification. After a great deal of debate about whether institutionalization or implementation should come first, it was decided that implementation would come first because the real problems were the lack of a working system for obtaining desired action and the lack of an ethos of and belief in accomplishment. It was believed that as working systems evolved through practice, institutions would be strengthened.

It is also worth noting that the later AID loans gradually changed the goals of the program towards productive uses of electricity -- the promotion of irrigation, industrialization -- as well as the building of the electrification system. A comparison of the stated purposes of the successive loan papers is included in Appendix E.

### D. The Role of Cooperatives

Cooperatives, as an organizational approach to rural electrification, were desirable in the Philippines because of four reasons: First, it was desired to get away from the popular belief that central government actions were "gifts" and the continued responsibility for maintaining these gifts was the responsibility of the giver. Second, a sense of local involvement would help reduce the tendency towards poor budget management of centrally controlled funds in an island country with poor communications. Third, it would be

practically impossible to manage hundreds of local distribution systems from Manila. Fourth, local involvement would generate pride and commitment to the project and insure the government a power base in the community.

NEA has played a major role in establishing cooperatives. In NEA's cooperative development efforts, an essential step was the provision of an adequate legal base. By law, NEA obtained the power to establish and oversee electrical cooperatives, make loans to cooperatives, take over private franchises, and borrow funds. In the initial stages of the program, NEA was responsible for engineering design, construction, financing, management, and training. Since 1974, NEA's role has evolved toward giving more and more responsibility for these tasks to the cooperatives and their recently created national association, FECOPHIL (The Federation of Electric Cooperatives in the Philippines).

The previous Philippines cooperative experience had been quite unsuccessful. Agricultural and water-user cooperatives had often failed. Nevertheless, some cooperatives had succeeded and they were thought to have the following five characteristics: First, the members of the cooperatives had to perceive strong benefits accruing to themselves because of that membership. Second, the cooperatives must have a large enough fiscal base to permit the hiring of competent management. Third, extensive training, by actual experience, is necessary in the roles and responsibilities of cooperative membership. Fourth, trust must be maintained. If funds are misused, even in a minor way, the sense of cooperation may be rapidly destroyed. Fifth, a measured

pace of development must be followed. Initial successes could not be used as grounds for a wildfire propagation of new cooperatives.

NEA, in building the cooperatives, had to carry out a difficult balancing act. The successes in building viable cooperatives is, in part, a measure of organizational skill in carrying out some difficult compromises. It had to allow substantial independence of the cooperatives in decision making while making sure through oversight and policing that national policies were carried out. Sometimes, it had to intervene or retreat on grants of independence. A final factor to be stressed in the coop building effort is the emphasis placed on training, the development of management systems and well-defined, and often quantified, goals. As a result, an elite and dedicated group of experts were developed who could provide the necessary technical help while remaining sensitive to needs and attitudes at the local level.

## E. References

1. NRECA, "Far East Region Rural Electrification Survey," June 1964.
2. Thomas, J.B., et. al., "Electric Power Industry Survey of the Philippines," USAID/Philippines, 1965
3. NRECA, "Engineering Feasibility and Loan Application Report, Victorias-Manapla-Cading Rural Electric Service Cooperative," August 1967
4. AID Capital Assistance Paper, "Philippines: Victorias Rural Electric Service Cooperative," AID-DLC/P-731, June 14, 1968
5. AID, Loan Agreement Between the Victorias-Manapla-Cading Rural Electric Service Cooperative, Inc., "The Development Bank of the Philippines and the United States of America for a Rural Electrification Project," AID Loan No. 492-H-025, August 31, 1968
6. AID Capital Assistance Paper, "Philippines: Misamis Oriental Rural Electric Cooperative, AID-DLC/P-730, June 14, 1968
7. AID, Loan Agreement, "Philippines: Rural Electrification Consulting Services," AID Loan No. 492-H-027, November 15, 1971
8. AID Capital Assistance Paper, "Philippines: Rural Electrification," AID-DLC/P-1003, February 18, 1972
9. AID, Loan Agreement (final draft), "Philippines: Rural Electrification Loan," AID Loan No. 492-H-023
10. AID Capital Assistance Paper, "Philippines: Rural Electrification II," AID-DLC/P-2053, June 14, 1974
11. AID Capital Assistance Paper, "Philippines: Rural Electrification III," AID-DLC/P-2061, December 10, 1974.
12. AID Project Paper, "Philippines: Rural Electrification IV," April 1976
13. AID Project Paper, "Philippines: Rural Electrification V," AID-DLC/P-2275, November 21, 1977
14. Robert R. Nathan Associates, Inc., "Contribution of AID Documentation to the Evaluation of its Rural Electrification Projects," Volume II, September, 1979
15. Denton, Frank H., "Lighting up the Countryside: The Story of Electric Cooperatives in the Philippines," Development Academy of the Philippines, 1979

### III. Major Findings in the Preliminary Survey Results <sup>1/</sup>

#### A. Variables Considered in the Preliminary Tabulations

For the preliminary tabulations, an effort was made to consider survey data items which we feel are fairly reliable without substantive editing. Consequently, the following variables have been chosen for this report:

<sup>1/</sup> Readers should be aware that the data presented in this report are preliminary and are subject to revision. The principal source of revision will be the adjustment of sample weights to correct for households that were selected in the sample but could not be surveyed. This adjustment will probably raise the survey estimates by approximately 3 to 5 percent, but will have minimal effect on the composition of the results. Thus, while the overall numbers of households may be raised, the relevant concerns such as the proportion electrified, the proportion that are poor, etc, are not expected to change markedly. Consequently, the inferences that are drawn from these results are expected to be borne out in final tabulations.

In addition, a cautionary note should be given about the use of the data for comparative analysis. Formal statistical testing of differences, such as the proportion electrified in urban vs. rural areas, requires the use of statistical tests of significance based on the variance of the estimates. Since the variances of these preliminary estimates have not been computed, formal statistical tests of significance cannot be performed. Consequently, the comparisons made in this preliminary report are limited to those differences that are quite large and are unlikely to be insignificant when formal statistical testing is later employed.

TABLE A-1. -- Variables, Cross Tabulations and Analytical Use of the Variables Selected for Preliminary Tabulations

VARIABLE	CROSS TABULATION	ANALYTICAL USE
(1) Percentage of households electrified	(a) urban/rural	
	(b) type of barangay (poblacion, main-road barangay, remote barangay)	indicates the extent of outreach
	(c) type of house construction	indicates how well electrification has reached different income groups (the association of house construction and income is shown in Appendix C)
(2) Types of household uses of electricity	(a) urban/rural	indicates differences in use of electricity in different areas
	(b) type of barangay (poblacion, main-road barangay, remote barangay)	
	(c) type of house construction	indicates differences in use by social classes
	(d) length of electric service	indicates the extent to which electrical usage changes with length of time electrified*
(3) Opinions of respondents about	(a) NEA coops vs. private	indicates differences in system performance by source of elec.
(a) overall satisfaction with electric service	(b) NEA coops by age of coop	indicates differences in system performance by source of elec.
(b) promptness of response to repair requests	(c) urban/rural	
(c) reliability of repair service	(d) type of barangay (poblacion, main-road barangay, remote barangay)	indicates the difference in system performance by location

\* some income effects will distort this measure. If the first households connected were the relatively higher income households, then the length of service will show both income and length of service effects.

The tabulations of these variables are presented in Appendix B, together with a glossary of terms in Appendix A. The balance of this section will be devoted to a discussion of the major findings according to four major concerns:

Section B. -- Who has been connected?

Section C. -- Who has not been connected?

Section D. -- How is electricity being used?

Section E. -- Opinions of respondents about quality of service.

#### B. Who Has Been Connected?

In reviewing these results, it is important to recall that, according to NEA plans, all rural areas will be electrified by 1990. Consequently, these preliminary results characterize those households that have been connected up to March 1980, but do not necessarily characterize all households that will ultimately be connected.

##### 1. NEA Service Area Coverage

For the purposes of this report, a "service area" is defined as a barangay that has at least one household receiving NEA cooperative electricity. Non-electrified towns within the domain of NEA cooperatives are not included in the "service area" as defined for this report. At the time the survey was conducted (February - March 1980), NEA service areas covered 2.7 million households, or 55 percent of the 4.9 million households in non-metro areas of the Philippines. Within these areas, 1.1 million or 42 percent of the households had connected to NEA coop electric systems, and 1.6 million or 58 percent had not connected. (See Appendix B, Table 1, for more details.)

## 2. Coverage of Rural Areas

The NEA rural electrification program has reached 775 thousand rural households. These households represent 69 percent of the 1.1 million households that have been electrified in the NEA program and represent 36 percent of all rural households within NEA service areas. The rural area coverage of NEA cooperatives is somewhat higher than rural area coverage of private and municipal electric systems, where 26 percent of the rural households have been connected. This comparison is particularly stark in "remote villages" where NEA coops have connected 12 percent of the households and private and municipal systems have connected 2 percent of households. (See Appendix B, Tables 2 and 3, for more details.)

