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REPORT ON THE  
PHILIPPINE RURAL ELECTRIFICATION  
IMPACT SURVEY (1981)

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## DEFINITIONS

- barangay -- formerly identified as "barrio"; village, but with administrative as well as geographic connotation
- main feeder -- three-phase electric distribution line generally following major roads.
- poblacion -- the central "urban" portion of Philippine "municipalidades" -- towns and cities

## ABBREVIATIONS

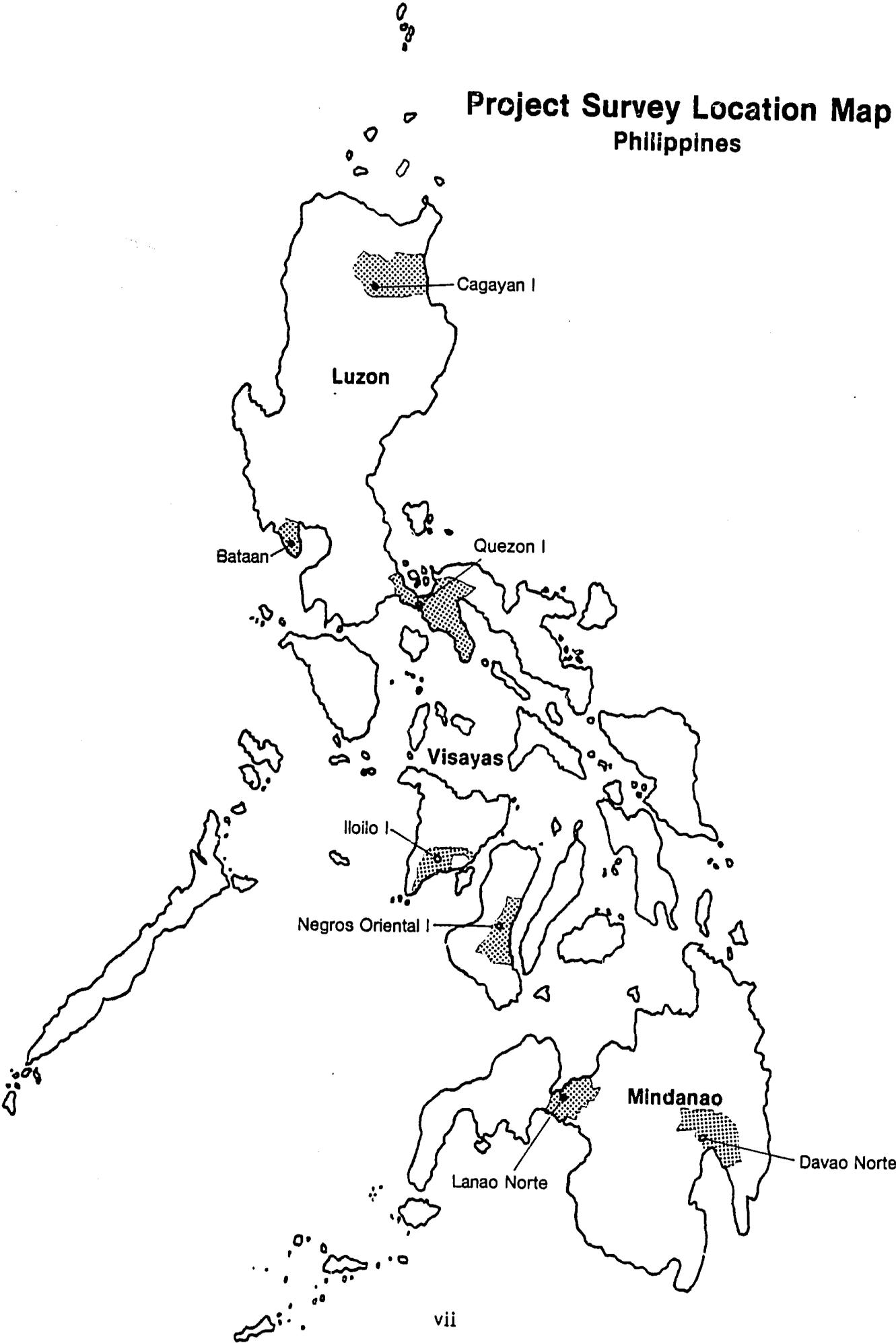
- ADB -- Asian Development Bank
- FECOPHIL -- Federation of Electric Cooperatives of the Philippines
- gWh -- gigawatt-hour
- km -- kilometer (5/8 mile)
- kWh -- kilowatt-hour
- mWh -- megawatt-hour
- NEA -- National Electrification Administration (Philippines)
- NPC -- National Power Corporation (Philippines)
- NRECA -- National Rural Electric Cooperative Association (U.S.A.)
- ₱ -- Philippine peso (₱8=US\$1 at time of survey, but ratio was less than that for the earlier years)
- REA -- Rural Electrification Administration (U.S.A.)
- USAID -- United States Agency for International Development

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# Project Survey Location Map Philippines



# PHILIPPINE RURAL ELECTRIFICATION IMPACT SURVEY (1981)

## I. SUMMARY

In late 1981 the National Rural Electric Cooperative Association undertook a survey-based evaluation of seven of the 106 cooperative electrification service areas in the Philippines. The evaluation was funded in part by the U.S. Agency for International Development and followed a methodology and format reviewed and acceptable to AID.

This report supplements several earlier studies conducted by AID and other organizations, and is believed to be more complete and representative of the present status of the Philippine electrification program and its impact. The seven cooperative electric systems were selected to represent geographic and socio-economic coverage of the country.

The rural electrification program in the Philippines now serves 1.5 million families with investment of \$85 million by USAID, and over \$200 million from other foreign sources. The National Electrification Administration reports that currently more than 1,000 new household, commercial, industrial, and public facilities consumers are being connected to the cooperative systems daily. The national rural electric authority (NEA) and a network of rural electric cooperatives with a national federation are in place, and additional international funding is being made available to supplement Philippine funding which will permit electric service to be extended progressively throughout the country.

The objectives of the study were to produce hard data to measure:

- (1) The impact of electricity on household standard of living at various levels;
- (2) Income, employment, and productivity changes in commercial, agricultural, and public service enterprises from use of electricity; and
- (3) The level of cooperative institutional and financial viability.

### 1. Impact of Electricity on Household Standard of Living.

The purpose of this study component was to isolate, as suggested from the survey data, meaningful impact links that appear to exist between the availability of electricity, the creation of new practices and activities within the household, and their impact on the change of standard of living in the household since 1978.

Houses electrified and houses not yet electrified were surveyed. Samplings were taken from households representing location (urban/rural) and type of house (light/mixed/heavy material construction). In addition, indicators of family standard of living (health, nutrition, housing quality, and income) were gathered for each of the household samples.

These underlying factors dealing with household electric consumption were observed in the surveyed households:

Heavy material households use more electricity than light material households.

One in three houses have four electric appliances, typically electric fans, a refrigerator, a television set, and an electric iron. Electric appliance ownership is related with the type of house material construction. Heavy material houses have more electric appliances.

The higher the price of electricity the less electricity will be consumed, especially by heavy material households.

Most households increase electric consumption year after year. A higher percentage of light material houses experienced increased kWh consumption than mixed and heavy material houses since 1978.

These underlying factors concerning the electric use patterns of families in light material houses were determined:

These are very low income families. Most household heads are farmers and fishermen or laborers. The median household annual income reported was about P 3,600 (\$450). Thirty-two percent reported incomes less than P 2,400 per year (\$300).

The households are basically minimum bill users. Electricity expenditures are about P 10 per month for 12 kWh.

Appliance ownership is limited but commonplace. Twenty-two percent of the households have an electric iron and 22% have radios. Fourteen percent have TV and 13% have electric fans. Five percent have an electric refrigerator and 5% electric tools. Only 1% was using any type of electric cooking appliance in the home.

A demand exists to purchase electric appliances. Thirty-eight percent reported plans to purchase an additional electric appliance during the coming year.

Credit was reported as a major constraint preventing the purchase of additional electric appliances.

The survey gave clear evidence that electric lighting stimulates the educational and productive activities in households. Households that were electrified reported greater levels of evening activities than did unelectrified households. Significant differences in evening activity levels were noted especially prevalent between electrified and unelectrified light material households. For example:

<u>Activity</u>	<u>Electrified</u>	<u>Light Material Houses</u>	
		(% Reporting Activity)	<u>Not Electrified</u>
Study (nightly)	48%		33%
General housework	48%		37%
Job related work	18%		8%
Sewing	17%		3%
Handicrafts	10%		3%
House repairs	9%		0%

The survey also gave clear evidence that labor savings generally were being derived from the electric appliances found in the household, and that electric lighting gave measurable money savings and perceptions of household safety and security. Tabulation of responses from the 315 questionnaires in the residential survey showed that about 80% of the savings from use of electricity was being expended on general family essentials such as food and clothing. Ninety percent of the households reported that electric lighting was essential or necessary for family safety and security.

Furthermore, the impact of electricity for water pumping, school lighting, and other public services was recognized by a large proportion of interviewed households:

- (1) Fifty-eight percent said electricity had a "great" positive effect on economic and social well being of the family. Another 35% said it had a "slight" positive effect.
- (2) Similar response came from a parallel question about impact on the community.
- (3) Over 15% of all household surveyed reported using water originating from a central electrified pumped source.

In summary, these points can be made in respect to electricity and its impact on household standard of living:

- Electricity is reaching the rural poor: One-third of all residential consumers are listed by the cooperatives as "minimum bill users." Typically these consumers have extremely low incomes (poor by any definition used for international standards). On a national basis cooperatives served approximately 1,500,000 households. Average family size is approximately six. Based on the above factors, it is estimated that nearly three million very poor Filipinos have been electrified by cooperatives.
- Electricity facilitates the creation of educational and productive activities in the household, especially at lower income levels.
- Electric appliances found in the household are being used to reduce labor time and to increase productivity. Future economic and health benefits may be expected to be derived through utilization of such appliances.
- Significant household money savings are being derived from use of electric lighting. Much of this money is utilized to meet daily basic living necessities. Some is used as investments to improve the family's future quality of life.
- Family members receive health, security, and educational benefits made possible through services from community facilities using electricity.

2. Impact of Electrified Enterprises on Productivity, Employment, and Income Formation.

The survey was designed to sample 50 enterprise consumers in each cooperative area. The enterprises chosen were representative of the commercial, industrial, and public service consumers served by the cooperatives. Such enterprises accounted for nearly 60% of the electricity consumed by the power systems. Two-thirds of the enterprises surveyed used more electricity in 1978 than in 1980.

The availability of electricity along with the accessibility of market roads were two main underlying factors determining where the enterprises chose to locate their facilities or operations. About 60% of the enterprises were either not in existence during 1973 or not using electricity in 1973. It was found that the timing of establishment of the following types of enterprises was very closely related with the availability of electric service:

- Meat and poultry production
- Manufacturing
- Small businesses.

The following enterprise types reported very high degrees of dependency on electricity to maintain their current levels of production or operations:

- Grain and food processing
- Manufacturing
- Personal services
- Public establishments.

On net, each enterprise type surveyed reported general gains in production, sales, or clients served since 1978. Small business enterprises reported significant sales volume increases.

The preponderance of electricity consumed by the enterprises was applied for such functions as water pumping, refrigeration, and machine operation. Two-thirds of the enterprises reported using lighting for security purposes. About 40% reported using lighting for income generation activities and processes.

The enterprises reported significant levels of purchases of electric equipment and appliances since 1978. Labor and money savings were derived from these purchases, particularly by manufacturing enterprises and small business establishments.

On net, each enterprise type surveyed reported extending average daily hours of operations since 1978. Most noticeable were extended hours of operations for small business enterprises.

A typical agriculture enterprise surveyed had six full-time employees. More enterprises reported gains in full-time employment since 1978 than decreases in full-time employment.

A typical manufacturing or small business enterprise surveyed had seven full-time employees. More enterprises reported gains than decreases in full-time employment since 1978. However, more enterprises reported decreases in part-time employment.

A typical public or community service enterprise surveyed had 24 full-time employees. More enterprises reported increasing their levels of full-time and part-time employment since 1978 than decreasing such employment levels.

In summary, the data collected for this part of the study suggests that electricity plays an instrumental role in project area development by:

- Extending operating hours for private and public enterprises.
- Broadening types of services that can be provided to clients of both private and public enterprises.
- Maintaining increased levels of manufacturing and agricultural enterprise production, and facilitating the formation of new types of rural industries, such as meat and poultry production enterprises.
- Providing labor and money savings through the use of electric equipment particularly in small business enterprises.
- Allowing enterprises to become more efficient and attractive investments, which in turn expand operations and contribute to project area employment and income generation.

### 3. System Institutional and Financial Viability.

The survey found that all seven projects were successful cooperative enterprises providing significant and growing levels of electric service throughout rural areas in the Philippines at competitive and affordable prices. Cooperative staffs were found qualified and adequate to fulfill the organizations' functions. Current financial performance, however, was found lacking in a number of circumstances. The major contributing factor in these was poor collections from customer billings.

Each cooperative showed a sound organization structure. The organizations were staffed pursuant to the organization plan issued by the National Electrification Administration with comprehensive training programs in place. Senior positions in the cooperative were staffed by college graduates, many of whom were women. Managers and local board of directors also had undertaken comprehensive training and appeared highly motivated and dedicated to the country's cooperative electrification program and objectives, with few exceptions.

There were reports of local politics interfering with the healthy management of the cooperatives. Overall, however, the survey revealed a high level of satisfaction by member-owners for the service provided by their cooperatives. Sixty percent of the members surveyed reported that they attended and participated in meetings sponsored by the cooperative. Sixty-eight percent of members surveyed recognized their ownership rights in the cooperative.

In addition to the function of providing electric service to its members, the cooperatives were found providing auxiliary community services as well as programs focused on broader national rural area development objectives. Specifically, the cooperatives were involved in assisting development of rural health, water, small-scale irrigation, school, and housing programs, and assisting the development of new cooperative enterprises to plant ipil-ipil (lucena) trees for wood-fueled thermal power plants and other uses.