## 3. Coverage of the Poor

The extent to which the poor have been reached by the NEA electrification program and by private and municipal utilities is shown in the following table:

TABLE B-1 -- Numbers and Percentages of Households: Service Area and Socioeconomic Status by Connection Status

SERVICE AREA AND HOUSE TYPE	Total all Households (thousands)	Electrified		Non-Electrified	
		(thous.)	% of Total	(thous.)	% of Total
Philippines Non-Metro Areas, total	4,927.8	1,566.6	31.8	3,361.2	68.2
Poorest households*	2,632.2	400.2	15.2	2,232.0	84.8
Other households	2,295.6	1,166.4	50.8	1,129.2	49.2
Households in NEA Service Areas, total	2,688.6	1,131.6	42.1	1,557.0	57.9
Poorest households*	1,345.8	312.0	23.2	1,033.8	76.8
Other households	1,342.8	819.6	61.0	523.2	39.0
Private and municipal Service Areas, total	1,162.2	435.0	37.4	727.2	62.6
Poorest households*	608.4	88.2	14.5	520.2	85.5
Other households	553.8	346.8	62.6	207.0	37.4
Areas not receiving any electrical service, total	1,077.0	-	-	1,077.0	100.0
Poorest households*	678.0	-	-	678.0	100.0
Other households	399.0	-	-	399.0	100.0

\* "Poorest households" are defined as being those classified as shanties or made of light materials. These house types are described further in the glossary in Appendix A. The association between house construction type and income is discussed in Appendix C.

There are 312 thousand electrified households in NEA service areas classified as "shanties" and dwellings made of "light materials." In a similar 1977 survey effort, those dwelling types are associated with the lowest 40 percent of the income distribution and are easily classified as poor. (See Appendix C for a discussion of this association.) These 312 thousand "poor" households that have been electrified represent 28 percent of all households electrified in the NEA program and represent 23 percent of all poor households in NEA service areas. In comparison, private and municipal systems have reached 88 thousand "poor" households, which represents 20 percent of all households electrified by private or municipal systems and 15 percent of "poor" households in private or municipal service areas. While the percentages reveal differences between NEA coops and the private/municipal systems, the most meaningful measure of outreach to the rural poor may be in terms of gross numbers: 312 thousand rural poor households had been electrified as of March 1980. (See Appendix B, Table 4, for more details.)

#### C. Who Has Not Been Connected?

There are two broad categories of non-electrified households. The first category includes non-electrified households in electrified towns; the second includes households in non-electrified towns. This latter category, in future reports, will be subdivided into non-electrified towns in energized cooperatives, towns in organized but not yet energized cooperatives and towns in unorganized areas.

##### 1. Nonelectrified Households in Towns Electrified by NEA Cooperatives

The following table presents some basic information from Appendix B, Tables 2-4.

TABLE C-1. -- Numbers and Percentage of Households in  
NEA Electrified Towns: Area Character-  
istic by Electrification Status

(thousands of households)

AREA CHARACTERISTIC	Total, all Households	Electrification Status			
		Connected	Percent	Not Connected	Percent
Total, all households in NEA Electrified towns	2,688.6	1,131.6	42.1	1,557.0	57.9
Urban	523.8	356.4	68.0	167.4	32.0
Rural	2,164.8	775.2	35.8	1,389.6	64.2
By type of barangay:					
Poblacion	551.4	394.2	71.5	157.2	28.5
Mainroad	1,359.6	619.2	45.5	740.4	54.5
Remote	736.8	96.6	13.1	640.2	86.9
Location not known	40.8	21.6	52.9	19.2	47.1
By type of house material:					
Shanty	155.4	24.6	15.8	130.8	84.2
Light Materials	1,190.4	287.4	24.1	903.0	75.9
Mixed Materials	873.6	457.2	52.3	416.4	47.7
Heavy/strong materials	466.8	361.2	77.4	105.6	22.9
Not known	2.4	1.2	50.0	1.2	50.0

Within rural areas, there are 2.2 million households, of which 1.4 million, or 64 percent, have not been connected. As mentioned earlier, and is to be emphasized here, the pattern of electrification and nonelectrification is principally a consequence of the approach taken to electrification. To provide the cooperatives with a sound financial base prior to providing broad area coverage, the central areas and areas inhabited by the relatively better-off among the rural poor were the first to be electrified. This is the principal trend to be observed in Table C.1. The more complete coverage of "rural poor" was not expected to take place until 1983 or later.

## 2. Households in Areas That Are Not Yet Electrified

There are 1.1 million households in towns that do not yet receive electric service from NEA cooperatives or from private or municipal systems. Those nonelectrified areas are somewhat poorer, but not radically different from the towns that have been energized, as shown below:

TABLE C-2. -- Numbers and Percentages of Households: Service Areas by Type of House

GROUP	NLA Coop Service Areas		Areas without electric service	
	Thousands of Households	Percent of Total	Thousands of Households	Percent of Total
All households, total	2,688.6	100.0	1,077.0	100.0
house type: shanty	155.4	5.8	124.8	11.6
light mat.	1,190.4	44.3	553.2	51.4
mixed mat.	873.6	32.5	238.2	22.1
heavy mat.	466.8	17.4	157.2	14.5
not known	2.4	(.1)	3.6	0.3

An important question to be asked at this juncture would be to what extent have the rural poor been excluded from the availability of electricity in the electrification efforts to date. If, for discussion purposes, the rural poor are defined as the rural population residing in "shanties" or dwellings made of "light materials" (a definition that approximately corresponds to the lowest 40 percent of the income distribution), then the following results are obtained:

TABLE C-2. -- Numbers and Percentages of Poor Households: Service Areas by Electrification Status

GROUP	Numbers of Poor Households (thousands)	Households receiving electric service		
		(thousands)	Percent of Total Poor	Percent Electrified
Total, all poor households in non-metropolitan* areas	2,632.2	400.2	100.0	15.2
In towns served by NEA coops	1,345.8	312.0	51.1	23.2
In towns served by private/mun. systems	608.4	88.2	23.1	14.5
In towns not receiving any electric service	678.0	--	25.8	--

\* The major metropolitan areas of the Philippines excluded from this tabulation are Metro Manila, Davao, Cebu, Iloilo, and Angeles. Rural population centers are included in figures in this table.

Based on these results, slightly more than half of all the rural poor are in NEA coop service areas and 23 percent of these have been connected. Additionally, 23 percent are in areas presently served by private or municipal systems, although only 14 percent of these have been connected. Finally, of all the non-metro poor in the Philippines, only 26 percent are in areas not yet covered by NEA cooperatives. (See Appendix A, Tables 2 and 3, for more details.)

These electrification results, as shown in Tables C-1 and C-2 are interesting primarily as an observation of the kind of compromise between the backbone approach and the need for reaching the rural poor. Based on the results of household connections made through March 1980, not only has the backbone been established, but household connections have in fact exceeded projections, and a considerable number of these connections have been to households clearly within the target "rural poor" group.

#### D. How is Electricity Being Used?

For a preliminary insight into the uses made of electrification, the following applications were considered:

1. lighting
2. reading at night by one or more household member
3. use of small electric appliances (flat iron, t.v. set, fan, radio, or phonograph)
4. use of major appliances (electric stove, refrigerator, air conditioners)

Readers may refer to Appendix A, Tables 5 through 8, for more details.

##### 1. Lighting

Virtually all (96 percent) of the electrified households use electricity for lighting. The proportion of households with electric lighting is relatively constant by urban/rural classification, distance from rural centers, socio-economic status or length of service variables.

##### 2. Reading at Night

Due perhaps to the high degree of literacy in the rural Philippines, 79 percent of all electrified households have one or more household members reading at night. The proportion is somewhat higher for households that have been electrified for 3 or more years. The proportion is also higher among the higher income households: 66 percent of electrified households classified as shanties had a household member reading at night; whereas 83 percent of households in structures built of heavy/strong materials had one or more members reading at night. Urban/rural and distance from rural center variables did not show any meaningful variation in the proportion of households with a household member reading at night.

### 3. Use of Appliances

Among all electrified households, 70 percent use small electric appliances and 25 percent use major appliances. The proportion using electric appliances varies markedly according to house construction type (a proxy for income) and length of service:

TABLE D-1. -- Percentages of Electrified Households Using Small and Major Appliances by House Type and Length of Service

House construction type and length of service	Percentage using Small Appliances	Percentage using Major Appliances
All electrified households in NEA service areas, total	70.0	25.0
by house type:		
shanty	48.8	4.0
light materials	50.5	9.0
mixed materials	72.8	24.7
heavy/strong materials	83.7	40.2
by length of service:		
1 year or less	56.6	13.0
1-2 years	64.7	19.7
3-4 years	76.1	23.4
5 or more years	88.2	40.1

\* see tables 6 and 7 for more details

Based on these results, a clear association of the proportion using appliances and the income proxy, house construction type, can be observed. The association with length of service is also apparent; however, this association is somewhat confounded by the fact that the first households connected were somewhat disproportionately the more well-off. Consequently, the association with length

of service is a result of both time and income variables. In future tabulations, these effects will be separated to reveal the length of service effects more clearly.

#### E. Opinions of Respondents About Quality of Service

For these preliminary results, three opinion questions were considered:

1. "How would you rate your degree of satisfaction with the performance of the electric company serving you?"
2. "Is the household repair service provided by your electric company usually reliable, usually not reliable, or is there no service available?"
3. "Is response to your request for repair service usually prompt or not?"

In reviewing the results of these inquiries, there is a degree of uncertainty surrounding the nature of these responses. Opinion responses are necessarily subjective and can be influenced by a variety of factors other than the formal content of the question. These extraneous factors include, but are certainly not limited to, political and economic conditions, the mood of the moment, recent experiences with electrical service or appliances or general level of expectation on the part of various socioeconomic groups. Further, in the case of the "degree of satisfaction" inquiry, the specific meaning of the "high," "fair" and "low" responses is unclear. It is not known whether a typical respondent would tend to answer "high" or "fair" if he is fully satisfied with the electrical service. For these reasons, the overall magnitude of responses cannot be exactly interpreted, although some useful comparison can be made among the opinions of various groupings of respondents.

#### 1. Overall Degree of Satisfaction

The following table presents the responses to the first opinion question, cross tabulated by type of house construction and length of service.

TABLE E-1. -- Percentages of Electrified Households: Degree of Satisfaction with Electric Service by Type of House and Length of Service

GROUPING	Percentage of Respondents Reporting their Degree of Satisfaction with electric service as:			
	High	Fair	Low	No Response
All electrified households	10.8	64.7	14.7	9.8
by type of construction:				
shanty	24.6	52.5	9.8	13.1
light materials	10.7	64.5	14.0	10.7
mixed materials	10.3	65.9	13.8	10.0
heavy/strong materials	10.3	64.8	16.7	8.2
by length of service:				
1 year or less	8.1	69.0	15.0	7.9
1-2 years	7.4	72.6	13.7	5.4
3-4 years	12.0	62.7	18.3	6.0
5 or more years	12.8	65.8	16.0	5.4
not known	12.7	55.6	13.2	18.6

The only variations in proportion reporting "high" and "low" degrees of satisfaction are:

- shanty dwellers appear to be considerably more satisfied with their electric service than other groups. This difference may be more related to different expectations than to different experiences.
- households that have recently connected show somewhat less satisfaction than do the longer-connected households.

Somewhat more variation is found when area groupings are considered which require a short explanation.

1. old towns/old coops - this group consists of electrified households in towns that were electrified prior to 1977.
2. new towns/old coops - this group consists of electrified households in towns that were electrified in 1977 or later, in cooperatives that were energized prior to 1977.

3. new coops - this group consists of electrified households in towns electrified in 1977 or later, in coops that were electrified in 1977 or later.
4. private/municipal systems - this group consists of electrified households in private or municipal system.

The opinion results, shown in Appendix A, Table 9, are summarized here:

TABLE E-2.-- Percentages of Electrified Households: Degree of Satisfaction with Electric Service by Area Groupings

GROUPING (a)	Percentages of Households Reporting Their Degree of Satisfaction as:				Col. (b) ÷ Col. (d) (f)
	High (b)	Fair (c)	Low (d)	No Response (e)	
Old town/old coops:	8.7	69.4	14.2	7.8	0.61
urban	7.3	77.4	12.0	3.2	0.61
rural	9.2	66.8	15.0	8.9	0.61
New towns/old coops:	16.7	66.4	11.4	5.6	1.46
urban	16.6	66.3	10.3	6.9	1.61
rural	16.7	66.5	12.2	1.8	1.37
New towns/new coops:	8.3	78.2	5.6	7.8	1.48
urban	8.9	73.8	7.4	9.9	1.20
rural	8.1	81.3	4.4	6.1	1.84
Private/municipal systems:	12.0	48.3	23.4	16.3	0.51
urban	18.6	45.1	10.7	25.6	1.73
rural	5.4	50.9	36.9	6.8	0.15

Some of the interesting results are:

- Private and municipal systems have the highest proportion of respondents reporting "low" satisfaction.
- The older cooperatives show a lower degree of satisfaction - this could be attributed to the "wearing-off" of the novelty value of being electrified, which could still be present in the more recently electrified areas.
- In contrast to the previous table, where satisfaction with electrification appeared to be largely unrelated to length of service when considered on a household basis, satisfaction with electrification appears to be moderately related to length of service when considered on an area basis. This is possibly related to the ceremonies and festivities usually accompanying the initial energization of the town, perhaps resulting in a certain bouyancy of opinion that is not repeated when individual households are electrified.

Another aspect of the opinion inquiry results is the urban-rural differences. For NEA coop areas, there is a very minor difference in satisfaction between urban and rural areas. However, for private and municipal areas, there is a large difference between urban and rural satisfaction: for the private and municipal systems, 37 percent of the electrified households show a low degree of satisfaction—over 3.5 times the apparent dissatisfaction rate in NEA cooperative areas. (More details will be found in Appendix A, Table 9)

## 2. Reliability and Responsiveness to Service Requests

The results of these inquiries are shown in Appendix A, Tables 10 and 11.

The principal findings are:

- Households in NEA service areas generally find the repair service more reliable than households in private or municipal service areas.
- Households in urban areas generally find the repair service more reliable than households in rural areas.
- Overall, relatively few respondents felt that services provided by NEA coops or the private and municipal systems were unreliable (16.3 percent in NEA areas and 19.7 percent in private/municipal areas)
- Overall, extremely few households felt that their requests for service had been ignored (3.2 percent in NEA areas, 3.0 percent in private/municipal areas).

#### IV. Description of the Survey and Future Survey Activities

##### A. Introduction

Although AID funded rural electrification programs have been implemented in a number of developing countries, prior to 1975 no comprehensive information had ever been collected about the socioeconomic response to rural electrification. Such studies as had been done tended to focus on engineering or management aspects of electrification, supplemented in some cases by sketchy information about "beneficiaries" in the areas initially electrified. BuCen involvement in applying survey research to rural electrification in the Philippines originated in the need for a comprehensive profile of the socioeconomic impact of rural electrification, with particular emphasis on the "rural poor."

The survey research project began with several goals:

- the development of comprehensive data on the socioeconomic characteristics of households that connected versus those that did not connect.
- the identification of the uses made of electricity and the changing pattern of use over time.
- the identification of the extent to which rural electrification reached the "poor majority" as opposed to upper-and middle-income groups
- the magnitude of demand for electricity

In addition, the survey research project was designed as an institution building activity. All too frequently, past information gathering efforts had been conducted by expatriate contractors and had provided little benefit to

host country organizational units. Consequently, the decision was made at the beginning of the survey effort to place overall responsibility for the survey research effort in the National Electrification Administration (NEA) and to support NEA's effort with extensive training and technical assistance from the U.S. Bureau of the Census.

The implementation history of this effort and the status of the continuing survey efforts are covered in the sections below. The highlights of the effort are:

- Two major nationwide household surveys have been completed:
  - the 1977 survey data has been analyzed and results have been published (June 1978) and the results of the preliminary analysis of the 1980 survey are contained in this report.
- Using BuCen technical assistance and training, the surveys were largely designed and carried out by the Program Control Office of NEA.
- In addition to the data available from the 1977 and 1980 surveys, extensive data is available from other sources on rural energy use which could support energy analysis or the design of future projects in this area.

## B. Description of the Surveys

### 1. 1980 Household Survey

The 1980 survey was a sample survey of about 6,000 households selected in a sample design that provided representation of both electrified and non-electrified households at both regional and national levels in several analytical groupings (See Appendix C). The survey included inquiries concerning:

- electrification status of the household
- the quantity and cost of electric usage and date of electrification  
(electrified households only)
- an energy use profile with detailed inquiries about availability of  
and expenditure for various kinds of energy and about the kinds of  
energy used for various household activities
- income and occupational data
- size and composition of the household
- several socioeconomic indicators, such as house construction  
materials, water source, ownership of various items, etc.
- attitudes and perceptions about the cost and quality of electric  
service

## 2. 1977 Household Survey

The 1977 survey covered essentially the same topics as the 1980 survey. Originally intended as a baseline survey covering recently electrified areas, the survey included about 3,000 household interviews. The sample design provided for nationwide representation of areas electrified in 1977. To provide estimates of nonelectrified areas, in 1977, the sample was supplemented with a judgmental sample of households in towns that were "matched" in terms of population size, electrification status, percentage of population that was urban, and geographical location. The somewhat more complex sample design for the 1980 survey was designed to provide, at one level, estimates that would be comparable in geographic scope to the 1977 survey and, on the other hand, estimates representative nationwide of the characteristics being studied.

The 1977 data were published in July 1978 by NEA. For the final 1980 report, the 1977 data will be retabulated to correspond to the more extensive detail in the 1980 report and published with an analysis of the 1977 - 1980 changes.

### C. Institutional and Survey Development

During the 1975-1980 period, the Program Control Office of NEA, and its predecessor offices, evolved from a small group of professionals with no survey research experience into a unit capable of carrying out two major survey efforts. Although a significant amount of staff turnover was encountered, the fact remains that the bulk of the work was carried out by NEA and, at this writing, the Program Control Office is planning studies of business uses of electricity using survey research methods which will take place with minimal technical assistance. In the following sections, the course followed by NEA's institutional growth will be discussed.