The cooperatives have experienced a phenomenal growth in their level of service during the past three years. In the sample systems surveyed, consumers served and electric sales increased 50% from 1978 to 1980. In 1980 the cooperatives represented one of the largest private investments in the rural Philippines. On average each cooperative represented an investment of approximately \$3 million of assets, with 535 kilometers of distribution line and 132 full-time employees serving 18,000 consumers. They provided electric service in 40% of the barangays (villages) franchised to them by the national government. Current workplans call for continued expansion to reach all barangays (villages).

System operations performance during 1978 to 1980 was generally efficient, as measured by the number of consumers served per cooperative employee and by the level of system operating and maintenance expenses. During that period, the cooperatives expanded programs to meet the needs of new members. All cooperatives reported providing house wiring loans to low-income members. They published newsletters for members. Four of the cooperatives had member service programs to help members use electricity more effectively and productively.

Some special problems have surfaced with cooperative growth. Cooperative membership has grown to such size, that direct membership participation in cooperative affairs is becoming difficult. This is reflected in the data collected on attendance at the annual meetings of some of the cooperatives. More important, however, management systems have not developed to keep pace with the physical growth of the enterprises. For example, at most projects, bill payment delinquencies have not been controlled. This has placed financial constraints on meeting debt service payments and power bill obligations. Also, management information systems were found not to be fully developed in respect to consumer complaints and operations reporting. Two of the cooperatives were found to be experiencing energy loss levels beyond ranges acceptable as prudent utility management norms. Such shortcomings, if not corrected, will affect project financial soundness in due time.

Although retail rates varied from one service area to another (depending on source of power), retail rates were found easily competitive with the price of kerosene and diesel oil for lighting and motive power. Residential members accounted for 37% of total energy consumed by the cooperatives. About one-third of these residential consumers consumed a limited (about 12 kWh per month) amount of electricity for which a special low monthly rate was applied (minimum bill).

Presently 60% of all electricity provided by the cooperatives is consumed by private and public enterprises, large and small, scattered throughout their service areas. Consumer density per mile of line is over ten times greater than in the United States.

This summary is extracted from the analysis of findings and conclusions presented in the four sections of the report which follow. Supporting the summary and report are a number of appendices compiled from the 770 interview questionnaires and from records in the offices of the seven cooperatives and the NEA in Quezon City. Methodology used in the study is described in detail in Appendix A.

There was a conscious effort made to shape this survey as a base for follow-up studies of rural electrification in the Philippines. Such studies at suitable intervals are needed to measure growth and evaluate impact of the program in relation to its objectives.

## II. INTRODUCTION

### I. ELECTRIFICATION PROGRAM PERSPECTIVE

Until the 1970s, electric service in the Philippines could be found only in cities and larger towns, and in some locations as extensions of power generated for sugar refineries, mines, and lumber mills. Much of this service was subject to voltage fluctuation and interruptions, and limited to morning and evening hours -- sometimes only 3 hours a day. Rates were generally high, with the result that few households or enterprises at the lower economic levels were connected.

Power suppliers included franchised systems and municipalities. Generation and the beginnings of transmission grids on Luzon and Mindanao were operated by the National Power Corporation. Two cooperative pilot projects had been started, MORESCO in northern Mindanao and VRESCO at the north tip of Negros Island.

The two pilot projects were based on recommendations of a 1964 power survey of the Philippines. They were funded by the U.S. Agency for International Development. Technical assistance was provided by the National Rural Electric Cooperative Association.

While these two cooperative systems were being developed, the Philippine Congress enacted enabling legislation similar to the Rural Electrification Act in the United States. A presidential decree converted the National Electrification Administration to a government corporation in 1973, with additional funding authority and responsibility to proceed with the rural electrification program that became one of the country's principal developmental phenomena. President Ferdinand E. Marcos called rural electrification "the cutting edge" of the nation's economic and social development.

While all the early foreign funding for the NEA/cooperative electrification programs was furnished through low-interest, long-term loans from the USAID, there have been six sources so far:

<u>Source</u>	<u>Date</u>	<u>Amount</u>
U.S. Agency for International Development	1971-1976	US\$ 77,000,000
	1978	8,000,000
World Bank	1978	60,000,000
OECF	1977-1978	Yen 9,970,000,000
Germany	1979	DM 40,000,000
	1981	10,000,000
France	1974	FF 82,000,000
Asia Development Bank	1981	US\$ 88,000,000

A decade of growth has produced 106 cooperative electric distribution systems serving 1,500,000 member-consumers. NRECA offered guidance to NEA and the cooperatives during most of this period, with a team numbering 10 specialists at the peak year of assistance. The last consultant left in 1979, and the Philippine electrification leaders are now themselves offering technical assistance in other parts of Southeast Asia.

## 2. STUDY PURPOSE AND OBJECTIVES

There has been sufficient passage of time to permit examination of how the rural electrification program in the Philippines has developed. In determining priorities for continuing economic and social development, the Government of the Philippines and a variety of funding agencies have an interest in weighing the impact of the electrification program to date. Line construction, consumer connections, and electric system development are readily seen by visual inspection and their progress is supported by construction and operations records. Government agencies and private entities already have made a number of studies. Most of these were local in coverage or designed to inquire about topical aspects of program development. A bibliography of representative studies is attached to this report. The present time seemed appropriate for evaluating what benefits NEA and the member-owned cooperatives are bringing to Philippine households and enterprises, both commercial and public.

The present survey is also limited in scope, but endeavors to present a realistic sampling of program performance and impact on a country-wide basis. The primary study objective was the recording of data and responses within a sampling process to record attitudes and impacts at households and enterprises served by the program. The survey also attempted to measure variations in project inputs, performance, and outputs as reflected by operating data presently available. The operating objective was to conduct the survey in such a way as to avoid pre-judging findings and to yield a fair range of representative information which could be examined statistically. The study had to be conducted impartially, but under the guidance of analysts familiar with the program and with the country.

The main body of the report which follows is in four sections: System Operating Data Findings, Household Survey Findings, Enterprise Survey Findings, and Study Conclusions.

Methodology used in the survey is set forth in Appendix A. Appendices C, D, and E contain text and tables detailing and interpreting the data obtained from the questionnaires and from office records of the seven cooperatives in the survey.

### III. SYSTEM OPERATING DATA FINDINGS

#### I. GENERAL

##### a. Location of Systems.

The seven systems surveyed in this study were selected to represent geographic and socio-economic coverage of the country. Three systems (Bataan, Cagayan I, and Quezon I) are located on the northern island of Luzon. Two systems (Iloilo I and Negros Oriental I) are located in the central islands of the Visayas, and the remaining two systems (Davao Norte and Lanao Norte) are located on the southern island of Mindanao where they serve largely Moslem populations. All systems serve predominantly rural areas. No large cities are served by any of the systems surveyed.

##### b. Age of Systems.

The systems were energized during the period October 1973 (Bataan) through April 1978 (Negros Oriental I). They represent, on average, five years of operations. The systems generally were organized and incorporated two years before being energized.

##### c. Area Coverage and Consumer Density.

The service areas of the systems range from 215 to 710 barangays. On the average 156 barangays were served per system at the end of 1980. This is an average coverage of about 38% of barangays in the service areas -- close to the national program average. About 92% of the barangays in Bataan's service area were energized by close of 1980. Less than 40% of the barangays located in the service areas of the remaining six systems surveyed were energized at the end of 1980.

Consumer growth during 1980 proceeded at an annual rate of 21% for all systems. The highest 1980 rate in consumer growth was experienced by Davao Norte (40%), while Bataan's 1980 consumer growth rate was the lowest (10%). The total number of consumers served by end of 1980 ranged from 6,416 (Negros Oriental I) to 36,453 (Bataan).

On balance, consumer density increased during the period 1978 through 1980 for the seven cooperatives (from 30 to 33 consumers per kilometer of distribution line). To appreciate the significance of number of consumers per kilometer of line it is necessary to recognize the high concentration of population in rural villages and along roads. Densities are exceptionally high compared to U.S.A. experience for rural electrification. The range in the seven systems surveyed was 22 per kilometer (Lanao Norte) to 54 (Quezon I). There is continuing dilution of system average density as new lines are built into more remote areas, but on balance this dilution in density is offset as more consumers sign up for service after the lines are built.

##### d. Size and Scale of Systems.

The average distribution system of the surveyed cooperatives was 535 km, with a range from 262 km (Negros Oriental I) to 1,015 km (Bataan). The average for all NEA-sponsored cooperatives was 452 km, with a spread from 18 to 2,514 km, as of June 1981 -- 6 months later than for the figures used for the surveyed systems.

During 1980 the average annual rate of growth in utility plant for the seven cooperatives was 28%. Quezon's plant growth nearly doubled (98%) during 1980. Davao Norte also experienced rapid expansion of plant growth (63%) during 1980, while plant growth for Bataan (3%) and Lanao Norte (12%) proceeded at much lower rates. Both consumer and plant growth for the projects have proceeded at high rates compared to established rural electric systems in the industrial world. Investment in distribution plant for the surveyed systems averaged ₱ 20,918,000 at the end of 1980, with a range from ₱ 12,744,000 for Cagayan I to ₱ 28,837,000 for Quezon I.

e. Power Supply.

Of the seven systems included in the survey, six were already connected to National Power Corporation (NPC) power sources. Only Cagayan I was still operating its own diesel generating plant in 1980. Consequently, its power costs and retail rate tariffs were higher than any of the other six systems surveyed. This cooperative was connected to the NPC Luzon grid in September 1981, and undoubtedly its financial status and viability profile will look quite different in future years from what is reported for its operations through 1980.

f. Energy Sales and Losses.

Highly significant in an electrification impact study are the figures for system energy consumption and losses. Energy sales for the seven systems increased 28% during 1980 -- at a somewhat faster pace than consumer growth. The amounts of energy sold during 1980 ranged from 9.0 gWh (Iloilo I) to 35.5 gWh (Bataan), with a system average of 17.5 gWh. When this is related to consumers, there is a rough average of 81.3 kWh per month per consumer; but this figure is slightly misleading, when it is realized that in Negros Oriental I, for instance, one large sugar mill consumer accounts for 82% of the cooperative's energy sales. This is an exceptional situation, as most large industrial loads in the Philippines are served directly by NPC.

Selected project investment cost and sales ratios are compared with similar ratios derived from REA cooperatives (U.S.A.) data in the following table. As indicated the Philippine and U.S.A. projects differ quite dramatically in respect to the ratios listed. Many factors create this difference, above all however is consumer density.

TABLE I. COMPARATIVE INVESTMENT COST AND PROJECT SALES STATISTICS (1980)

	7 Survey NEA Co-ops	921 U.S.* RE Co-ops
KWh use per month per average consumer on line	88 kWh	1,361 kWh
Investment per consumer	\$146(₱1,168)	\$1,434
KWh sales per pole line mile per month	4,604 kWh	6,856 kWh
Investment per kWh sold	\$0.151(₱1.21)	\$0.091
Revenue per kWh sold	\$0.080(₱0.65)	\$0.044
Cost per kWh purchased	\$0.044(₱0.35)	\$0.028

Note: Peso/U.S. dollar value assumed at 8/1 for comparative analysis purpose.

\*1980 Statistical Report, Rural Electric Borrowers, REA, U.S. Department of Agriculture.

As regards energy sales utilization, it should be noted that the Philippine cooperatives have attained a level two-thirds of that experienced by their cooperative counterparts in the U.S.A., when viewed on a kWh sales per pole mile of line (load density) basis. For the surveyed cooperatives, the level was attained during a five-year electrification period. For the REA cooperatives, the sales level represents a forty year electrification period. Presently, Philippine cooperative project load density is comparable to that level attained by REA cooperatives in 1973, after thirty-eight years of electrification experience.

System energy losses (the difference between energy purchases or generated and energy sales) ranged from 3% at Quezon I to 29% for Cagayan I in 1980. A high energy loss figure indicates revenue capture problems for a system. An acceptable energy loss trend line prescribed for Philippine cooperatives by the World Bank would show a reduction from year to year, with values dropping toward 12%. The data shown in the "Financial Profile of Cooperatives in the Survey" (see Appendix C) therefore indicates that energy losses at Bataan and Cagayan I are excessive. Part of those losses may be attributed to improper power supply metering or to technical problems in the distribution system, and part result from poor controls in billing consumers. Data was not available to pinpoint which factor or factors underlay these high levels of energy losses.

## 2. INSTITUTIONAL DATA

### a. Cooperative Organization.

The seven electric systems included in the survey -- like nearly all the 106 borrowers of NEA funds -- are non-profit, consumer-owned cooperatives. The basic organization rests on bylaws for each cooperative which provide for members to elect a board of directors which then hires a general manager. The general manager hires and supervises the staff of employees and is responsible to the board for day-to-day operations of the cooperative within policies laid down by the board. NEA maintains general supervisory requirements as relates to its security interests as lender of construction and initial operating funds to the cooperatives, and to its responsibilities for administering the country's rural electrification program under Philippine law.

### b. Staffing Pattern.

The number of directors elected by members to the boards of the cooperatives in the survey varied from 7 to 14. All seven had some changes in board members within the 3-year study span. The boards elect their own officers. Three of the cooperatives had changes in the general manager's position during 1978-1980, and two others had changes in 1981 (since the survey period).

The staffing patterns under the general manager have four or five departments. Six cooperatives had a separate office of the general manager. There were various combinations to carry responsibilities for engineering and construction, operations, office services, maintenance, and member services. Cagayan I had a separate department for operating its generating plant. Three reported district offices and two others were considering sub-offices as a way to overcome problems of transportation and communication in areas with poor roads and no telephone service. All systems have short-wave radio links with one another and with NEA.

c. Employees.

The smallest staff consisted of 73 employees (Negros Oriental I). The largest had 222 (Bataan). The average size of staff was about 132. Men outnumbered women more than 3 to 1, but a number of department heads were women.

About 35% of all employees are college graduates. In addition, most employees had participated in training programs sponsored by NEA or by district organizations of the cooperatives or the Federation of Electric Cooperatives of the Philippines.