The evaluation began with the development of concepts and concerns to be examined during the course of the study. It is worth noting that many of the current issues in rural electrification evaluation -- and, in fact, the evaluation issues currently being discussed in the Bennet reports, etc. -- have largely evolved since 1976. At the time the issues of concern were being decided and the first survey was being designed, there were no clear issues to guide the development of the content of the surveys. In addition, there was very little background information about similar efforts in other countries. Consequently, an early effort was made to anticipate the kinds of socioeconomic responses that might follow rural electrification and might be of concern in project evaluation. With NEA professionals playing a major role, discussions were held with a variety of experts including engineers, social researchers, government officials and AID staff experienced in other rural electrification projects. Based on these discussions, a list of concerns was assembled that formed the direction of the evaluation and the basis of the first survey content. Throughout this effort, NEA efforts were supported by periodic technical assistance TDY's by BuGen staff to train the NEA staff in various aspects of evaluation design and survey development.

#### D. Survey Implementation

The questionnaire for the 1977 survey was developed by NEA professionals with BuCen support. The implementation of the 1977 survey effort was performed by a Philippine survey research contractor with experience in household surveys. After NEA had completed contract negotiations, BuCen technicians worked with NEA staff and contractors to develop complete training and fieldwork manuals and subsequently participated in the survey pretest. After all survey materials were pretested and the actual survey sample was developed, the contractor team went into the field to conduct the actual listing and interview fieldwork. Following the fieldwork, a second contractor, with responsibility for data processing, carried out most of the required data processing work. Technical difficulties in the final stages resulted in the work being transferred to Census Bureau headquarters to complete the tabulations of the survey data.

The results were returned to the Philippines, where NEA produced the first statistical report in this effort. When the 1977 survey report was released in July 1978, it was only of the few times that a major evaluation, involving a major survey research effort, had been successfully completed by host-country professionals.

After the 1977 survey was completed, preparations began almost immediately for the second survey, which was originally planned to take place February - March 1979. Several delays occurred which would have resulted in an April - May survey. The concensus of opinion at the time was that the 1980 survey should be conducted during the same months of the year as the second survey

in order to avoid distortions in comparisons that would arise from seasonal variations. Therefore, the second survey was postponed until February - March 1980. With the added developmental time, the survey content was reconsidered and modified based on the 1977 experience and additional inquiries were added to obtain an energy source and use profile. During this period, two professionals from NEA came to Washington, D.C. to work intensively with BuCen staff in the development of survey materials. The additional time was also used to develop comprehensive training materials to assure interviewer performance.

The second survey was fielded in February - March 1980. The first phase involved the preparation of household listings for the sample areas. In each of the 337 barangays that had been selected for the sample, sketch maps of the village were drawn, each household was numbered and placed on listing sheets, together with basic sampling and identification information, such as electrification status, location and name of the head of the household. The final sample of households was randomly selected from these listings.

The second phase involved the actual household interviews. Using a verbatim questionnaire, calling for each interview to be conducted in precisely the same manner, the interviewers conducted 6,219 interviews in the 337 barangays during a two-month period. While still in the field, the field supervisors reviewed the interviewers' work for completeness and consistency, requiring, in some cases, that an interview be repeated if the original work seemed incomplete or inadequate. At the conclusion of the fieldwork, the questionnaires were returned to Manila to await transmittal to the data processing contractor.

It was in the data processing phase that several delays took place. After a delay in the selection process, a contractor was selected who proved to be incapable of the somewhat complex tasks required. After several technical assistance TDY's by BuGen data processing experts over a period of several months, (during which period, the contractor largely exhausted the available funds without any real progress past keypunching the questionnaires), the decision was made to transfer the data processing operation to BuGen headquarters.

By the end of December 1980, the questionnaires and data tapes had been received in Washington and processing work resumed. The first major processing obstacle was the presence of approximately 1,000 questionnaires in the data file with inadequate identification. This problem had been identified and partially resolved by NEA staff prior to the transfer of the data. However, a considerable amount of work remained in a thorough-going validation of the keypunching and preliminary processing done by the contractor. This work was completed and all identification and duplicate problems were resolved in late January 1981. During February, a priority review was made of selected data items to be included in this report, following which, preliminary data tabulations were produced.

The review and correction of the survey data is continuing. Although this is a lengthy and, at times, tedious clerical process, it is absolutely necessary if reliable tabulations are to result. Based on current analysis of work load, the resolution of invalid and inconsistent data will be concluded in May 1981. At that time more comprehensive tabulations of the survey data will begin. Readers interested in obtaining copies of the tabulation plans should contact the office listed on the front page.

GLOSSARY OF TERMS AND CONCEPTS

APPLIANCES - devices operated by electricity and designed for household use. They were classified as small or major. Small appliances include irons, small television sets, fans, radios and phonographs. Major appliances include stoves, refrigerators, and air conditioners.

AUTOGENERATED (SELF-GENERATING) - households electrified with their own generators.

BARANGAY - the smallest political sub-division of a municipality.

BARRIO - same as barangay.

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

ELECTRIFIED OR CONNECTED HOUSEHOLD - household being provided with electricity or with a service drop at the time of the interview.

ENERGIZED TOWN OR BARANGAY - town or barangay which has at least one household served by an electric utility.

HEAD OF HOUSEHOLD - (NOTE: This is the standard definition employed by the National Census and Statistics Office, Republic of the Philippines.) - the person responsible for the care and organization of the household. This person usually provides the chief source of income for the household. Traditionally, this is the eldest male member of the household.

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 SIZE - the number of household members.

HOUSING MATERIALS - kind of building used in the construction of the dwelling occupied by the household. Four categories -- heavy/strong, light, mixed and shanty/barang-barang. The types of construction materials associated with each category are as follows:

Heavy/strong: the material used in the construction of the walls include: hollow blocks, stone, brick or wood. Roofing materials are either galvanized iron, aluminum, fiberglass, asbestos, concrete, or tile.

Light: the materials used in the construction of the walls and the roof are either bamboo, sawali, nipa, buri or anahaw.

Mixed: This is a combination of heavy and light.

Shanty/barong-barong: the materials used for the walls and the roof are billboards, salvaged materials, tires, canvas, cartons, etc.

INTERRUPTIONS: - any sudden cut-off or power failure during a regular electric service lasting more than 30 minutes.

MAINROAD BARANGAY - one that is within 4 kilometers from a national highway.

MAJOR APPLIANCES - this classification includes three devices operated by electricity and designed for household use. They are stove, refrigerator, and air conditioner.

NEA (National Electrification Administration): This agency of the Philippine government is responsible for organizing cooperatives who in turn distribute the electricity generated by the National Power Corporation.

NON-COOPERATIVE AREA - a geographical area not being served by the NEA electric cooperatives but served by a private or municipal electric system.

NON-ELECTRIFIED AREA - a geographical area not being served by any electric system.

NON-ELECTRIFIED or NON-CONNECTED HOUSEHOLDS - households not being provided with electricity, including households whose electric service had been cut-off.

NON-ENERGIZED TOWN OR BARANGAY - town or barangay which does not have a single household served by an electric utility.

NON-METROPOLITAN (METRO) AREA - areas other than Metro Manila, and the cities of Cebu, Iloilo, Davao and Angeles.

POBLACION - the barangay which is generally more urbanized than the other barangays of the municipality. It is generally located centrally and is the seat of the municipal government.

REMOTE BARANGAY - a barangay that is more than 4 kilometers from a national highway.

RESPONDENT - (NOTE: This is the standard definition employed by the National Census and Statistics Office, Republic of the Philippines.) - is any responsible member of the family who furnishes the information or answers to questions during the interview.

RURAL AREAS - all areas not falling under any of the urban classifications.

SERVICE AREAS - the geographic area covered by a supplier of electric power.

SMALL APPLIANCES - this classification includes the following electrically-operated household items: irons, small television sets, fans, radios, and phonographs.

STRATA - the universe was stratified into seven (7) strata or sub-universes. They are:

a. Electrified Towns in Coop Areas

U1 - Towns energized in 1977 (Old Towns, Old Coops)

U2 - Towns energized after 1977 by coops operating at the time of the 1977 survey (New Towns, Old Coops)

U3 - Towns energized by coops electrified after 1977 (New Coops)

b. Electrified Towns in Non-Coop Areas (Private Utilities)

U4 - Towns electrified presently by a private or municipal utility.

c. Non-Electrified Towns

U5 - Towns in energized coops

U6 - Towns in registered by non-energized coops.

U7 - Towns in unorganized a.

**URBAN AREAS** - (NOTE: This is the standard definition employed by the National Census and Statistics Office, Republic of the Philippines.) - are cities and municipalities in their entirety which meet any one of the following 4 criteria:  
 (1) having a population density of at least 1,000 persons per square kilometer;  
 or (2) Poblaciones or central districts of municipalities and cities which have a population density of at least 500 persons per square kilometer; or  
 (3) Poblaciones or central districts (not included in 1 and 2), regardless of the population size, which have the following characteristics:

- a. street pattern, i.e., network of streets in either parallel or right-angle orientation;
  - b. at least six establishments (commercial, manufacturing, recreational and/or personal services) and contains;
  - c. at least three of the following:
    - (1) a town hall, church or chapel with religious services at least once a month;
    - (2) a public plaza, park or cemetery;
    - (3) a market place or building where trading activities are carried on at least once a week;
    - (4) a public building like a school, hospital, agriculture and health center or library; and
- (4) Barangays having at least 1,000 inhabitants which meet the conditions set forth in (3) above, and where the occupation of the inhabitants is predominantly non-farming or fishing.