Employee separations reported by four cooperatives averaged a turnover of just under 5% in 1980. This reported figure however may in reality be low, based on conversations held with staff supervisors concerned about experienced employees leaving for jobs in mid-east oil producing countries.

An attempt was made to establish a ratio of employees to consumers, to kilometers of line, and to investment in utility plant. These ratios would be useful in measuring employee productivity, but the ratios obtained appear to have limited use, due in part to lack of clarity as to whether employee totals included line construction crews. With such limitation in view, ratios for consumers per employee ranged from 84 (Davao Norte) to 170 (Quezon I).

d. Relations with Consumer/Members.

All cooperatives had procedures for reporting consumer outages and complaints. However, the quality of report records on such matters varied dramatically from one cooperative to another, and there was no way to align one system of reporting with another for useful comparisons.

One of the cooperatives surveyed (Quezon I) reported only 19 service complaints during the entire year 1980 (less than the number of service interruptions). This is totally unbelievable, and indicates either poor communication between consumers and the headquarters office, or inadequate record keeping. This cooperative also reported only 10 billing complaints in 1980.

Lanao Norte, on the other hand, recorded 1,012 complaints of service interruptions and 180 billing complaints. Davao Norte reported an even higher number of service complaints (3,907) during 1980. This high complaint level was undoubtedly related to the fact that transmission power to the project was interrupted during 37 days of the year. Only 420 such complaints were registered during 1979.

Attendance at annual meetings during 1980 ranged from 500 (3.6% of the membership) at Cagayan I to 5,082 (36% of the membership) at Davao Norte. Cooperative district meetings, however, had a greater membership attendance than the annual meetings. Two cooperatives (Bataan and Lanao Norte) did not hold annual meetings in 1980. Peace and order problems were given as the reason for cancelling the meeting at Lanao Norte, although this situation did not prevent the scheduled district meetings being carried out. The annual meeting for Bataan was cancelled pending decision in a court action concerning an earlier election. Annual meeting data for Quezon was not gathered by the survey team. In general, during the survey, cooperative officers explained that their membership was too large for effective annual meetings to be held.

e. Membership, Rural Development, and Productive Use Activities.

One of the cooperatives, Negros Oriental I, requires new members to attend a membership responsibility orientation meeting before receiving service. Most cooperatives publish a newsletter which gives topical energy and related information to members. Some of these are monthly. Others are published irregularly and copies are available at the cooperative's office in limited number of copies.

All cooperatives made housewiring loans available for poor residential consumers. The cooperatives in general did not extend credit for purchases of electric equipment by consumers for private use. Four of the cooperatives were conducting some level of consulting services to all classes of consumers on how they could use electricity more effectively or productively. Two cooperatives (Bataan and Lanao Norte) were not staffed to perform such activity. Data on such activity was not available from Cagayan I.

All cooperatives, furthermore, have assisted the national government to foster development in rural areas by funding the installation, on a credit basis, of lighting and water supply systems in schools, and rural barangay water systems. During 1980 the cooperatives assisted the National Government its rural Bagong Lipunan Improvement of Sites and Services (BLISS) program, primarily by supervising and coordinating the physical planning and construction of 50-house rural area BLISS development projects in each of the cooperative areas. The cooperatives, moreover, have assisted national rural energy program development (coordinated through NEA) by participating in mini-hydro and dendro-thermal power supply surveys and development activity in the service areas.

3. OPERATING DATA

a. Power Costs.

Annual average power costs per kWh purchased for the seven systems are shown in the "Financial Profile of the Cooperatives in Survey" (see Appendix C). Cagayan's 1980 average power cost was 130% higher than the other two systems (Bataan and Quezon I) located on Luzon which purchased power from the NPC grid. Moreover, systems purchasing power from the NPC Mindanao grid (Davao Norte and Lanao Norte) paid charges approximately one-half of those paid by the two systems purchasing power from the Luzon grid. The price differential in these latter charges is attributed directly to lower cost factors in operating the hydro-electric generation plants which feed power to the Mindanao grid. The preponderance of power fed into the Luzon grid derives from dispersed high-cost thermal generation units, although some low cost geothermal power is presently being fed into the grid. Iloilo I purchases NPC power generated locally with diesel oil. Therefore, its 1980 purchased power costs approximates closely the 1980 level of power costs at Cagayan I.

b. Other Operating Expenses.

Controllable operating expense ratios (i.e., ratios involving operations and maintenance, consumer accounting, and administration expenses compared to investment, sales levels, consumers served, etc.) generally respond to size of operations for electric utilities. Such response is indicated for the surveyed cooperatives in the "Institutional Profile of Cooperatives in the Survey" (see Appendix C). For example, ratios calculated for Bataan and Quezon I (the largest systems in respect to kWh sales) are lower than for the other cooperatives. On the other hand, the operating expense ratios calculated for Negros Oriental I (the smallest system in respect of kWh sales when excluding sales to the large

sugar mill located in its service area) were generally the highest. As example, in 1980 administrative costs at Negros Oriental I were three times higher than administrative costs at the other cooperatives when such expenses were related to the number of consumers served by the cooperative.

The ratios shown in the "Institutional Profile of Cooperatives in Survey" (see Appendix C) point out additional items. Depreciation expense write-offs appear generally in line with depreciation guidelines used by electric utilities in other countries, in respect to both age and composition of utility plant. It should be noted here that headquarters plant investment for the cooperatives generally accounts for a larger portion of utility plant investment than it does for distribution electric systems found in the fully developed world. This accounts for the general lower consolidated depreciation rate used by the cooperatives. Data in the tabulation also indicates that much or all of Cagayan's generation plant was depreciated prior to 1980.

Operations and maintenance expenses for the systems also appear generally appropriate when considering age, size, and density of system. The data, however, suggested that Iloilo I may be deferring maintenance expenses longer than prudent, and that Davao Norte's consumer accounting and administration expense levels may be excessive.

#### 4. PRICING AND FINANCIAL DATA

##### a. General.

For a mature utility system, (say five to seven years after energization) electric retail tariffs are generally set so that operating revenue will cover operating expenses, taxes, and depreciation, with a margin (called the utility operating margin) to meet interest costs or dividends payments on invested capital. As shown in Appendix C, "Operating Revenues, Expenses, and Ratios," all of the cooperative systems except Cagayan I generated positive utility operating margins during 1980. This indicates that adequate financial "book" margins exist at each of these six cooperative which theoretically could be applied to meet the cooperative's current interest costs on borrowed capital. As noted above, this poor financial performance by Cagayan I is expected to improve dramatically after shutting down its generating plant and shifting to lower cost power from the Luzon transmission grid, in September 1981.

In actuality, however, cash may not be available to meet system operating expenses and debt interest payments when consumer revenue collection lags behind what was billed and is reported as operating revenue on the cooperative's financial statement. This is the case for a number of cooperatives as indicated by the data in Appendix C. Such payment deficiency indicates either that cooperative electric tariff rates should be increased to compensate for uncollectibles, or that more stringent cooperative collection methods be implemented so that increased cash flow can be generated to meet current system operating and interest expenses.

##### b. Payments.

NEA policy allows systems to defer loan interest and principal payments for a five-year period. Such deferment period is still in place for Negros Oriental I. Of the six remaining systems, Cagayan I and Lanao Norte are in arrears to NEA on their distribution loan accounts as of June 1981. A slight accounting arrear also occurred in the case of Davao Norte. Moreover, four cooperatives (Bataan, Davao Norte, Iloilo I, and

Negros Oriental I) were delinquent on their power bills to the National Power Corporation (NPC) at the end of 1980.

c. Collections.

All cooperatives, except Quezon I, have performed poorly in collecting bills from consumers. About 10% of 1980's billing to consumers were delinquent in Bataan, Cagayan I, and Davao Norte at year end. Over 20% remained delinquent for Iloilo I, Lanao Norte, and Negros Oriental I.

The problem of collectibles is further reflected when accounts receivable for electric sales on the cooperative books were analyzed. Iloilo I currently had a one-year backlog on such receivables. Negros Oriental I had 4 months backlog, and Lanao Norte over 3 months of backlog. Utility and financial policy generally calls for maintaining these backlogs under a 2-month level.

Undoubtedly, collectibles are a major cause of financial and management concern to each of the systems surveyed, and a concern when evaluating the impact of rural electrification in general, and consumer cross-subsidies. In retrospect, the issue of unpaid electric bills should have been explicitly incorporated in the survey documents, in order to shed light on this problem.

d. Alternative Energy Costs and Retail Rates.

As noted, purchased power costs vary from cooperative to cooperative depending on source of power. In general, the cooperative's retail rates reflect this variation. As indicated in Appendix C, these electric rates are extremely competitive to the price of kerosene and diesel oil in each of the cooperative areas. If one uses the very conservative estimate of equating the cost of one kWh of electricity with the cost of one liter of kerosene or diesel oil for lighting, motive and refrigeration use, electric energy cost to the cooperative consumers can be imputed as being at least two times cheaper than the alternative oil-based energy costs. From the limited data available it may be also imputed, that the costs of palm stems, wood, and charcoal are cheaper for household heating and cooking activity than electricity.

5. ENERGY USE DATA

a. Consumers.

In brief, the rural electric systems surveyed can be characterized as large (average consumer size in 1980 was nearly 18,000), rapidly expanding systems.

During 1980 the seven cooperatives served 125,416 consumers in 1980, a 21% increase from the 104,030 consumers served in 1979. From 1978 to 1979 the number of consumers served increased by 23%. During 1979-80, the greatest increases in the number of consumers served were experienced at Davao Norte (40%), Quezon I (35%), and Negros Oriental I (31%), and the least increase was experienced at Bataan (10%).

Overall the proportion of total residential consumers served to total consumers served increased slightly during the 1978-79 and the 1979-80 periods, from 87.1% to 88.7%. Commercial consumers served increased at an annual rate of 10%, slower than any other consumer classification and accounted for 6.2% of total consumers served in 1980. The 1980 proportion of public facilities (2.2%), industrial (0.1%), irrigation (0.1%), and public

lighting (2.8%) consumers served to total consumers remained fairly constant during the 1978-80 period.

b. Sales.

Total energy sales of the seven cooperatives in the survey for 1980 were 121.4 gWh, or an average of 17,348 mWh per cooperative. Overall for the seven cooperatives, electric sales increased 28% during 1979-80. Residential electric sales (21%) increased at a slower pace than for any other consumer classification. As example, industrial electric sales increased 38%. Consequently, the proportion of residential electric sales to total electric sales decreased from 39.0% in 1979 to 36.9% in 1980. During 1980, industrial sales accounted for 37.4% , commercial sales for 16.7%, public facilities sales for 4.8%, public lighting sales for 3.6%, and irrigation pumping sales for only 0.7% of total electric sales. Only at Cagayan I did irrigation electric sales account for any significant part (5.9%) of total electric sales.

Electricity sales increased dramatically (142%) at Davao Norte during 1980. Sales increases there were experienced in all consumer classifications, except for irrigation pumping. Industrial consumers, numbering 55, accounted for 47.7% of total cooperative sales. Residential consumers, numbering 9,018, accounted for 27.6% of cooperative sales. Iloilo I sales during 1980 increased by 45%. Industrial consumers , numbering 20 accounted for 38.7% of total sales; residential consumers, numbering 8,928, accounted for 45.9% of total sales.

During 1980, Cagayan I, Lanao Norte, Negros Oriental I, and Quezon I sales increased 14%, 22%, 28%, and 22% respectfully. For those four cooperatives industrial sales accounted for 5.9% (3 consumers), 31.3% (3 consumers), 83.2% (basically one large sugar mill), and 41.3% (4 consumers) of total sales respectively. Therefore, these 11 industrial loads accounted for 43.5% of total sales to the 59,462 consumers served in the four cooperatives.

During 1980 Bataan experienced the least increase (8%) in total sales. Industrial sales, however, increase (18%) more rapidly. It should be noted that Bataan is the largest system surveyed, and has extended lines to nearly all barangays in its service area. Therefore, a somewhat lesser rate of increase in sales should be expected.

c. Consumer Usage.

In 1980, monthly average usage for residential consumers was 33.5 kWh, for commercial consumers it was 215 kWh, for public facilities consumers 176 kWh, and for industrial consumers 12,750 kWh.

Monthly average residential use ranged from 23.2 kWh at Negros Oriental I to 44.0 kWh at Bataan. The proportion of residential consumers paying minimum bills (10 to 15 kWh per month or less) ranged from 54.7% at Cagayan I to 24.8% at Bataan.

#### IV. HOUSEHOLD SURVEY FINDINGS

##### 1. MEMBER PERCEPTION OF COOPERATIVE PERFORMANCE

###### a. System Outages.

Interruptions in electric service not only produce an irritating and negative psychological effect on customers but also cause losses and damage measurable in pesos. Enterprises can be seriously handicapped by power failure. For residential consumers, where electric service is new and kilowatt-hour consumption is still low, the outages or "brownouts" may be considered more of a nuisance than a serious economic loss.

In the survey, heads of households were asked to recall how many times service had been interrupted for more than one hour during the previous two months. Of the 314 households interviewed, 31 did not know or could give no specific answer. The remaining 283 in the sample responded as follows:

16 - never  
94 - one day  
83 - between 1 and 2 days  
43 - between 3 to 5 days  
47 - more than 5 days.

Consumers were generally unable to distinguish between outages on the transmission lines of NPC and those resulting from problems on the distribution lines of the cooperative.

In general the remote barangays appeared to have fewer outages than the poblacion and feeder-line households experienced.

Higher levels of outages were reported to have existed at the two cooperatives (Bataan and Quezon I) served by NPC on the Luzon grid, an area susceptible to typhoon damage. Service interruptions of three or more days were reported by 78% of the respondents of Bataan and by 52% of Quezon I respondents. Such levels of interruptions were reported by only 3% of surveyed households in Negros Oriental I and by 7% of the respondents in Davao Norte. Both of these cooperatives are located south of the typhoon belt in the country.

###### b. Cooperative Service Performance.

A consumer's estimate of good service rests on many factors other than outages. The survey questionnaires did not incorporate such salient factors as voltage fluctuations, courtesy of employees, accuracy in billing and collections, and the quality and quantity of the cooperative's membership and public relations programs. A key question in the survey however asked, "Does the NEA electric cooperative give you good service?"