**APPENDIX B**  
**Statistical Tables**

TABLE 1. -- Numbers and Percentage of Households by Service Area and Connection Status

DESCRIPTION	Thousands of Households	Percent of Area	Percent of Total
Philippines Non-Metro Areas, total	4,927.8	(x)	100.0
Electrified	1,566.6	(x)	31.8
Not Electrified	3,361.2	(x)	68.2
Households in NEA Service Areas, total	2,688.6	100.0	54.6
Electrified	1,131.6	42.1	23.0
Not Electrified	1,557.0	57.9	31.6
Households in private or municipal service areas, total	1,161.1	100.0	23.4
Electrified	435.0	37.4	8.8
Not Electrified	727.0	62.6	14.6
Households in areas not served by any electric service, total	1,077.0	(x)	21.9

NOTE: (x) means not applicable

TABLE 2. -- Numbers and Percentages of Households: Service Area  
and Urban/Rural Status by Electrification Status

DESCRIPTION	Total Number of Households  (thousands)	Electrified Households		Non- Electrified Households	
		(thous.)	% of total	(thous.)	% of total
Philippines Non-Metro Areas, total	4,927.8	1,556.6	31.6	3,371.2	68.2
Urban	979.2	576.0	58.8	403.2	41.2
Rural	3,948.6	980.6	25.1	2,968.0	74.9
Households in NEA Service Areas, total	2,688.6	1,131.6	42.1	1,557.0	57.9
Urban	523.8	356.4	68.0	167.4	32.0
Rural	2,164.8	775.2	35.8	1,389.6	64.2
Households in private or municipal service areas, total	1,169.2	435.0	37.4	734.2	62.6
Urban	325.8	219.6	67.4	106.2	32.6
Rural	843.4	215.4	25.5	628.0	74.5
Households in areas not served by any electric service, total	1,077.0	-	-	1,077.0	100.0
Urban	129.6	-	-	129.6	100.0
Rural	947.4	-	-	947.4	100.0

TABLE 3. -- Numbers and Percentages of Households: Service Area and Remoteness of Village by Electrification Status

	Total Number of Households  (thousands)	Electrified Households		Non- Electrified Households	
		(thous.)	% of total	(thous.)	% of total
Philippines Non-Metro Areas, total	4,927.8	1,566.6	31.8	3,361.2	68.2
Poblacion villages	859.8	519.0	58.5	370.8	41.5
Mainroad villages	2,464.6	917.4	37.2	1,547.2	62.8
Remote villages	1,503.0	102.0	6.8	1,401.0	93.2
Location not known	70.2	28.2	40.2	42.0	59.8
Households in NEA Service Areas, total	2,688.6	1,131.6	42.1	1,557.0	57.9
Poblacion villages	551.4	394.2	71.5	157.2	28.5
Mainroad villages	1,359.6	619.2	45.5	740.4	54.5
Remote villages	736.8	96.6	13.1	640.2	86.9
Location not known	40.8	21.6	52.9	19.2	47.1
Households in private or municipal service areas, total	1,166.2	435.0	37.4	731.2	62.6
Poblacion villages	302.8	134.5	44.5	208.3	68.8
Mainroad villages	660.6	298.2	45.1	362.4	54.9
Remote villages	281.4	5.4	1.9	276.0	98.1
Location not known	17.4	6.9	37.9	10.5	60.1
Households in areas not served by any electric service, total	1,077.0	-	-	1,077.0	100.0
Poblacion villages	135.6	-	-	135.6	100.0
Mainroad villages	444.6	-	-	444.6	100.0
Remote villages	484.8	-	-	484.8	100.0
Location not known	12.0	-	-	12.0	100.0

TABLE 4. -- Numbers and Percentages of Households: Service Area and Type of Home by Electrification Status

DESCRIPTION	Total Number of Households (thousands)	Electrified Households		Non-Electrified Households	
		(thous.)	% of total	(thous.)	% of total
Philippines Non-Metro Areas, total	4,927.8	1,566.6	31.8	3,361.2	68.2
Shanty	415.8	36.6	8.8	379.2	91.2
Light Materials	2,216.4	363.6	16.4	1,852.8	83.6
Mixed Materials	1,461.6	643.2	44.0	818.4	56.0
Heavy/strong materials	820.9	517.2	63.2	303.7	36.8
Not known	13.2	6.0	45.5	7.2	54.5
Households in NEA Service Areas, Total	2,688.6	1,131.6	42.1	1,557.0	57.9
Shanty	155.4	24.6	15.8	130.8	84.2
Light Materials	1,190.4	287.4	24.1	903.0	75.9
Mixed Materials	873.6	457.2	52.3	416.4	47.7
Heavy/strong materials	468.8	361.2	77.4	107.6	22.6
Not known	2.4	1.2	50.0	1.2	50.0
Household in private or municipal service areas, total	1,161.2	438.0	37.4	723.2	62.6
Shanty	135.6	12.0	8.8	123.6	91.2
Light Materials	472.8	76.2	16.1	396.6	83.9
Mixed Materials	349.8	182.0	52.0	167.8	48.0
Heavy/strong materials	196.8	156.0	79.3	40.8	20.7
Not known	7.8	4.8	61.7	3.0	38.5
Households in areas not served by any electric service, total	1,077.0	-	-	1,077.0	100.0
Shanty	124.8	-	-	124.8	100.0
Light Materials	553.2	-	-	553.2	100.0
Mixed Materials	271.2	-	-	271.2	100.0
Heavy/strong materials	117.2	-	-	117.2	100.0
Not known	3.6	-	-	3.6	100.0

TABLE 5. -- Percentages of Electrified Households in NEA Service Areas: Type of Use by Length of Service

USE OF ELECTRICITY	Total, all Households	Length of Service				
		1 Year or Less	1-2 Years	3-4 Years	5 or more Years	Not Known
ALL electrified households	100.0	19.2	23.9	10.9	21.0	25.0
Lighting	95.5	95.0	94.9	97.1	95.5	95.8
Reading at night	79.3	79.6	81.8	85.4	79.6	73.5
Small Appliances	70.0	56.6	64.7	76.1	88.2	67.4
Major Appliances	25.0	13.0	19.7	23.4	40.1	28.0

TABLE 6. -- Percentages of Electrified Households In NEA Service Areas: Type of Use by Type of House

USE OF ELECTRICITY	Total, all Households	TYPE OF HOUSE			
		Shanty	Light Materials	Mixed Materials	Heavy Materials
ALL electrified households	100.0	2.2	25.4	40.4	31.9
Lighting	95.5	92.7	95.4	94.8	97.1
Reading at night	79.3	65.9	74.5	80.6	82.6
Small Appliances	70.0	48.8	50.5	72.8	83.7
Major Appliances	25.0	4.9	9.0	24.7	40.2

TABLE 7. -- Percentages of Electrified Households Not In NEA Service Areas: Type of Use by Length of Service

USE OF ELECTRICITY	Total, all households	LENGTH OF SERVICE				Not known
		1 year or less	1-2 years	3-4 years	5 or more years	
ALL electrified households, total	100.0	9.5	12.7	6.3	29.0	42.5
Lighting	99.2	98.6	100.0	100.0	99.0	99.0
Reading at night	79.2	76.8	79.3	89.1	81.9	76.3
Small Appliances	74.2	56.5	73.9	87.0	81.0	71.8
Major Appliances	28.9	15.9	18.5	43.5	29.0	32.1

TABLE 8. -- Percentages of Electrified Households Not In NEA Service Areas: Type of Use by Type of House

USE OF ELECTRICITY	Total, all Households	TYPE OF HOUSE				
		Shanty	Light Material	Mixed Material	Heavy Material	Not Known
ALL electrified households, total	100.0	2.7	17.4	41.7	36.0	1.1
Lighting	99.2	95.0	99.2	99.4	100.0	75.0
Reading at night	79.2	80.0	69.3	77.7	86.5	50.0
Small Appliances	74.2	55.0	63.0	73.5	83.1	37.5
Major Appliances	28.9	10.0	16.5	24.5	41.5	12.5

TABLE 9. -- Percentages of Electrified Households: Service Area Grouping and Location by Rating of Satisfaction with Electric Service

(The figures in this table are based on responses to this question: "How would you rate your degree of satisfaction with the performance of the electric company serving you?")