Surprisingly, in view of that high outage levels reported at some of the cooperatives, the overall response to the question was a 95% favorable declaration by the residences surveyed. Of interest, 100% of the respondents in Lanao Norte made favorable responses, while only 76% answered favorably in Quezon I.

c. Cooperative Meeting Attendance.

An underlying factor which may affect consumers' attitudes about their electric service is ownership, which carries with it the opportunity to speak out and to vote for board directors at an annual meeting. This is an essential element in any cooperative enterprise.

Overall, the survey revealed that 60% of the membership interviewed attended one or more meetings of the cooperative during the year. Generally speaking, the data suggests that those householders using more electricity attend more meetings.

Ninety-three percent of the members interviewed in Negros Oriental I attended at least one meeting (annual, district, orientation, or other) during 1980. For the other cooperatives, the percentages were:

Lanao Norte	88%
Cagayan I	75%
Davao Norte	74%
Iloilo I	45%
Quezon I	30%
Bataan	27%.*

Records at the offices of the cooperatives and the National Electrification Administration, along with conversations with officials at both levels indicated that a possible relationship exists between meeting attendance and the level and quality of the cooperative's activities through its membership programs department. Attitudes expressed by the members of the board of directors and by the general manager were also suggested as an important factor.

d. Cooperative Ownership Recognition.

Residential member consumers were queried concerning their perceptions of ownership of their electric cooperative, in order to ascertain to what degree the member-owner cooperative approach was recognized. Of the 314 replies, 68% recognized that they themselves were joint owners. However, 13% thought the cooperative was owned by NEA, 7% by the Government, 4% by the board of directors, 1% by the general manager, and 7% did not know.

The breakdown of responses by cooperative is enlightening. Every respondent but one in the service area of Negros Oriental I identified the cooperative as jointly owned by its consumer-members. The response in Cagayan I indicated recognition of consumer ownership by 96%. Davao Norte and Bataan showed close to two-thirds identifying ownership in the hands of the consumer-members. Quezon I had 15% replying "do not know." Less than half of the respondents in Iloilo I and Lanao Norte recognized they had joint ownership in the cooperative. For the latter, 55% thought the electric system was owned by NEA or the Government. In Iloilo I, 18% believed the board of directors was the owner of the cooperative.

\*For attendance at annual and district meetings reported by the cooperatives, see Appendix C.

Here, as with members' willingness to attend cooperative meetings, field interview data suggests that a direct relationship exists between consumer responses of ownership recognition and the attitudes of directors on the board and of the general manager, and the relative effectiveness of the member services department and other employees who come in contact with the consumers.

e. Impact Perceptions of Households.

Overall, 90% of the residential survey respondents reported that household lighting was essential or necessary for personal safety and security. Only one respondent said it was not important. Response levels were similar for households in the poblacion and along the main feeder, with responses made by households located in remote electrified barangays indicating less reliance on house lighting to ameliorate incidences of personal safety and security. Response levels were nearly identical also from all three grades of houses surveyed. It is interesting to note that households reporting the highest monthly usage of electricity yielded the strongest perception of house lighting as being essential and necessary for safety and security. Cagayan I had the highest percentage of respondents declaring house lighting to be essential or necessary (100%), while Iloilo I had the lowest level of such perception (71%).

The parallel question concerning outdoor/public electric lighting and personal safety and security drew a similar response. Eighty-eight percent responded that outdoor/public electric lighting was either essential or necessary for safety and security of their communities. Again, those respondents consuming the highest levels of electricity were the ones who most strongly believed outdoor/public lighting was essential or necessary for community safety and security. Regional differences, however, were marked, with 100% of Cagayan I respondents indicating that public lighting was essential and/or necessary, Bataan 98%, and Iloilo I 71%.

Electrified households were asked to comment on how the availability of NEA cooperative electric service affected the economic and social well-being of the family. Fifty-eight percent reported that electricity had a great positive effect, and another 35% said it had a slight positive effect. Of direct interest, the data indicated that a higher percentage of "minimum bill" respondents than high kWh users considered electric service to have great positive effect on their family's economic and social well-being. Response of this nature was 80% in Cagayan I, but only 40% in Quezon I.

The parallel question concerning the general impact of electric service on community economic and social well-being was answered by all but five of the residential consumers in the survey. Fifty-seven percent replied that it was essential for community betterment, 19% more said it was necessary, and 23% responded that it was important. Only three persons thought electric service "not necessary" to community economic and social well-being.

Eighty-nine percent of Cagayan I electrified households responded that electric service was essential for community betterment and in Bataan, it was 86%. Only 36% of Iloilo respondents perceived that electric service was essential, and in Quezon I, it was only 25%. This difference of perception among the various cooperative service areas concerning the importance of electricity as an input for community betterment is striking and should be investigated more fully in any future impact study of the Philippine rural electrification program.

## 2. ELECTRIC USE AND APPLIANCES

### a. KWh Electric Use.

Annual kilowatt-hour billings for the years 1978, 1979, and 1980 were obtained from the offices of the seven cooperatives for respondents interviewed. When kWh usage was examined by category of house construction, it was found that a third of "light" materials houses showed minimum billings (10 kWh or less per month), while more than a quarter of "heavy" materials houses were billed for usage of over 100 kWh per month. "Heavy" construction houses (i.e. households with more income) clearly use more electricity.

Iloilo I and Cagayan I had the largest percentage of minimum bill users. Bataan had the lowest. This suggests that the price of electricity is a major determinant of the amount used by residential consumers, as these two cooperatives have the highest residential rates of the seven surveyed.

Cagayan I was the only cooperative where decreases in respondent use of electricity from 1978 to 1980 exceeded increases. Residential households interviewed in the Quezon I service area, by contrast, showed 87% increased kWh consumption and only 13% decreased usage from 1978 to 1980. This data also indicates that a direct relationship exists between price of electricity and consumption, since these two cooperatives represent the two extremes of power costs to the consumer.

### b. Electric Appliances.

A third or more of electrified households in the sample were found to be using electric fans, refrigeration equipment, television, and irons. The percentages of electricity-powered radios, tools for household maintenance and repairs, and stoves or appliances for heating water or cooking was substantially lower.

With the exception of radios, percentages of electric appliances in use were higher in the poblaciones than in remote barangays, and higher in "heavy" construction houses than in those of "light" construction. The findings suggest that household income and access to appliance stores and service may be factors in acquisition.

Forty-three percent of the respondents in the study indicated that they planned to buy electric appliances or equipment during the next year. Whether the household was situated in the poblacion, along the main feeder line, or in a remote barangay seemed to make little difference. The percentages were 40% for poblacion, 44% for main feeder, and 48% for remote barangay which had electric service. The surprise came in finding that 34% of the 105 households in unelectrified barangays answered "yes," that they intended to make purchases in the next year. This can be taken as a measure of rural peoples' faith that these remote barangays will have electric service in the near future.

Examination of the replies of residents in each of the seven cooperative service areas produced the following spread of "yes" responses to the question about intention to purchase appliances during the coming year:

Cagayan I	60%
Quezon I	49%
Negros Oriental	48%
Davao Norte	46%
Iloilo I	43%
Lanao Norte	38%
Bataan	19%

This wide variation in response may be related to a combination of factors including the cost of electricity, years of service, and level of saturation of appliance purchases already made.

More than 40% of the minimum bill consumers said they had purchase plans.

Television sets topped the list of next purchases, with 37%. Then came refrigerators (18%), stereo/phonographs (13%), and electric fans (13%). No other planned purchase ranked higher than 6%.

High cost of the appliance desired was given by 57% of respondents as the reason for not having made the purchase earlier. Lack of credit and the cost of electric power were next most frequent reasons.

### 3. HOUSEHOLD INCOME AND CHARACTERISTICS

#### a. Family Size.

Family size of households surveyed showed little change from 1978 to 1981. Most households had three or more adults and had four or more children. A slight positive relationship existed between the adults in the household and electric consumption.

#### b. House and Land Ownership.

Approximately 88% of families in the study sample owned their homes, but only 63% owned the land on which the house was located. Home ownership was highest in the service area of Cagayan I, with 98% of respondent families owning their house and 83% owning the land. Lowest ownership pattern was in Davao Norte, where 75% owned their house, and in Quezon I, where 52% owned the land.

Minimum bill users of electricity (10 to 15 kWh per month or less) had the highest percent of home ownership (98%), while families using over 100 kWh had the lowest (85%). Contrarily, however, there was a weak positive correlation between average monthly electricity usage and ownership of land on which the home was located. The difference between house ownership and ownership of the land diminishes as consumption of electricity rises.

Only 13% of households surveyed owned adjacent or non-adjacent land that was irrigated. Of these, just over one-half utilized gravity irrigation systems. The highest percent of families owning irrigated land lived in "heavy" material construction houses in unelectrified remote barangays. Respondents in Iloilo I had the highest percent (34%) owning irrigated land.

c. House Size and Furnishings.

Of all houses surveyed, 40% had cement floors, followed by bamboo (27%), wood (20%), tile (8%), and dirt (5%). However, in unelectrified remote barangays, 41% of floors were bamboo. When responses were classified by type of house construction (heavy, mixed, light), logical results were found. About 70% of "heavy" construction houses had cement floors, and bamboo was the principal flooring material in "light" houses.

Houses with two bedrooms were more prevalent than any other kind (34%). There was a high correlation between the number of bedrooms and household kWh consumption. One bedroom was prevalent in the zero to 10 kWh range, two bedrooms in the 10-50 kWh, and four or more bedrooms where billing was for 100 kWh or more per month.

A little more than one-third of houses in the survey sample added or replaced furniture in the previous two years. In remote barangays 44% of households with electric service had more furniture acquisitions, but only 24% of households in the unelectrified control group.

Purchase of furniture correlated strongly with the type of material used in house construction--59% in "heavy" construction houses, but 20% in "light" houses.

Purchase of furniture also correlated strongly with the amount of electricity consumed. The comparison showed 56% in houses where power used was 100 kWh or over per month, but only 19% in households of minimum users.

d. Occupations and Income.

Forty-two percent of household heads in the survey were employed as farmers or fishermen. The remainder was about evenly divided among: clerical, services sales, or crafts; laborers; professional; other or retired; and unemployed. There was about 10% in each classification. Relating occupation to amounts of electricity consumed gave a mixed picture, but in general the professional category appeared to have higher consumption patterns than other groupings, and those heads of households with no specified occupation had the lowest.

Of all households surveyed, over one-quarter reported having present incomes exceeding 1,000 pesos per month, while 16% had incomes less than 200 pesos per month. About 20% indicated that incomes were higher since 1978, while about 38% said that incomes had declined.

Income in unelectrified remote barangays was below 200 pesos per month for 24%; in electrified remote barangays 17%.

As expected, a strong positive correlation was found between income and the type of house construction materials. This validates the use in the study of "heavy," "mixed," and "light" construction houses as a rough basic indicator of household economic level.

For each house class, those electrified had a higher percentage of respondents claiming an increase in income since 1978 than the unserved households of the same type.

As expected, there was found a strong positive correlation between income level and electricity usage. For instance, no respondent consuming 50 or more kWh per month had income less than 200 pesos per month. Somewhat surprisingly, though, there seems to be no strong trend or relationship when changes in household incomes are stratified by electrical consumption.

#### 4. HOUSEHOLD ACTIVITIES AND PRACTICES

##### a. Night-time Activities.

In asking about household activities after sundown, survey interviewers found that use of evening house lighting for studying was the most significant. Education is given a high priority among the developmental programs of the Government of the Philippines. One aspect of this emphasis on education is the school lighting program sponsored by the National Electrification Administration in coordination with the rural electric cooperatives. The program was launched in 1976, and by the end of December 1978 the cooperatives had electrified 1,813 schools with 18,026 classrooms in their service areas. By the end of 1980, there were 3,285 schools electrified with 38,743 classrooms.\*

In many locations the cooperatives made the connection free of charge. The electrification emphasized lighting, but provided much more: power for electrical equipment and in some instances piped drinking water and kitchen cooking facilities for hot school lunches.

A tabulation at the end of 1978 counted 8,008 adults and out-of-school youths who graduated from evening vocational courses, while 300,687 other students were enrolled for formal high school and college courses offered in evening classes made possible by electric lighting. By the end of 1980, there were more than 100,000 graduates from these evening courses.

In respect to household study activity at night, it was found that 46% of households surveyed had someone studying at home on a regular night basis--about a third of those were for more than 2 hours a night. Daily night study activity was reported by 47% of the electrified homes surveyed, and by 34% of homes without electric lights. Daily night study differed only slightly among the electrified households in the three kinds of locations surveyed: remote barangays, along the main feeder line, or in the poblaciones.

Night study levels differed only slightly among types of electrified houses surveyed, but significantly among unelectrified house classes surveyed. For unelectrified houses, the level of daily night studying was substantially higher for "heavy" material houses (46%) than for "light" material houses (33%). In view that lower-income remote barangay families generally live in the "light" material houses, it appears that where there is no electrification, the poor do not have as much opportunity for studying at home at night as they do when electrification is made available.

Significant variation also was reported among the night study activity of the seven cooperative service areas surveyed. Cagayan I reported the highest levels of daily night study activity (70%), and Davao Norte the lowest level (27%). In view that the Cagayan I area reported the highest level of household monthly peso incomes and the Davao Norte area the lowest level of monthly peso incomes, positive correlation appears to exist between area income level and night study activity.

\*1980 Annual Report, National Electrification Administration.

Electric lighting in the home opens the evening hours for additional productive activities by members of the household. The questionnaire for the Impact Survey inquired about the extent to which some of these activities were practiced in electrified homes as compared to a control group of unelectrified homes. Except for handicraft activity at "mixed" material households, all such activities were reported somewhat more prevalent for all three classes of electrified house-types surveyed, as shown in Appendix D, Table D-3.

- (1) Cooking. Sixty-two percent of households interviewed in unelectrified remote barangays did some cooking after sundown. In remote barangays with electric lighting, 67% did some cooking after sundown. Along the main feeder lines the households which cook after sundown made up 54% of the survey sample, while in the poblaciones the proportion was 72%.
- (2) Housework. In 47% of interviewed households some housework is done after sundown in unelectrified remote barangays, but in those with electric lights 50% do some housework after sundown. Responses indicated 44% did housework after sundown in homes along the main feeder lines. In the poblaciones the figure was 63%.
- (3) Sewing. Only 7% of households interviewed in unelectrified remote barangays did sewing after sundown, while 20% did some sewing after dark in the remote barangays with electric lighting. About the same percentage was reported along main feeder lines and in the poblaciones.
- (4) Handicraft. Seven percent of those questioned in unelectrified remote barangays make handicraft items after sundown. The proportion in remote barangays with electric lighting was 10%. About the same percentages were found along main feeder lines and in the poblaciones.
- (5) Maintenance repair work. The statistical difference reported in maintenance repair work in the home after sundown in unelectrified and electrified remote barangays was significant--6% in the first and 16% in the latter. There was 12% reported along the main feeder lines and 5% in the poblaciones.
- (6) Job-related work at home. Respondents in unelectrified remote barangays reported 14% doing job-related work in the home after sundown, while in remote barangays with electric lighting 16% was reported. Along the main feeder lines, there was a figure of 26%, and in the poblaciones, 23%.

b. Agriculture and Home Business Activities.

Overall, 58% of the households surveyed reported raising food crops of some sort on land adjacent to the house or on non-adjacent land. Sixty-three percent raised livestock.

In all three types of house construction, the percentage raising crops and livestock was higher for unelectrified remote barangays than for those electrified. This suggests that road inaccessibility may be a major factor requiring unelectrified households to rear crops and livestock with greater frequency.

In some rural areas of the Philippines fish pond production is an important economic activity, but for the particular locations selected for the Electrification Impact Survey fish pond production was reported as an infrequent household activity.

Twenty percent of respondents from electrified households reported business or services performed in the home. Twenty percent of those households reported that such activity contributed more than 50% of the household cash income. Fourteen percent of electrified households reported handicraft, food, or other products made or prepared in the home. Thirty nine percent of these households reported that such activity contribute more than 25% of household cash income.

## 5. LABOR AND COST SAVINGS FROM ELECTRIFICATION

When queried about household electrical equipment use and reduction of household chores, 14% of the respondents reported that use of household electrical equipment had a "great positive effect" in reducing normal household chores. An additional 9% indicated "moderate positive effect." The wording of the question eliminated electric lighting, and applied only to such appliances as electric irons, sewing machines, etc.

When queried about electric lighting and money savings, 11% reported "no" money savings. "Significant" money savings were claimed by 31% of households surveyed along main feeder lines, which was about twice that of households located in the poblaciones or in remote barangays. By cooperative service area, all consumers interviewed in Cagayan I and Negros Oriental I reported some level of money savings, but only 77% in Bataan claimed any money savings using electricity for lighting in lieu of kerosene. It was found that the great majority applied these money savings for general family needs and essentials including food. Only a small amount was spent for electrical appliances and hardly any on recreation.

Eleven percent of electrified households reported use of electrical equipment in the home for business purposes or to produce products for sale. All but one of those who had such equipment reported that they derived money savings using the equipment.

## 6. HOUSEHOLD HEALTH AND NUTRITION

Health clinic availability varied strikingly in accordance with house location. Sixty-four percent of respondents in electrified remote barangays reported nearby rural health clinics or hospitals while only 43% in unelectrified barangays reported such health and medical facilities. Responses were much higher along the main feeder (87% and in the poblacion (95%).

In the poblaciones, 96% of those interviewed said the clinics were electrified; along the main feeder the response was 77%, and in the electrified barangays, it was 42%. In the barangays not yet electrified, 26% reported that any nearby medical or health facility had electric lights and equipment. Interviewers reported that a number of respondents commented favorably and at length about the advantages of electricity for sterilization, refrigeration, and emergency treatment at night.

It may be of some interest that familiarity with the availability of health and medical facilities cut across lines of economic status as reflected by type of housing. For example, those in "heavy" material houses responded 82% "yes," "mixed" responded 81%, and "light" 84%.

There was significant differentiation of health clinic availability by region, with Negros Oriental I households reporting 90% availability and Iloilo I, Cagayan I, and Quezon I 67%, 68% and 69% availability respectively. A similar finding was noted in response to the question about electrified clinics and hospitals supplied with electric service, with Lanao Norte as well as Negros Oriental I on the high end and Iloilo I, Quezon I, and Cagayan I again at the low end.

Three questions concerning household water use were asked. It was found that 41% of respondents used water from a well and manual hand pump at the house. Only 6% had an electric pump and most of these were in Lanao Norte and Bataan, where the cooperative electric systems offer low residential rates. Municipal or barangay water systems pumped by electricity were supplying 31% of surveyed households in Bataan, 29% in Cagayan I, and 26% in Negros Oriental I. All three of these electric cooperatives are participants in the NEA program to promote barangay water systems for rural communities. At the end of 1980, NEA-financed electric cooperatives had sponsored 448 waterworks systems, directly benefiting more than 450,000 households. This program for rural development has become so important that it is now administered by a new separate Rural Waterworks Development Corporation, headed by NEA Administrator Pedro G. Dumol.

The survey found that 83% of all respondents did not drink boiled water at home, and of those who did only 5% of electrified households used electric appliances for this function.

Ten percent of respondents bathe indoors with warm water. Not surprisingly, the highest percent of households reporting indoor bathing with warm water was from electrified "heavy" materials houses (15%). Outdoors bathing with cold water was reported by 57% of the surveyed households.

Analysis of information collected on illness in the households did not indicate any clear relationship with use of electricity.

In looking at food consumption patterns, a strong correlation was found between electric consumption and consumption of meat at least twice a week. No convincing relationship was discerned between use of electricity and consumption of dairy products, canned food products, or fresh fruit. Specific findings on these matters are presented in Appendix D of this report.

## V. ENTERPRISE SURVEY FINDINGS

### 1. PROJECT TECHNICAL PERFORMANCE

The great majority of enterprises surveyed (88%) were satisfied with the reliability of electric service received from the electric cooperatives. The level of service reliability satisfaction appears most closely related with cooperative service area rather than with the type of enterprise served or where an enterprise is located within the cooperative service area. For example, most satisfied were enterprises located in the poblacion portion of service areas (90%), in the category of rural agriculture enterprises (91%), and enterprises served by Quezon I (100%), Negros Oriental I (100%), and Lanao Norte (96%). Least satisfied were enterprises served at Davao Norte (74%), Cagayan I (78%), and Iloilo I (81%).

### 2. PRIVATE AND PUBLIC INPUTS

#### a. Supplemental Power Requirements.

Although most enterprises were satisfied with the reliability of electric service received from the cooperatives, some enterprises deemed it prudent to maintain "back-up" generation to augment enterprise electric service needs. This situation is particularly in agriculture enterprises and public facility enterprises, many of which retained generating equipment they had on hand when the cooperative began providing service. However, the great majority of enterprises (82%) were 100% dependent on cooperative service to meet their electric service needs. Manufacturing and small business establishments in the survey reported themselves "most dependent" (85%) on cooperative service to meet all their daily electric needs.

#### b. Roads.

Road accessibility appears a priority necessary precondition for most enterprise development. For example, all 12 enterprise classes surveyed reported road accessibility as an important or necessary factor in determining site specific enterprise location. However, 28% reported that road accessibility was not a necessary condition for enterprise location. From the data available, road accessibility appears to be the leading underlying factor for enterprise location for the following types of enterprises: food or grain processing, grain or food production, manufacturing, and government buildings and offices. Road accessibility appears as a supplementary determinant in enterprise location for all other types of enterprises interviewed, with perhaps the exceptions of small retail establishments (sari-sari stores) and churches/mosques.

#### c. Labor and Raw Materials.

The availability of skilled labor and raw materials was considered a necessary factor for enterprise location by a majority of the enterprises surveyed; however, 41% of enterprises reported that skilled labor was not a necessary condition, and 46% reported that raw materials was not a necessary condition for enterprise location. The availability of skilled labor appears most important in determining the location of agricultural production, manufacturing, and "other" public service enterprise--and least crucial for churches/mosques. The availability of skilled labor cannot be considered the primary factor of location for any of the 12 enterprise types surveyed. The availability of raw materials, however, may be considered as a primary factor for locating public markets.

d. Private and Public Capital.

The availability of private capital in the service areas is an important ingredient for manufacturing and churches/mosques establishment. The availability of public capital in the service areas is a crucial ingredient in the establishment of public and community facilities enterprises. However, neither the availability of private nor public capital can be considered overriding factors determining site specific enterprise location.

e. Electricity Availability.

Along with road accessibility, the availability of electricity plays a very important role in determining site specific location for private and public enterprise development in the service areas. Only 30% of the establishments surveyed reported that availability of electricity was not a necessary condition for enterprise location.

3. ENERGY USES AND APPLICATIONS

a. Enterprise kWh Use.

Based on energy use data collected at the offices of the seven electric cooperatives in the survey, the 12 enterprise classes surveyed accounted for only 11% of 1980 consumer connections but accounted for 60% of all energy sold during 1980. More electricity is demanded each year from each enterprise class surveyed, with the possible exception of grain and food processing and production enterprises. Two-thirds of the preponderance of surveyed enterprises increased energy use during the 1978-1980 period. Energy use levels were relatively higher for these enterprises: food or grain processing, restaurants/lodging, and "other" public services. Use levels were relatively lower at schools, retail and manufacturing establishments surveyed. The average use increases varied among the types of enterprises surveyed. Usage increases were higher for clinics, churches, retail, meat production, and manufacturing establishments, and lower for grain and food processing and production enterprises.

b. Agriculture Enterprises.

The preponderance of electricity utilized by the agriculture enterprises surveyed was for work-related activity (pumping and processing) and for preserving food (refrigeration). The most prevalent application of electricity reported was for water pumping (40% of sampled enterprises). The second most prevalent application was for refrigeration (22%). The third was for running processing machines (20%). Only 14% reported indoor lighting use of 10 or more light fixtures.

c. Manufacturing and Small Business Enterprises.

The preponderance of electricity used by manufacturing and small enterprises surveyed was utilized for work related activity (pumping, fabricating, and office work), for preserving food produce (refrigeration), and for running electronic equipment.

Primary application of electricity by manufacturing enterprises was for running fabrication machines (63% of those sampled). Secondary application was for water pumping (44%). Primary and secondary applications for retail shops were refrigeration (65%) and water pumping (30%) respectively. Primary and secondary applications for personal services shops were for office machines (47%) and electronic equipment (47%) respectively. Primary and secondary applications for restaurants/lodging was

refrigeration (100%) and for electronic equipment (81%) respectively. Overall, only 24% of all these enterprises reported indoor lighting use of 10 or more light fixtures.

d. Public or Community Service Enterprises.

Electricity use by the public or community facility consumers surveyed differed significantly among various end uses depending on the type of enterprise. The prevalent applications, however, were for lighting, electronic equipment, water pumping, and refrigeration.

Primary and secondary applications for government buildings and offices was for electronic equipment (63% of those sampled) and for fans (3 or more) and air conditioning (55%) respectively. Primary and secondary applications for schools/colleges was indoor lighting -- 10 fixtures or more -- (56%) and water pumping (56%) respectively. Primary and secondary applications for clinics/hospitals was refrigeration (64%), lighting -- 10 fixtures or more -- (57%) and cooking (57%) respectively. Primary and secondary applications for churches/mosques was cooling equipment -- fans (3 or more) and air conditioning (40%) and electronic equipment (37%) respectively. Electricity applied by other public service enterprises was used primarily for lighting, running fans and air conditioning, pumping water, office machines, and electronic equipment (all over 40% of those sampled).

e. Lighting for Security Purposes and Income Generation Purposes.

Lighting for security purposes was an extremely important application of electricity for the enterprises surveyed. Three-quarters of them reported that security lighting provides significant safety from theft or other crime. Overall 39% of the enterprises surveyed reported that they apply electric lighting for income generation purposes respectively. Lighting applied for income generation purposes was most pronounced for meat or fish production enterprises (76% of those sampled) and for restaurants/lodgings (73%).

4. NEW ENTERPRISE CAPACITIES AND ELECTRICITY

a. New Enterprise Services.

Overall, the data suggests that new enterprise service connections have more than doubled since cooperative power was introduced in the provinces (roughly 1973), especially in provinces where rural electric service was less developed. Forty-three percent of all enterprises surveyed reported receiving electric service prior to 1973 (49% for urban enterprises, 35% for rural enterprises). The percentage receiving electric service prior to 1973 varied significantly among the cooperatives surveyed -- from 63% at Bataan to 26% at Quezon I and Davao Norte.

b. Agriculture Enterprises.

Strong relationships exist in the survey data to suggest that electricity plays a major role leading to the formation and the expansion of meat or fish production enterprise. The data also suggest that electricity plays a major role in maintaining current levels of other agriculture enterprise production.

Meat or fish production enterprises approximated 1.8 years between date of formation and date of taking electric service, a comparatively lesser time frame than for the other types of agriculture enterprises surveyed. It was also reported that the availability of

reliable electric service played an important factor (70% of those sampled) in plans for the former type of agriculture enterprises to expand operations and that lighting for income generation purposes was extremely important (76%) to such enterprises. As previously noted, the availability of electricity was, moreover, considered a very important factor in determining the location of meat production enterprises. Finally, only one of these enterprises reported a decrease in the hours of daily operations since 1978, while 28% of the enterprises reported increased hours of daily operations since 1978.

Only minimal net increase in daily operating hours was noted for the other two types of agricultural enterprise surveyed. These food and grain processing and production enterprises, however, reported a high dependency on electric service to maintain daily operations. Most of the enterprises reported that they would be forced to curtail operations by at least 50% without electricity.

#### c. Manufacturing and Small Business Enterprises.

The availability of electric service and lighting appear closely related to the increases of daily operating hours experienced by small business enterprises in the cooperative service areas. Electricity furthermore appears a necessary precondition to maintain and increase current levels of manufacturing enterprise production in the service areas.