High  
 Fair  
 Low  
 Don't know/no response)

GROUP (a)	PERCENTAGE OF RESPONDENTS ANSWERING:					
	High (b)	Fair (c)	Low (d)	DK/NR (e)	Col b Col d (f)	Col b - Col d (g)
Town energized for 3 or more years In NEA service areas energized for 3 years or more, total	8.7	69.4	14.2	7.8	0.61	- 5.5
Urban/Rural Status: Urban	7.3	77.4	12.0	3.2	0.61	- 4.7
Rural	9.2	66.8	15.0	8.9	0.61	- 5.6
Location Status: population vil.	11.3	69.1	12.6	7.0	0.90	- 1.3
mainroad vil.	6.5	70.3	15.6	7.4	0.41	- 9.3
remote village	12.3	64.6	9.5	13.0	1.29	2.8
Town energized for less than 3 years In NEA service areas energized for 3 or more years total	16.7	66.4	11.4	5.6	1.46	5.3
Urban/Rural Status: Urban	16.6	66.3	10.3	6.9	1.61	6.3
Rural	16.7	66.5	12.2	1.8	1.37	4.5
Location Status: population vil.	15.2	67.6	9.9	7.0	1.54	5.3
mainroad vil.	21.2	63.3	13.5	2.5	1.57	7.7
remote village	2.7	73.0	6.1	16.2	0.35	5.4

TABLE 9 (continued)

GROUP (a)	PERCENTAGE OF RESPONDENTS ANSWERING:					
	High (b)	Fair (c)	Low (d)	DK/NP (e)	$\frac{\text{Col b}}{\text{Col d}}$ (f)	Col b - Col d (g)
Towns in NEA coop areas energized for less than 3 years, total	8.3	78.2	5.6	7.8	1.48	2.7
by urban/rural: urban	8.9	73.8	7.4	9.9	1.20	1.5
rural	8.1	81.3	4.4	6.1	1.84	3.7
by location: poblacion vil.	11.3	72.7	5.5	10.5	2.05	5.8
mainroad vil.	5.6	84.7	6.0	12.5	0.93	- 0.4
remote village	5.3	78.9	5.3	10.5	1.00	-
Households with electricity from private and municipal electric systems, total	12.0	48.3	23.4	16.3	0.51	-11.4
by urban/rural: urban	18.6	45.1	10.7	25.6	1.74	7.9
rural	5.4	50.9	36.9	6.8	0.15	-31.5
by location: poblacion vil.	20.2	41.8	27.9	10.1	0.72	- 7.7
mainroad vil.	8.7	51.5	22.3	17.6	0.39	-13.6
remote village	-	22.2	-	77.8	(x)	(x)

NOTE: (x) means not applicable

TABLE 10. -- Percentages of Electrified Households: Service Area Grouping and Locations by Rating of Reliability of Service

(The figures in this table are based on responses to this question: "Is the household repair service provided by your electric company usually reliable, usually not reliable, or is there no service available?")

- Usually reliable  
 Usually not reliable  
 No service available  
 Don't know/no response)

GROUP	PERCENTAGE OF RESPONDENTS REPORTING:		
	Reliable	Unreliable	No service or DK/NE
Households serviced by NEA, total	57.4	16.3	26.3
Urban	61.8	13.0	25.2
Rural	55.9	17.6	26.4
Households serviced by private or municipal system, total	48.7	19.7	31.6
Urban	54.6	17.5	27.9
Rural	42.6	21.9	35.5

TABLE 11. -- Percentages of Electrified Households: Service Area Groupings and Location by Rating of Responsiveness to Requests for Repair Service

(The figures in this table are based on responses to this question: "Is response to your request for repair usually prompt or not?")

- Usually prompt
- Not prompt
- Ignored
- Don't know/no response)

GROUP	PERCENTAGES OF RESPONDENTS REPORTING:			
	Usually prompt	Not Prompt	Ignored	DK/NA
Households serviced by NEA cooperatives, total	51.7	21.7	3.2	23.4
Urban	54.4	19.2	6.1	20.4
Rural	51.0	22.7	2.0	24.4
Households serviced by private or municipal systems, total	45.1	22.3	3.0	29.4
Urban	49.5	22.1	1.1	27.3
Rural	40.9	22.7	5.1	31.2

**APPENDIX C**

**The Relation of Income and House Construction Materials**

## APPENDIX

## The Relation of Income and House Construction Materials

For this report, house construction materials have been used as a proxy for income or socioeconomic status. This appendix presents the relation between income and house construction type based on a 1977 survey in which both were collected. The 1977 survey used a sample of 3,000 households in the non-metropolitan areas of the Philippines. The excluded metropolitan areas were: Metro-Manila and the cities of Cebu, Iloilo, Angeles and Davao. Tables 1 and 2 in this appendix show the relation of house construction type and total annual household income (all sources). The income data are presented in quintiles. In the literature, the use of household per capita income is sometimes recommended to adjust for large families with several income producing members. Tables 3 and 4 are based on quintiles of household per capita income. In this instance, quintiles of total household income and quintiles of household per capita income produced substantially the same results. Table 5 shows the relation of total household and per capita household income quintiles.

The following definitions have been used in these tables:

Total Household Income - annual income from all sources received by all household members.

Quintiles of Total Household Income - the values of total household income were arrayed from lowest to highest values. The lowest 20 percent of households formed the lowest quintile, the next lowest 20 percent of households formed the second lowest quintile, etc.

Household Per Capita Income - this figure is computed by dividing total household income by the number of household members.

Quintiles of Household Per Capita Income - the values of household per capita income were arrayed from lowest to highest. The lowest 20 percent of households formed the lowest quintile, the second lowest 20 percent of households formed the second lowest quintile, etc.

TABLE 1. -- Percentages of All Philippine Non-Metro Area Households: Type of House Materials by Quintiles of Total Household Income

QUINTILES OF TOTAL ANNUAL HOUSEHOLD INCOME	Total, all Types	Percentage of Households Residing in:			
		Shanty	Light Materials	Mixed Materials	Heavy Materials
Total, all income groups	100.0	12.5	46.8	28.2	12.5
Lowest 20% (P 0-1899)	20.0	5.4	10.7	3.1	0.9
Second Lowest 20% (P 1900-3459)	20.0	2.9	11.2	4.4	1.4
Middle 20% (P 3460-5499)	20.0	2.3	10.5	5.3	1.8
Second Highest 20% (P 5500-9619)	20.0	1.5	8.8	7.3	2.7
Highest 20% (P 9620 and more)	20.0	0.5	5.7	8.1	5.7

TABLE 2. -- Percentages of All Philippine Non-Metro Area Households: Type of House Materials (Grouped) by Quintiles of Total Household Income

QUINTILES OF TOTAL ANNUAL HOUSEHOLD INCOME	Total, all house types	Percentage of Households Residing in:		
		Shanty or light mat.	Mixed Materials	Heavy or Strong
Total, all income groups	100.0	59.3	28.2	12.5
Lowest 40 percent	40.0	30.2	7.5	2.3
Middle 40 percent	40.0	23.1	12.6	4.5
Highest 20 percent	20.0	6.2	8.1	5.7

TABLE 3. -- Percentages of All Philippine Non-Metro Area Households: Type of House Construction by Quintiles of Household Per Capita Income

QUINTILES OF ANNUAL HOUSEHOLD PER CAPITA INCOME	Total, all Types	Percentage of Households Residing in:			
		Shanty	Light Materials	Mixed Materials	Heavy Materials
Total, all income groups	100.0	12.5	46.8	28.2	12.5
Lowest 20% (P 0-359)	20.0	4.4	11.1	3.7	0.8
Second Lowest 20% (P 360-609)	20.0	3.3	10.7	4.7	1.3
Middle 20% (P 610-969)	20.0	2.6	10.5	4.9	2.0
Second Highest 20% (P 970-1699)	20.0	1.6	8.6	7.3	2.5
Highest 20% (P 1670 or more)	20.0	0.6	5.9	7.6	5.9

TABLE 4. -- Percentage of All Philippine Non-Metro Area Households: Type of House Construction (Grouped) by Quintiles of Household Per Capita Income

QUINTILES OF ANNUAL HOUSEHOLD PER CAPITA INCOME	Total, all house types	Percentage of Households Residing in:		
		Shanty or light mat.	Mixed Materials	Heavy or Strong
Total, all income groups	100.0	59.3	28.2	12.5
Lowest 40 percent	40.0	29.5	8.4	2.1
Middle 40 percent	40.0	23.3	12.2	4.5
Highest 20 percent	20.0	6.5	7.6	5.9

TABLE 5. -- Percentage of Philippine Non-metro Area Households:  
 Quintiles of Total Household Income by Quintiles  
 of Per Capita Household Income

QUINTILES OF HOUSEHOLD PER CAPITA INCOME	Total, all Households	Quintiles of Total Household Income				
		Lowest 20%	Second Lowest 20%	Middle 20%	Second Highest 20%	Highest 20%
Total, all house- holds	100.0	20.0	20.0	20.0	20.0	20.0
Lowest 20 percent	20.0	14.7	5.0	0.3	-	-
Second lowest 20%	20.0	4.2	8.8	6.2	0.8	-
Middle 20 percent	20.0	1.1	4.1	8.2	6.5	0.1
Second highest 20%	20.0	-	1.9	4.0	8.8	5.3
Highest 20 percent	20.0	-	0.2	1.3	3.9	14.6

**APPENDIX D**

**1980 Sampling Methodology for Household Survey**

## APPENDIX

## 1980 Sampling Methodology for Household Survey

1. The Universe and the General Sample Design

The universe for NEA's 1980 household survey consists of all households in the Philippines except those in Metro-Manila, Cebu, Iloilo, Davao and Angeles, where private franchise systems will not be taken over by NEA electric cooperatives. The households in the survey then will be part of a national probability sample of households in the Philippines excluding those in the five cities mentioned previously. There also was a separate follow-up sample of the noncooperative sample barrios that were in the 1977 survey. In addition, after the national probability sample had been selected, an experimental design-like matching of the nonelectrified barrios to the electrified cooperative barrios in the sample was proposed.

2. Partition of the Universe for Sample Selection

In accordance with the objectives and analytical plan of the survey, the universe was divided into the following sub-universes:

## (1) Cooperative Areas

$U_1$  = towns served by co-ops energized at the time of the 1977 survey  
(Old towns, old co-ops)

$U_2$  = towns served by the old co-ops after the 1977 survey (new towns, old co-ops)

$U_3$  = towns served co-ops energized after 1977 (new co-ops)

## (2) Private Utilities (noncooperative areas)

$U_4$  = towns served by a private or municipal electric utility

## (3) Nonelectrified areas

$U_5$  = towns within the domain of an energized co-op but without electricity.