Extremely close relationships existed between the year of reported formation and the reported year of initial electric use for these enterprises: restaurants/lodgings (0.8 years average lag), personal services shops (1.1 years), and manufacturing enterprises (1.6 years). Over 50% of the manufacturing and small business enterprises surveyed reported that they would have to curtail operations 50% or more without electricity. A significant number of restaurants/lodgings (net 20% of those sampled) reported increased operating hours since 1978. No retail enterprise surveyed reported a decrease of daily operating hours since 1978, while 24% of the retail shops reported increases of daily operating hours since 1978. Also, manufacturing and personal service shops reported lesser increases in operating hours since 1978.

Lighting was reported as an essential input for income generation purposes by 70% of the restaurants/lodgings surveyed. Over 66% of the manufacturing and small business enterprises surveyed reported the availability of lighting to be essential to enterprise safety and security.

#### d. Public or Community Service Enterprises.

The provision of cooperative electricity also affects schools/colleges and churches/mosques activity and practices, but in a more diffused manner. Electricity is a major direct input for establishing or broadening operations in government buildings and offices, hospitals/clinics, and "other" public facilities enterprises. Basically, service to schools/churches may be considered as a new social service introduced by the cooperatives not previously undertaken by private electric companies providing electricity in the service areas.

All public or community service enterprise classes reported net increases in daily operating hours since 1978, although significant variation existed among classes. Relative lesser increases in extended operating hours were experienced by schools than by the other public and community consumers surveyed. Findings for government buildings/offices and other public service establishments indicated high correlation between the date of electricity availability and the year of enterprise formation. This

was not so for schools/colleges, churches/mosques, and for clinics/hospitals. Other public service enterprises reported very high dependency on electricity to maintain present operating levels, and all the enterprises except churches/mosques reported that the continued availability of electricity plays a leading positive role in contemplating expanded operations.

## 5. SAVINGS FROM PURCHASES OF ELECTRIC EQUIPMENT

### a. Agriculture Enterprises.

A minority of the agriculture enterprises surveyed purchased electric equipment since 1978. Significant labor savings were derived from use of this equipment. However, only marginal money savings were derived from electrical equipment purchased for employee use.

Thirty percent of the agriculture enterprises surveyed reported purchasing electric equipment since 1978 for management use. Over 90% of the enterprises purchasing such equipment reported they derived some degree of labor savings utilizing this equipment. Over 75% reported they derived some money savings utilizing this equipment.

Fifteen percent of the enterprises also reported purchases of electric equipment since 1978 for use specifically by employees. About 70% of those purchasing this equipment reported they received significant labor savings, and 55% reported they had derived money savings to any degree from such purchases.

### b. Manufacturing and Small Business Enterprises.

Overall, manufacturing and small business enterprises purchased more electric equipment since 1978 than did agriculture enterprises. Significant levels of labor and money savings were derived from this electric equipment.

Sixty-one percent of this class of enterprises surveyed purchased electric equipment since 1978 for management use. Eighty-nine percent of those purchasing such equipment reported deriving moderate to great labor savings from use of the equipment. Furthermore, 88% of these enterprises reported deriving some money savings.

Twenty-eight percent of the enterprises reported purchases of electric equipment specifically designed for employee use since 1978. Of those who purchased such equipment, 92% reported deriving moderate to great labor savings, and 86% reported deriving some money savings.

### c. Public or Community Services.

Purchase levels of new electric equipment since 1978 for the public and community service sector were similar to those made by private sector. Labor and money savings derived from these purchases were also similar.

Forty-seven percent of electrified public and community services surveyed purchased electric equipment for management use since 1978. Of those purchasing such equipment, 83% reported deriving moderate to great labor savings and 86% reported deriving some money savings.

Thirty-one percent purchased electric equipment for use by employees since 1978. Of those who purchased this equipment, 88% reported deriving moderate to great labor savings, and 83% reported deriving some money savings.

## 6. ENTERPRISE EMPLOYMENT AND PRODUCTION LEVELS

### a. Agriculture Enterprises.

The agriculture enterprises surveyed have contributed directly to project area employment and income formation. Electricity, furthermore, appears to have assisted most directly in this process, by allowing animal production operations to become more efficient and attractive investments.

The typical agriculture enterprises surveyed had four male and two female full-time employees. About one-half had male part-time employees and one-third had female part-time employees. On net, gains (since 1978) in full-time employees were experienced by 20% of the enterprises surveyed. Gains in full-time female employees were slightly higher. On net, gains (23%) were also experienced in part-time male employees, but net losses (4%) were reported in part-time female employees.

More enterprises reported production gains rather than production decreases since 1978. Seventy-five percent of the enterprises surveyed reported increases in the number of animals raised, while only 10% reported decreases. The enterprises surveyed cultivated slightly more land than they did in 1978. Fifteen percent reported increasing the number of hectares under cultivation, while 4% reported decreasing hectares under cultivation. The enterprises also processed greater amounts of food and grain than they did in 1978. Sixty-eight percent of the enterprises surveyed reported processing more food or grain presently than during 1978, while 27% reported decreases in the amount of food or grain processed.

### b. Manufacturing and Small Business.

These enterprises have contributed to project area income formation through small yet significant employment gains, generated primarily by increased merchandising activity. Lighting through electricity appears to have assisted this process by facilitating extended hours of enterprise operation.

The typical enterprise surveyed had four male and three female full-time employees. About 20% of the enterprises had some part-time help. The level of part-time help, especially female help decreased slightly over the past three years. Full-time employment, on the other hand, particularly female help, increased since 1978. About one-quarter of the enterprises surveyed reported employing more people on a full-time basis in 1980 than they did in 1978. About 15% reported employing less people. Employment gains were concentrated at manufacturing and retail enterprises. Female net employment gains were most notable in retail and personal service enterprises. Female employment losses were most notable in restaurants/lodgings.

Retail sales since 1978 increased for every retail establishment surveyed, except one which reported retail sales equivalent to its 1978 level. Manufacturing output level changes varied among the enterprises surveyed. About as many reported production output decreases as reported increases. Similar experience was reported in respect to number of customers or clients served by personal service shops and restaurants/lodgings.

c. Public or Community Service Enterprises.

The public and community service enterprises surveyed have helped to improve social and economic well being in the service areas through continued creation of new employment opportunities, and through provision of social and health services to an increasing number of clients. Electricity's major linkage to this process appears to be provision of electricity for lighting and running machinery which facilitates the ability of these service enterprises to expand operations.

The typical public or community service enterprise surveyed employed 13 male and 11 female full-time employees. About one-quarter employed part-time help. On net, about 20% of the establishments had added new full-time employees since 1978. Female employees have been added at a faster rate than male employees, except for part-time work. All hospitals/clinics surveyed reported new employees since 1978.

On net, over one-third of the enterprises reported serving more clients than they did in 1978. Most notable were increased school enrollments and clients served by hospitals/clinics.

## VI. STUDY CONCLUSIONS

### I. COOPERATIVE TECHNICAL AND OPERATING PERFORMANCE

From a project output view, the performance of the seven representative cooperatives can be summarized as successful in respect to training, communications and line construction activities. Each cooperative surveyed provides its management and members a well designed, low-cost electric system and office facilities.

This design includes an integrated radio system, which allows instant communications not only with staff units throughout the cooperative service area, but among all the cooperatives throughout the country and NEA. Such a system facilitates cooperation and expedites daily operation activities and correction action to be taken during periods of unscheduled outages and storm damage. Line extensions are based on economic load-density priority, and technically sound design, and are constructed in a timely fashion. Through well designed and comprehensive training activities conducted by NEA, FECOPHIL and cooperative personnel, cooperative staffs have developed and maintain excellent technical skills to operate their electric systems.

Data gathered during the survey, however, indicates that the level of technical and operating performance differs quite significantly among cooperatives in respect to energy losses, service interruptions, collections, maintenance practices, transportation availability, and system information record keeping and availability. Each cooperative surveyed indicated some weakness in at least one of these areas of performance.

Reported energy loss data from Bataan and Cagayan I systems suggests levels far excessive for prudent utility operations. Faulty substation or consumer metering data may explain a good portion of why reported losses are excessive. Such study should be initiated by NEA and the cooperatives, if not already undertaken.

Data collected from the household survey indicates that service interruptions experienced by residential consumers runs considerably higher than standards accepted, for example in rural areas of the U.S. Most of these service interruptions have been unscheduled, being attributed to outages at power supply site or along NPC transmission lines. Such service interruptions were most common at the two cooperatives (Bataan and Quezon I) in the survey served by the NPC Luzon grid.

Residential consumers were not overly concerned by such poor performance in service interruption. Apparently even interrupted service seems better to them than no service at all; or, present electric service in respect to service interruptions has improved relatively over the years. This level of service interruptions, however, appears less acceptable to enterprise consumers surveyed. This is indicated by the significant percentage of enterprises still maintaining privately held "back-up" generators, particularly by rural agriculture enterprises. It would be worthwhile for the cooperative to investigate more fully the reasons why this has occurred, as part of their productive use development activity.

As observed first hand during the survey, all cooperatives are attempting to construct and maintain plant, and maintain consumer services with an inadequate fleet of transportation equipment. High levels of indirect costs can be associated with this resource inadequacy. The recent ADB loan to NEA will assist in modernizing this transportation deficiency at the cooperatives. Therefore, these unnecessary indirect costs should be reduced in the near future.

Consumer complaint and service data availability was spotty and generally not available during the survey. The lack of availability of such data may be symptomatic of the more extensive information base needed to operate a modern utility enterprise, not yet implemented in full by the relatively newly formed cooperatives. System report data in other areas of operations were found lacking. Both NEA and FECOPHIL should take a leading role in assisting the individual cooperatives to improve their general performance and capability in expanding and maintaining all necessary system operating records and reports. This is needed especially in the areas of monthly operating and financial data, including consumer complaint, consumer collection, plant in service, and energy sales and purchase metering data.

For future impact or productive use of electricity analyses, it is recommended that the cooperatives consider jointly with NEA the merits and the costs of restructuring the consumer classes presently used on their billing records in such a fashion that would utilize billing data more directly and effectively. Specifically it is suggested that consumer classes be broken down by project location (urban or rural), by amount of energy used (especially to identify minimum bill users), and by specific type of enterprise served (manufacturing, retail, personal service, public service, etc.) typical in the Philippines.

## 2. INSTITUTIONAL VIABILITY

All seven of the electric cooperatives surveyed gave evidence of continued institutional viability. They varied widely, however, in the strengths or general factors which measure such viability. Each is a highly individualized service enterprise, shaped and guided by NEA requirements that are adapted to the character of local cultural patterns, economics, and politics in the service area.

Each one showed a sound organizational structure, prescribed by NEA and generally followed. Staffing was generally adequate, and comprehensive training programs were in place. Staff turnover appeared high according to U.S. standards, although full statistics were not obtained at all of the cooperatives. There was consistent comment about the large number of trained employees who moved on to better paying jobs in cities or to contract jobs overseas in the oil-producing countries.

Turnover of general managers could be judged high by comparison with other industries and other countries. It was noted that a considerable number of general managers are assigned to cooperatives from the NEA staff. This is defended as part of a practical and effective management training program and as a remedy for local problems that may threaten viability.

Conversations with directors on the boards of the cooperatives, and with other persons familiar with them, reveal great variation in attitudes about the objectives of the cooperative and about the concept of its joint ownership by the consumer-members. While most directors seemed devoted to real concern for the best possible service to the most potential consumers at the lowest feasible cost and to a truly democratic concern for the members' ownership rights, there were others who appeared motivated by opportunity for personal advantage. The survey coordinator received too many comments about "local politics" becoming an increasing threat to the future of the cooperative to ignore this concern.

A high level of respect for the cooperative as a community institution showed in comments picked up during the survey interviews. Along with this, the reports by NEA

and the cooperatives show a strong record of participation in community activities and community development.

Consumers' perceptions of the cooperative's electric service as a benefit to the community is matched by a surprisingly high praise for the electric service as a household blessing. Statistically, the appreciation and loyalty of consumers appeared to be strongest where there was a high level of recognition by consumers that they were the joint owners of the cooperative.

Responses to the questionnaires pointed to a sharp difference in ownership recognition from one service area to another. Two of the seven had nearly 100% understanding that the cooperative was owned by its consumer members. Two others had a high percentage of responses that it was believed to be owned by the government, NEA, or the local board of directors. There seemed to be a positive correlation between members' perception of ownership and the attitudes about ownership expressed by directors and key staff members of the cooperative. Another related factor seemed to be the effectiveness of the cooperative's member or consumer relations department. This same linkage appeared to exist in attendance at membership meetings of the cooperative.

One of the cooperatives in the survey required new consumers to participate in an orientation meeting and issued membership certificates. Another had a strong program for encouraging members in productive uses of electricity. These efforts showed improved operations results in consumer-member response, which in turn makes for a more viable institutional profile. Generally, the cooperatives seemed not very active in encouraging power use development which would benefit both the consumers and the cooperative.

One of the positive supports for institutional viability which stood out at all cooperatives in the survey was the strong, healthy tie with NEA, which provides technical and financial support and necessary controls over such critical areas as budget, finance, selection of manager, staff training, etc. Some interest was found in potential assistance from the new Federation of Electric Cooperatives of the Philippines. It was seen as an institutional support for member cooperatives which could supplement NEA's services. In some ways the Federation was suggested as a means to pick up activities which NEA decides to terminate as the cooperative systems mature and show ability to provide more of their own needs as ongoing institutions.

### 3. FINANCIAL SOUNDNESS

The seven cooperatives selected for survey were chosen specifically to represent regional differences of electricity (load composition) and supply (power supply cost) factors in order to make a statement on the overall financial soundness of the electric cooperative movement in the Philippines, and to lay the framework to be able to trace impact "linkage" chains that may exist between the level of electric energy costs and development in the rural areas of the Philippines. It was found that cost of electricity has a significant affect on the amount of electricity that can be afforded, and the degree to which electricity can be applied for productive or developmental use. Moreover, it was found that cost of electricity, in the rural Philippine context, is inextricably related to sound cooperative financial performance.

As mentioned, two cooperatives (Bataan and Cagayan I) have experienced energy loss levels excessive for prudent utility operations. Furthermore, each cooperative except Quezon I experienced consumer collection delinquencies excessive for prudent utility financial soundness. A dramatic slippage in revenue therefore has been forthcoming

which has affected the ability of some cooperatives to meet their financial obligations on a timely basis to NEA, and to their power supplier, NPC. This indicates an underlying need for the cooperatives to initiate a structured program which measures and controls these causes of revenue slippage.

Cooperative electric tariffs have been set at levels to generate adequate financial returns to meet operating expenses, depreciation, and debt service. The levels of tariffs vary according to the base cost of power purchased or generated by the cooperatives. Therefore, Cagayan I, which generated its own power electric, had tariffs which were much higher than those of other cooperatives. In each service area, these tariffs are competitive with prevailing costs of kerosene and diesel fuel. The tariffs, however, were not competitive with wood-based fuels used widely for household cooking. Although actual cash returns on the tariffs have lagged behind billings, due to the collection problems noted, such tariff levels appear adequate and competitive to assure financial soundness during the future, provided that the present collection deficiencies are ameliorated.

Moreover, assuming that system energy loss levels are prudently reduced and assuming that new lower cost electricity energy sources are forthcoming (from mini-hydro and dendro-thermal power plants presently being developed by NEA on Luzon and in the Visayas), conceivably the current level of electric retail tariffs can be reduced.

Furthermore, financial soundness of project development is suggested by system design, policies, and standards implemented. Low-cost standardized line design construction is found at each cooperative. New line extensions have been built based on anticipated economic returns (i.e., on a forecasted investment per kWh sold basis) in accordance with NEA policy guidelines and review. Such design control was initiated in the early 1970's by NEA to adapt to the economic inadequacies inherent in project design of the two pilot rural electrification projects in Negros Occidental and Misamis Oriental funded by AID. Implementation of such policy has increased investment returns for the newly developed cooperatives at a pace exceeding those experienced by rural electrification cooperatives in the U.S.A. For example, it took U.S. rural electric cooperatives a forty-year period to attain the similar level of return (i.e., on an electric sales volume per mile of line basis) as that experienced by those seven cooperatives under study just after five years of electric development.

#### 4. MAJOR IMPACT OF ELECTRICITY IN HOUSEHOLDS

Households make up 89% of the total consumers in the seven cooperatives surveyed, and they use 37% of the total power delivered by the cooperative systems.

Lighting is the principal application of electric service to households; and electric lighting is seen by the great majority of residential respondents in the seven service areas as a major factor in household safety and security. Lighting also is reported making possible home studying during evening hours and a wide variety of other household activities after sundown: sewing, cooking, and other home-making chores; handicrafts, repairs and other services; and job-related work.

Electric lighting is recognized by most households as being cheaper than kerosene lamps or other alternatives, and many respondents cited measurable savings of money as well as time in using electric lighting. Respondents said that money saved as a result of using electricity was being used for additional food and other household essentials.

Although appliances are not found in every household--in contrast to lighting in all homes--appliance use accounts for a major portion of the kilowatt-hours of electricity billed to residential consumers. Principal electrical appliances found in the homes of the sample families were: electric fans, refrigerators, television sets, and irons. It should be noted that there is limited use of electricity for cooking. In most service areas, wood, palm leaf stems, charcoal, and refuse is cheaper than electricity for heating at present rates.

Over half of the households interviewed said that electricity had a great positive effect on the economic and social well-being of the family. A significant portion said that the family enjoyed added income made possible from electricity used in the home for producing goods or services for sale.

Although data collected from the interviews and questionnaires threw light on housing, health, and nutrition conditions in small towns and the countryside, correlation with rural electrical service could be considered parallel rather than cause and effect. Findings were not always statistically significant. It is clear, however, that many heads of households see their electric service as a way to maintain and improve the family's level of living. The overall impact within a community appears to encourage upward mobility.

Supporting this conclusion is the indirect electric impact linkages--although not statistically tested--of such contributions as electrically powered water systems; school, church, and plaza lighting; electric service to rural health clinics; and improved nutrition and health conditions resulting from refrigeration of food in restaurants and markets. None of this shows up in household electrification usage, and yet it has a beneficial impact on the family.

Almost half of the households in the survey indicated plans for purchase of some additional appliance in the next year, with television, refrigerators, stereo/phonographs, and fans listed in that order. Insufficient income was given in most cases as the reason for not having already purchased desired appliances. Most of the cooperatives offer a credit plan on favorable terms for housewiring in the homes of low-income families, but questioning revealed difficulty in purchasing appliances on credit in most locations.

The overall implication of the appliance and electric usage part of the Impact Survey is that the cooperatives could advantageously give more attention to encouraging productive uses of electricity and work more closely with appliance dealers in towns for better appliance information and servicing -- or to provide such services themselves, perhaps through a program which could be established by their Federation, where appropriate.

The survey found that minimum bill users (10 to 15 kWh per month or less) in the seven cooperatives ranged from one-quarter to more than one-half of total consumers. This is a significant statistic for measuring the level of accessibility and affordability at the lower economic level of the population.

In rural electrification the following realities have been accepted on the basis of long and careful study:

- (1) People in all economic levels recognize the benefits of electric service and especially the money savings in electric lighting.
- (2) While people in all economic levels sign up for electric service from the cooperative systems, households with high incomes use large amounts of

electric energy and households with low incomes use small amounts. KWh consumption is directly related to income.

- (3) Consumers generally increase their use of electricity as time passes, so if no new consumers were added to the system, power deliveries would increase over the months and years. Adding new consumers from lower economic levels dilutes the normal increase in use by consumers who have been on the line for some time.
- (4) With the number of consumers increasing and the total delivery of power growing, while the average household use holds relatively steady and the percentage of minimum bill users increases or remains about the same, it is clear that the Philippine electrification program is reaching the rural poor.
- (5) One major control factor in all this is the retail rate charged for electric service. When the rate goes up, use goes down. When the rate goes down, the use goes up.

Because retail rates in various parts of the Philippines are not within the control of the cooperative's management, there should be a continuing program of information to help the member-consumers understand rate determination. The Federation (FECOPHIL) has recently launched a program to do this, pointing especially to cooperative service areas getting power from the NPC Luzon grid. Cooperatives serving islands and remote areas with high-cost diesel generation are faced with continuing high retail rates and difficulty in fully serving consumer needs. That is why so much hope rides on NEA's introduction of dendro-thermal and mini-hydro generation. It will be useful to watch the relation of rates to consumer consumption patterns when these alternative energy sources are successfully installed.

## 5. IMPACT OF ELECTRIFIED ENTERPRISES ON COMMUNITY STANDARD OF LIVING

To appreciate the impact that the seven cooperatives have on project service area development, it is essential to trace how enterprise use and apply electricity in their operations. As noted, approximately 60% of all electric energy sold by the cooperatives is used by the enterprise sector, while less than 40% of the electricity distributed is consumed by the residential (household) sector. The remaining portion, about 4%, is consumed for public and security lighting purposes.

Electric retail rates to the enterprise sector are generally set at higher levels than for household minimum bill users. Therefore, payments for electric service from the enterprise sector not only support the financial base for cooperative operations, but subsidize electricity costs to the residential sector, particularly lower income households which consume minimal amounts of electricity. These households in turn are able to take advantage of the competitive price of electricity over oil-based fuels which actualizes money savings, helping these households to maintain or improve their standard of living.

The availability and proximity of electricity has played an instrumental role in determining where many types of enterprises locate their operations and an important role in determining their decision to expand enterprise operations. Road accessibility has played a similar instrumental role for determining enterprise location. The availability of private and public credit, however, appears to have play a lesser significant role in determining site specific location of enterprise location.

The great proportion of electricity consumed by the enterprise sector is used for work-related purposes (water pumping, fabrication, food processing, office work, etc.) and for refrigeration (preserving food and office work). Only a small portion is utilized for lighting, which in most cases is used for service or income generating purposes. Therefore, it becomes evident that the great proportion of electricity provided by the cooperatives can be directly related to some type of productive or work-related end use. Based on rural electric energy application patterns in the U.S., and the data available from the study survey, rural electric usage in the Philippines appears quite comparable in respect to the amount of total electric energy that is expended for work or productive applications.

The data collected in the survey furthermore suggests that electricity plays an important role in project area development by:

- (1) Maintaining current levels of manufacturing and agriculture enterprise production, and by accelerating the formation of meat production enterprises;
- (2) Extending operating hours for private and public enterprises;
- (3) Broadening types of services that can be provided to clients of both private and public enterprises;
- (4) Providing labor and money savings through the use of electric equipment, particularly to small business enterprises;
- (5) Allowing enterprises to become more efficient and attractive investments, which in turn expand operations and contribute to project area employment and income generation.

## SURVEY METHODOLOGY

The present study was undertaken in November under sponsorship of the Federation of Electric Cooperatives of the Philippines, but that organization avoided direct participation in order to assure impartial conduct of the survey. Preparations for the study were made by Philip P. Costas, Assistant Administrator, Economic Analysis and Evaluation, International Programs Division, National Rural Electric Cooperative Association.\* The survey itself was supervised by Donald H. Cooper, president of Cooper Consulting, Inc.\*\* The study report was prepared by Mr. Costas and Mr. Cooper, with William E. Knight, Washington Institute for Social Research, making the computer printouts and helping with statistical analysis.

Methodology, including the interview questionnaires, sampling techniques, and comparisons of project data, was based on a pre-test made in Ilocos Norte during August 1981 (see Appendix A) and after examining other earlier surveys.

1. Preparing the Questionnaire. Separate questionnaires for households and for commercial and public enterprises were designed early in the year based on an analytical framework reviewed by AID (attached to this Appendix A), then reviewed by analysts familiar with economic and social conditions in the Philippines and with research techniques. Mr. James Cudney, NRECA Regional Administrator for Asia and the Pacific, field tested draft questionnaires in the service area of Ilocos Norte Electric Cooperative, August 23-30, interviewing 40 households and enterprises. On the basis of this test run, further revisions were made in the questions and format. The final draft contained 100 questions in the residential and 65 questions in the enterprise questionnaires. The format permitted digital coding (0 through 9) for key punching and data processing.

Questions for households were grouped to obtain identification and classification information, economic status, living patterns, use of electricity, and attitudes about its benefits and about the cooperative supplying the service.

The enterprise questionnaire sought to determine extent and variety of use of electric power and light and to identify any links between these factors and such outputs as production or extent of service offered to customers or clients. A group of questions sought to establish whether or not increased hiring and education and training for employees was related to electrification. Attitudes about the value of electrification and about the cooperative and its service also were explored in some of the questions.

\*Mr. Costas has been an overseas advisor in the Philippines, Indonesia, Bangladesh, and North Yemen. He was previously employed as a program officer at REA, and as an operations and rates specialist with the National Rural Utilities Cooperative Association, Washington, D.C. Mr. Costas has also served as a consultant to the World Bank, United Nations Development Program, and the Asian Development Bank on rural electrification project study matters.

\*\*Mr. Cooper was an information specialist and management specialist in the REA, U.S. Department of Agriculture for 17 years; then served 9 years with NRECA as specialist in rural electrification and cooperatives. He was organization and management consultant to NEA in the Philippines for 4 years, and prepared feasibility studies on rural electrification in Indonesia and the Yemen Arab Republic.

Some overlapping of questions provided a measure of validity in responses.

2. Establishing the Sample. From time to time opinions have been expressed by persons interested in "third world development" and "foreign aid" about the extent to which the rural electrification program reaches and benefits "the rural poor." Because of continuing discussion of this question, the present survey attempted to find a measurable response -- sampling information that would have reliability.

Instructions for household interviews provided for an equal number to be made at houses with "light" or inexpensive materials construction, houses with "mixed" or medium cost material construction, and those with "heavy" or solid and more expensive construction. A definition for each type was provided in each copy of the residential questionnaire, for the interviewers. In addition, several questions established correlation on income level and economic situation. The rural/urban household identification was easily determined by the sampling technique used in the survey.

Four types of rural/urban locations were designated for interviews: poblacion (urban concentrations), main feeder line (corresponding to suburbs), remote barangays (4 kilometers or more from the main feeder line or main road) which have electric service, and remote barangays still without service. Interviews in the latter grouping served as a control sample for the responses.

Each of these geographical rural/urban groupings was to be divided into five sectors. It was planned to have a "light," "mixed," and "heavy" house interview in each of the five sectors, so that for each cooperative service area there would be 15 poblacion, 15 main feeder line, 15 remote served barangays, and 15 unserved barangay interviews. This is a total of 60 planned random questionnaires completed for each electric cooperative in the survey.

To assure controlled random sampling the following instructions were given to each interviewer:

"The poblacion is divided arbitrarily into five sectors. In the sector assigned to you, go to the barangay hall or to the house of the barangay captain. Then follow the electric pole line from there in a direction away from center of town. Stop for interview at the first 'light' constructed house you come to. If no one is home, go to the next 'light' one until you can make your interview. Next, continue in the same manner for your 'mixed' construction house. And then repeat the process to get the 'heavy' constructed house."

For interviews along the main feeder line, we will start from the electric cooperative's office (or along the main road from the edge of town). At kilometer 1, we will drop off the first interviewer. He will proceed away from town, presenting his questionnaires at the first 'light,' 'mixed,' and 'heavy' house, as was done in the poblacion. The second interviewer is dropped at kilometer 2; the third at kilometer 3; the fourth at kilometer 4; and the fifth at kilometer 5."

In a similar manner, the remote barangays with electric service and those not yet electrified were divided into five sectors for interviews at three levels of housing.

Selecting commercial and public enterprises for interview required a different process, but this, too, had to assure random selection and avoid predetermination of results. It was decided in advance that 50 enterprise questionnaires at each cooperative service

area would yield sufficient variety of data and constitute a sufficient balance for the 60 residential inquiries.

The survey planning team examined principal elements which comprise the socio-economic life of town and rural areas in the Philippines, and from this prepared a list of agricultural, commercial/industrial, and public establishments that should be included in the study. Types of enterprise within these three general categories were then established, along with the number needed in rural and in non-rural areas to give a representative framework for determining the impact of electrification.