$U_6$  = towns within the domain of a registered, but nonenergized co-op

$U_7$  = towns in unorganized areas

### 3. Sampling Procedures

$U_1$  = old towns, old co-ops

The co-op universe for the 1977 survey consisted of the energized towns in the 54 established co-ops. These towns will be represented by their 1977 sample towns so that the change in energized towns over the last two years can be analyzed. Since the 1977 co-op sample was not a self-weighting one, the selection rates were adjusted to give self-weighting samples of electrified and nonelectrified households.

Sampling rates that would provide a self-weighting sample were calculated. The actual sample size varied depending on the number of households in the selected barrios in 1977. But if the sampling rates or sampling intervals are applied exactly, each electrified household in the sample will have a weight of 600 and each nonelectrified household a weight of 1200.

To illustrate the manner in which these sampling intervals were obtained, the sample design will be discussed. 1/ First the co-ops were divided into six non-self-representing strata and two self-representing strata of one co-op each. 2/

---

1/ The 1980 sample design is almost the same as the sample design used in 1977. The selection of the households within the selected barrios is different.

2/ VRESCO in Negros Occidental and NORESCO in Misamis Oriental are the two self-representing strata.

(The sampling intervals for the self-representing co-ops are explained later in the appendix.) The co-ops were selected with probability proportional to the number of households in a co-op.

So the chance of drawing La Union into the sample was 2 times the ratio of the 1970 number of households in La Union to the 1970 total number of households in Stratum I, i. e.  $2 \times (37218/282294) = .2637$ . Second, two towns were selected probability proportional to the estimated number of households in a town in 1970. The chance of drawing Aringay in La Union, then, was two times the ratio of the 1975 number of households in Aringay to the total for La Union, i.e  $2 \times (4166/37218) = .2239$ . Third, four barrios were selected probability proportional to the 1975 number of households in a barrio. The chance of drawing the barrio, poblacion within Aringay, was four times the ratio of its 1975 number of households to the 1975 number of households in Aringay, i.e.  $4 \times (425/4175) = .4072$ . For the overall probability of selection for each household to be .001667 or 1 out of 600 we must have:

$$\frac{1}{600} = \frac{1}{SI_{hijk}} \times \frac{2 N_{h170}}{N_{h70}} \times \frac{2 N_{h1j70}}{N_{h170}} \times \frac{4 N_{hijk75}}{N_{h1j75}}$$

- where  $SI_{hijk}$  = the sampling interval for the kth barrio in the jth town, the ith co-op, the hth stratum;
- $N_{h70}$  = the 1970 number of households in the hth stratum
- $N_{h170}$  = The 1970 number of households in the lth co-op, the hth stratum
- $N_{h1j70}$  = The 1970 number of households in the jth town, lth co-op, hth stratum;
- $N_{h1j75}$  = The 1975 number of households in the jth town, in the co-op, hth stratum;
- $N_{hijk75}$  = The 1975 number of households in the kth barrio, jth town, lth co-op, hth stratum

The sampling interval then is:

$$SI_{hijk} = \frac{9600}{N_{h70}} \times \frac{N_{h1j70}}{N_{h1j75}} \times N_{hijk75}$$

For example in Poblacion in Aringay of La Union:

$$\frac{1}{600} = \frac{1}{SI} \times 2 \frac{37218}{282294} \times 2 \frac{4166}{37218} \times 4 \frac{425}{4175}$$

SI = 14.42

Exceptions:

1. In stratum IV, Camarines Norte was selected assuming a population of 74549, but in fact the electrified towns sum to 37549. The sampling interval calculated using the above formula must be multiplied by a factor of 37549/74549.
2. In Stratum IV, Poblacion in Maercedes of Camarines Norte was a double hit in the systematic sampling of barrios because its 1975 population of 1365 was greater than one-fourth of the total for Mercedes, 4084. The interval in table 1 is one half that given by the formula.
3. In Stratum V, Zamboanga City, a town, represents an entire co-op. Because the probability of selecting Zamboanga City was one, the correct sampling interval is one half of that given by the above formula.

For the self-representing co-ops, the number of towns and barrios selected was reduced to lower the sampling interval. In 1977, two towns were selected from each self-representing co-op. For the 1980 survey, one of these towns was selected with equal probabilities: Gitagum in MORESCO and Manapla in VRESCO. Two of the four barrios were also selected with equal probabilities. Cogan and Matangad in MORESCO, and Poblacion and Purisima in VRESCO. The sampling intervals for the self-representing barrios are

$$SI_{hijk} = 1200 \times \frac{B_{h1j70}}{N_{h170}} \times \frac{N_{h1jk75}}{N_{h1j75}}$$

**(2) U2 - New towns, Old Co-ops**

Using NEA's "Status of House Connections by towns served per co-op," the new towns were identified and their 1975 household population recorded. The co-ops with their new town's household population were grouped according to their 1977 stratification. The total number of households per strata was obtained and these co-ops were stratified into four (4) super-strata on the basis of geographical location and approximately equal size strata. Size is defined as the number of households.

The co-ops were sorted by the household population of their new towns and one co-op was selected per stratum. In selecting the U2 sample co-ops the overlap with the U1 sample was maximized using a Keyfitz technique. A sample co-op was treated as a cluster and two (2) towns were selected per co-op by PPS (probability proportional to size) method of sampling. Prior to selection, the towns were ranked by their percent electrification (i.e., no of electrified households ÷ total no. of households). Similarly, the barrios were ranked under each sample town by percent electrification (the unelectrified barrios were selected per town by PPS. At the barrio level, selection rates were computed to obtain self-weighting samples of electrified and nonelectrified households.

Sampling rates: 1 in 600 electrified

1 in 1200 nonelectrified

The sampling interval ( $SI_{ijk}$ ) for electrified households can be calculated from the following formula:

$$SI_{ijk} = 600 \times P_i \times 2 \frac{N_{ij}}{N_i} \times 4 \frac{N_{ijk}}{N_{ij}}$$

where  $P_i$  = probability of a co-op being selected using Key fitz technique

$N_i$  = the 1975 number of households in the  $i$ th co-op,

$N_{ij}$  = The 1975 number of households in the  $i$ th co-op,  $j$ th town

$N_{ijk}$  = The 1975 number of households in the  $i$ th co-op,  $j$ th town and  $k$ th barrio.

(3) U3 = Towns served by New Co-ops

The same set of records were used to identify and the same basis for stratification was employed as in U2, the new co-ops were identified and stratified into four (4) strata. Then the co-ops were sorted by their 1975 household population and one co-op was selected per stratum by PPS. A sample co-op was treated as a cluster and two (2) towns were selected per co-op by PPS. Prior to selection the towns were ranked by their percent electrification. Within sample towns, the barrios were ranked by percent electrification with unelectrified barrios being ranked by their household population. Then four (4) barrios were selected per town by PPS. At the barrio level, selection rates were computed to get self-weighting samples of electrified and non-electrified households.

Sampling rates : 1 in 600 electrified

1 in 1200 non-electrified

The overall probability of selection for each electrified household is:

$$\frac{1}{600} = \frac{1}{S_{hijk}} \times \frac{N_{hi}}{N_h} \times 2 \times \frac{N_{hij}}{N_{hi}} \times 4 \times \frac{N_{hijk}}{N_{hij}}$$

where:

- $SI_{hijk}$  = The sampling interval for the kth barrio in the jth town, the ith co-op, the hth stratum  
 $N_h$  = The 1975 number of households in the hth stratum  
 $N_{hi}$  = The 1975 number of households in the ith co-op, the hth stratum  
 $N_{hij}$  = The 1975 number of households in the jth town, ith co-op, hth stratum  
 $N_{hijk}$  = The 1975 number of households in the kth barrio, jth town, ith co-op, hth stratum

(4) U4 = Nonco-op Towns

NEA's Program Control Center's list of towns served by private or municipal systems was used to identify the nonco-op towns and these were sorted by province and region. These were then stratified geographically into four (4) approximately equal-size strata. Ten sample towns were selected and allocated proportionately per stratum on the basis of stratum size. Within stratum, the towns were ordered by their 1975 household population. Once the sample town was selected by PPS, the barrios within towns were sorted by their 1975 Census urban-rural classification and 1975 household population. Then four barrios were selected per town by PPS and selection rates were computed to get self-weighting samples of electrified and non-electrified households.

To obtain a 1 out of 600 over-all probability of selection for electrified households, then

$$\frac{1}{600} = \frac{1}{SI_{hij}} \times C \frac{N_{hi}}{N_h} \times 4 \frac{N_{hij}}{N_{hi}}$$

Where  $SI_{hij}$  = the sampling interval for the jth barrio, in the ith town, the hth stratum

- $C$  = the number of towns selected per stratum;  $C = 2$  Or  $3$   
 $N_h$  = the 1975 number of households in the  $h$ th stratum  
 $N_{hi}$  = the 1975 number of households in the  $i$ th town,  $h$ th stratum  
 $N_{hij}$  = the 1975 number of households in the  $j$ th barrio, the  $i$ th town, the  $h$ th stratum

- (5) U5 = Non-electrified towns in the Service Area Coverage of Energized Co-ops.

The list of towns under the service area coverage of each energized co-op was obtained from the Franchising Division in NEA and together with the list of energized towns per co-op, the U5 towns were identified. The towns were sorted by province, and the provinces sorted by region. Then the towns were stratified into four (4) approximately equal size strata.

Within stratum, the towns were ordered by their 1975 household population and two towns were selected per stratum by PPS.

Within towns, the barrios were ordered by their 1975 Census urban-rural classification and 1975 household population and four barrios were selected per town by PPS. Once the sample barrios were selected, the sampling intervals were computed to get a self-weighting sample of non-electrified households. For the overall probability of selection of each non-electrified household to be 1 out of 1200, we must have

$$\frac{1}{1200} = \frac{1}{SI_{hij}} \times \frac{2 N_{hi}}{N_h} \times \frac{4 N_{hij}}{N_{hi}}$$

- Where  $SI_{hij}$  = the sampling interval for the  $j$ th barrio, in the  $i$ th town, the  $h$ th stratum  
 $N_h$  = the 1975 number of households in the  $h$ th stratum  
 $N_{hi}$  = the 1975 number of households in the  $i$ th town, the  $h$ th stratum

$N_{hij}$  = the 1975 number of households in the  $j$ th barrio, the  $i$ th towns, the  $h$ th stratum

(6) U6 = Nonelectrified towns in registered but nonenergized co-ops

A list of the registered but nonenergized co-ops and the towns under the service area of these coops was obtained from the Feasibility Division of NEA. These towns were sorted by province and region and stratified geographically into four (4) approximately equal size strata. Then the same procedure was followed in selecting the U5 sample towns and barrios. The selection rates were also computed to get a self-weighting sample of nonelectrified households using the formula given in section 3.5.

(7) U7 = Towns in unorganized areas

From the National Census and Statistical Office list of towns by province and region for the whole country, the towns that belong to sub-universes U1 through U6 were crossed out. Then the remaining towns were sorted by province and region, and stratified geographically into four (4) approximately equal size strata. The same procedure in selecting the U5 sample towns and barrios was followed and the same formula for computing the sampling intervals in U5 was used.

**APPENDIX E**

**Purposes of the Philippine Rural Electrification Program**

In this appendix, excerpts of the various loan papers are provided to illustrate the evaluation of the stated purposes of the rural electrification programs.

I. VRESCO Capital Assistance Paper:

A. From the main text:

- "1. To demonstrate the success of large-scale area coverage for the Philippines, through an electric power cooperative.
2. To demonstrate the financial viability of large-scale area coverage electrification where investment in generating capacity must be made to provide a source of power.
3. To stimulate the formation and activities of public and private sector institutions which would advance rural electrification in the Philippines through technical, managerial, organization and financial assistance to rural systems."

B. From the introductory sheet of CAP summary (and changes):

"PURPOSE OF LOAN: This is a pilot demonstration project to initiate a program of rural electrification in the Philippines, with the following objectives:

- a. To demonstrate the economic feasibility of rural electrification,
- b. To demonstrate the benefits to the regional economy from the introduction of electrification to rural areas of substantial population,
- c. To develop public sector support for a nationwide program including scale of power, technical assistance and financing."

C. From the section on the "Place of the Project in the Development Program"

"The project is intended to accelerate economic development, improve the standard of living in rural areas of the Philippines and develop democratic institutions."

II. MORESCO Capital Assistance Paper:

A. From the main text:

- "1. To demonstrate the success or large-scale area coverage for the Philippines, through an electric power cooperative.
2. To promote electrification on the Island of Mindanao and utilization of the low-cost hydropower source of the National Power Corporation (NPC) at Maria Cristina. (NOTE: This is the only difference between the MORESCO and VRESCO goals).
3. To stimulate the formation and activities of public and private sector institutions which would advance rural electrification in the Philippines through technical, managerial, organizational and financial assistance to rural systems."

B. From the introductory sheet of CAP summary (and changes):

"PURPOSE OF LOAN: This is a pilot demonstration project to initiate a program of rural electrification in the Philippines, with the following objectives:

- a. To demonstrate the economic feasibility of rural electrification,
- b. To demonstrate the benefits to the regional economy from the introduction of electrification to rural areas of substantial population.

c. To develop public sector support for a nationwide program including sale of power, technical assistance and financing."

C. From the section on the "Place of the Project in the Development Program:"

"The project is intended to accelerate economic development, improve the standard of living in rural areas of the Philippines and develop democratic institutions."

### III. Rural Electrification Loan I -- 1972

A. From the Capital Assistance Paper:

"PROGRAM GOAL" the goal of AID's Rural Electrification Assistance Program is to further the welfare of the people in the rural areas and to increase income and employment opportunities in the rural areas by making electric power available at reasonable rates for both household amenities and increased production.

This goal is among the highest priorities of the government of the Philippines and USAID/Manila.

PURPOSE OF LOAN: In the context of AID's overall rural electrification program goal, the immediate objectives of the loan are twofold:

a. To assist the GOP in the implementation of an initial stage rural electrification program that will provide for establishment of an initial group of economically, administratively and technically viable rural electric cooperatives systems

geographically dispersed throughout the Philippines. These systems will provide reliable and economic service for domestic, agricultural and industrial uses in areas inhabited by about 5 million people, at a total cost in the vicinity of 600 million pesos and resulting an estimated 36 cooperatives. This will be accomplished by the end of FY 1976; and

- b. to develop the institutional capability of NEA through the experience gained in the implementation of this first phase program, through utilization of technical assistance provided that under this loan and other related loan and grant assistance; and through the self help measures agreed to by the GOP as conditions and covenants under this loan."

#### IV. Rural Electrification Loan II - 1974

From the only loan-related purpose statement appearing on the summary sheet:

"PURPOSE: To assist the GOP in its efforts to improve the economic and social conditions of rural areas by providing continuous, dependable and economical electric service on a self-supporting basis."

NEA program objectives are also described as follows:

1. Provide a backbone distribution system (in areas of population concentrations) which will be capable of future expansion;
2. Enable the sub-beneficiaries and implementing agencies (Rural Electric Cooperatives) to acquire the technical capability and

financial resources necessary for sustained, financially viable operation and future expansion;

3. Promote economic development of rural areas by providing energy for more intensive agriculture through electric pump irrigation, agro-industrial use, and for small-scale use industrial development;
4. Generally improve the quality of rural life by bringing electric service to individual member homes of the cooperatives, increasing employment opportunities and improving food supplies."

V. Rural Electrification Loan III -- 1974

From the logical framework (This was the first Philippine RE loan to use the logical framework project design summary):

"PROGRAM ON SECTOR GOAL: the goal of the project is to further the welfare of the people in the rural areas and to increase income and employment opportunities particularly among the highest priorities of the government of the Philippines and USAID.

MEASURES OF GOAL ACHIEVEMENT:

1. Increase in the number of rural households electrified in 1980.
2. Increase in employment in rural areas by 1980.
3. Increase in per capita purchasing power in real terms for lower 50 percent income group of rural areas by 1980.

PROJECT PURPOSE: To make electric power available in selected rural areas at reasonable rates for both household amenities and increased production.

END OF PROJECT STATUS:

1. Approximately 12 new rural electric coops operating satisfactorily by 1978.
2. These coops have an average of 7,000-7,500 customers each by 1980.
3. Use of some project inputs for assistance to existing coops by 1978."

VI. Rural Electrification Loan IV -- 1976

From the logical framework:

"PROGRAM ON SECTOR GOAL: an improved standard of living for rural people.

MEASURES OF GOAL ACHIEVEMENT:

1. Average rural family real incomes in coop areas increased by 20 percent between 1975 and 1980.
2. By 1980, at least 20 percent of residents of coop areas realizing incomes from jobs that did not exist before electricity.
3. By 1980, at least 40 percent of coop area residents having ready access to social services.

PROJECT PURPOSE: Increased production and improved daily amenities made possible by reliable electric power available at reasonable rates in rural areas.

**OBJECTIVELY VERIFIABLE INDICATORS:**

1. Electric power available 24 hours a day to one-third of the rural population
2. Agricultural production (especially rice) increased by 20 percent in coop areas; and actually doubled in areas where electric pumps have been installed;
3. All connected households having at least one labor-saving or convenience electric appliance, and 30 percent having three or more."

**VII. Rural Electrification Loan V - 1977**

From the logical framework:

"PROGRAM ON SECTOR GOAL: an improved standard of living for rural people

**MEASURES OF GOAL ACHIEVEMENT:**

1. Average rural family real incomes in coop areas increase by 20 percent between 1976 and 1980
2. By 1980, at least 20 percent of residents of coop areas realizing incomes from jobs that did not exist before electricity.
3. By 1980, at least 40 percent of coop area residents having ready access to social services.

**PROJECT PURPOSE:** Increased production and improved daily amenities made possible by reliable electric power available at reasonable rates in rural areas.

**OBJECTIVELY VERIFIABLE INDICATORS:**

1. Electric power available 24 hours a day to one-third of the rural population.
2. Agricultural production (especially rice) increased by 20 percent in coop areas; and actually doubled in areas where electric pumps have been installed.
3. All connected households having at least one labor-saving or convenience electric appliance, and 30 percent having three or more."