The final listing included the following:

<u>Type of Enterprise</u>	<u>No. of Interviews in Poblacion</u>	<u>No. of Interviews in Rural Areas</u>
Agriculture		
Food or grain processing	0	5
Poultry/meat/fish production	0	5
Grain and other food production	0	5
Private small enterprise		
Manufacturing	2	1
Retailing (including sari-sari)	2	2
Personal services (barber shops, tailoring, banks, movies)	3	2
Restaurants, lodging	2	1
Public or community services		
Government offices or buildings	2	4
Schools, colleges	1	4
Health clinics, hospitals	2	2
Churches, mosques	1	2
Other (transportation, communication, markets, plazas, waterworks)	1	1

This yielded a total of 16 interviews in the town centers and 34 in rural areas for each cooperative.

Specific consumers for interview were found by looking through the billing records at the office of the cooperative and selecting the first ones that fit the categories listed. This produced random selection because the order of consumer accounts in some offices is alphabetical, while in others it may be geographical or by the date when the enterprise was connected to the cooperative's lines. It was agreed that if the distance from the headquarters to the enterprise selected was excessive, the next similar billing in the files could be used.

3. Size of the Sample. Sixty residential interviews plus fifty from enterprises made up the sample of 110 in each cooperative service area. The total of 770 interviews from the seven electric cooperatives represents a significant sampling: the cooperatives represent 6.5% of the 106 NEA-financed systems. These cooperatives serve 8% of all the consumers presently connected in the electrification program, and sell 9% of the electricity. The upward bias in consumers and power reflects the omission from the study of very new cooperatives on the small islands. Most of these use small diesel

generators and do not have the full 3 years of operation that was one of the study requirements in order to obtain some kind of trend line.

4. Criteria for Selecting the Cooperatives. The survey was designed originally to cover six electric cooperatives: two in Luzon, two in the Visayas, and two in Mindanao. Ten criteria for use in the selection had already been determined and set forth in a memorandum, "Basic Criteria for Selecting Cooperatives to Survey." These criteria were the following:

- (a) Geographic representation to cover Luzon, Visayas and Mindanao.
- (b) Early established cooperatives with minimal take-over urban customers. (Need original feasibility comparison; should be 6 to 8 years old, so trends are available). One should be more recently established.
- (c) Better than average financial and system loss performance (but select to cover a wide range; do not pick just those with good performance).
- (d) Good Board/management relations and good community relations.
- (e) Some areas where other government development inputs exist: BLISS housing, barrio water systems, school lighting, etc.)
- (f) Self-generation vs. grid system (pick one still using self-generation and one which has converted to grid; remainder on grid).
- (g) Each cooperative selected must have good records and maps.
- (h) Include a wide range of number of consumers; at least one large and one small. Also, look for at least one thinly populated and one with heavy population clusters.
- (i) No selected cooperative should have extreme high or low rates.
- (j) Must have 24-hour service.

General Pedro G. Dumol, NEA Administrator, concurred in the selection criteria and in the six selected on the basis of the listed criteria, but pointed out that seven (three in Luzon, two in the Visayas, and two in Mindanao) would more nearly represent the actual distribution of the 106 cooperatives providing service. The final selection was:

Cagayan I Electric Cooperative (CAGELCO I), with headquarters at Solano, Cagayan Province, Luzon Island

Bataan Electric Cooperative (BATELCO), Balanga, Bataan Province, Luzon Island

Quezon I Electric Cooperative (QUEZELCO I), Pitogo, Quezon Province, Luzon Island

Iloilo I Electric Cooperative (ILECO I) Tigbauan, Iloilo Province, Panay Island

Negros Oriental I Electric Cooperative (NORECO I), Bindoy, Negros Oriental Province, Negros Island

Davao Norte Electric Cooperative (DANECO), Montevista, Davao Norte Province,  
Mindanao Island

Lanao Norte Electric Cooperative (LANECO), Tubod, Lanao Norte Province,  
Mindanao Island.

These selections gave representation to seven of the twelve administrative districts of the country.

The seven include neither the best nor the worst of the service systems, but are roughly representative of the entire program, geographically and in terms of project input, viability performance, and outputs as perceived by the people served. Cooperatives previously studied in some depth and those frequently visited as models were not included (except in a single instance which permits some cross-checking with earlier findings).

##### 5. Conducting the Survey.

Mr. Cooper was engaged to conduct the survey in the Philippines as a volunteer with all expenses paid by the Volunteer Development Corps. This is a non-profit, cooperative organization established in 1970, which arranges for retired specialists in the United States to serve overseas in response to requests from developing countries of the world. The VDC has headquarters at 1629 K Street, N.W., Washington, D.C. 20006. Direct survey costs were covered by a budget provided by the NRECA, FECOPHIL (Federation of Electric Cooperatives of the Philippines) paid a nominal fee to VDC for its assistance in sending a consultant to conduct the survey. FECOPHIL, through its general manager, Frances Nacianceno, provided office space, secretarial service, and local transportation for the consultant supervisor during the survey period. Furthermore, a \$15,000 grant was provided to NRECA by USAID to cover computer and other special costs associated with the study.

The Philippine study was scheduled for completion within an 8-week period in November and December. The plan called for hiring in the Philippines a coordinator for each two cooperatives. The coordinator was to be recruited from research organizations or the economics or sociology departments of Philippine colleges.

The coordinator would hire 10 interviewers locally to get the questionnaires answered in the cooperative's service area. It was anticipated that each set of 110 questionnaires would require two days for recruiting interviewers and for orientation and training the interview team. Actual interviews were expected to take three days. Another task for the coordinator was the gathering of considerable operating statistics at the office of the cooperative for establishment of viability profile to help with the interpretation of questionnaire findings at the analysis stage of the study. Ten pages of forms had been prepared in Washington for the gathering of financial and operations data covering 1978, 1979, and 1980. It was intended that some indications of trend lines could be seen by having figures for three consecutive years.

One of the basic survey concepts was to avoid involvement of the cooperative's board of directors or employees, nor were employees of NEA to participate — to avoid any possibility of influencing questionnaire findings.

Upon arrival in Manila, a first obstacle was the difficulty in locating on short notice competent research coordinators who could leave their current assignment for two weeks of travel to electric cooperatives on four different islands. Another constraint was the closeness of the Christmas holiday season.

To stay within the survey schedule, Mr. Cooper himself served as coordinator at Negros Oriental I Electric Cooperative, and Mr. Cudney, en route from NRECA in Washington served as coordinator at Davao Norte and Bataan. For Lanao Norte, Ruth Grace Padasas, of Iloilo City, was hired as coordinator. Dr. Venancio B. Ardales, Central Philippines University, was coordinator at Iloilo I. The coordinator of Cagayan I and Quezon I was Vince Aureus, of Quezon City. All three of the local coordinators fully met the predetermined requirements:

"...mature and have good judgment and integrity, be able to work easily with other people, and exercise supervision over the interviewers hired. Previous experience in survey work and some knowledge of economics, psychology or sociology would be helpful."

The coordinators hired interviewers locally after arriving at the headquarters of the electric cooperative and established leads and connections in nearby communities through the help of the general manager.

For conducting the interviews at Cagayan I, ten school teachers were recruited. At Bataan, interviewers were selected from the staff of a local college. In Quezon I service area, interviews were conducted by college students. Interviewing at Iloilo I was conducted by graduate students. For Negros Oriental I, barangay electricians (independent contractors for housewiring) were hired. At Davao Norte, a nearby college supplied interviewers from its staff. Interviewers for Lanao Norte were taken from a waiting list of applicants for employment with the cooperative.

Best results were obtained by the barangay electricians at Negros Oriental. They already knew something about the rural electrification program; they were familiar with the rural service area, and they were experienced in talking with the people who lived in the rural barangays.

All interviewers were provided with certificates of identification and authorization signed by Mr. Cooper and by the general manager of the electric cooperative where they conducted interviews.

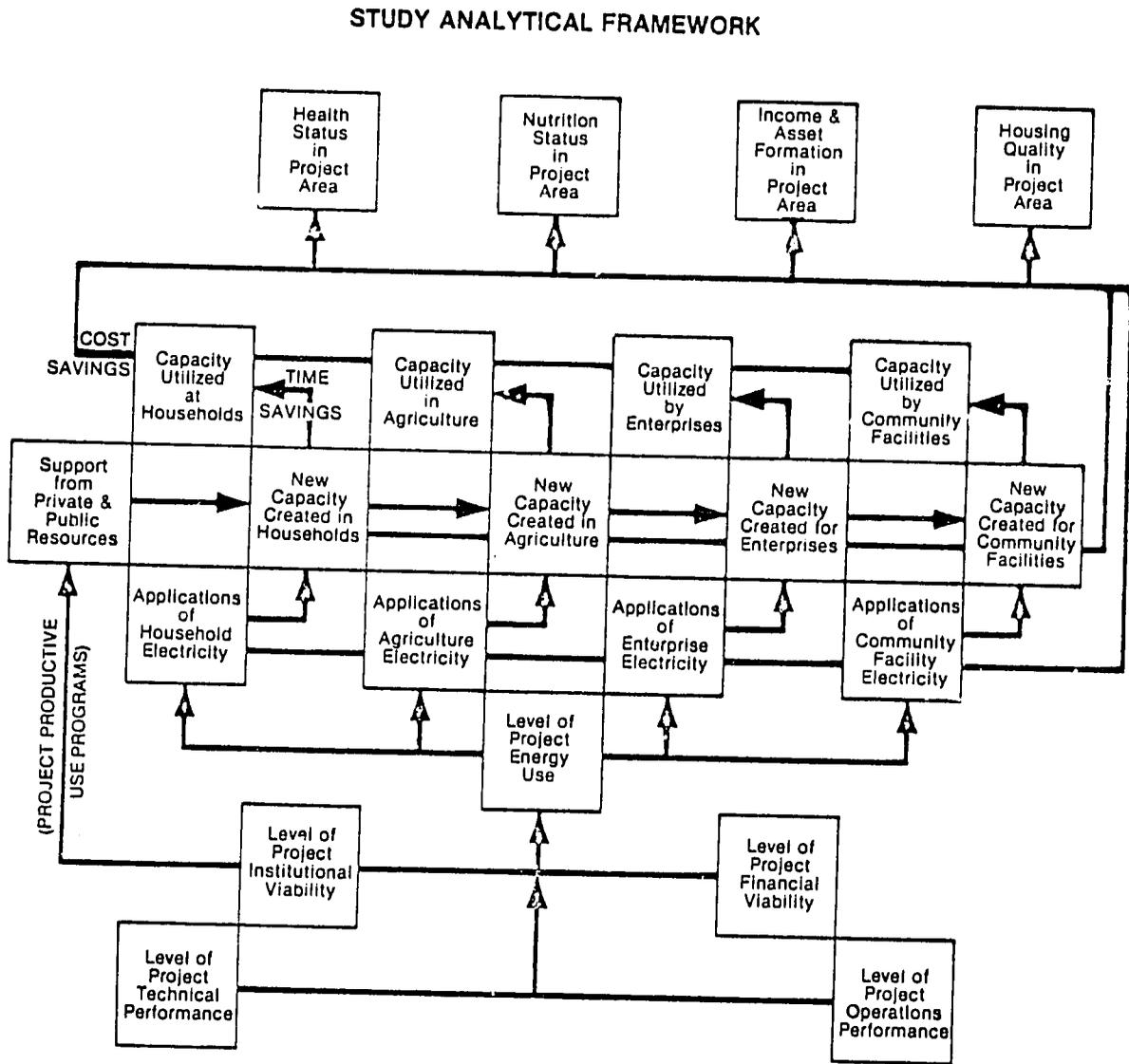
It was found that from three to five interviews could be handled in one day. From 20 to 45 minutes were required to fill out a questionnaire. The main difficulty proved to be local transportation. In most localities, jeepnies and tricycles (motorcycles with enclosed sidecars) were the only public transportation available. On some main roads, rural buses were also used. On occasion, a truck of the cooperative was used to drop off interviewers and pick them up again while engaged in other service trips.

Transportation was severely limited in Quezon I, as the worst typhoon of the year swept across the province on the day before the survey started. All interviews had to be made close to the headquarters town of Pitogo because so many of the roads were flooded or blocked with fallen trees.

In most provinces the unserved barangays and some of the remote barangays which had electric service could only be reached by foot.

6. Study Analytical Framework.

The chart below shows the logical linkages which guided the preparation of the questionnaire and the writing of the report.



NOTES ON PRE-SURVEY TRIP TO ILOCOS NORTE, AUGUST 1981  
BY JAMES CUDNEY

The draft questionnaires for the Electrification Impact Survey were field tested by James Cudney of NRECA in August 1981 in Ilocos Norte. As a result of this pre-test, revisions were made in the forms in accordance with the following notes from Mr. Cudney's report.

1. The actual survey was conducted by the employees of the cooperative.
2. It was found that a man-woman interviewer team seemed to be the most desirable. Often the man of the home was working, and only the woman was available for the interview. Some of the ladies were very nervous with a man interviewer, but relaxed considerably with the woman interviewer.
3. The interviews proved to be beneficial to the cooperative in that it provided an opportunity for interaction between the employees and the member consumers. The small industries and governmental facilities such as hospitals were particularly anxious to discuss at length any problems they were having with service, bill paying, rates, etc. The cooperative's employees expressed the opinion that they learned more from this experience than at any time in the past.
4. Some of the questions proved embarrassing, such as "Have you had enough food to eat?" These types of questions were eliminated from the pre-test forms for the final surveys.
5. I was very impressed with how good the records are kept at this cooperative--they are extensive and complete.
6. This area had very little individual irrigation pumping, but had several large central systems. Therefore, the pre-test questionnaires were not adequate for agricultural production resulting from individual electric pumping.

SYSTEM OPERATING DATA AND INTERPRETATION

Detailed statistical back-up for the following summary text is presented in tables at the end of Appendix C. These are:

- Table C-1 -- Operations Profile of Cooperatives in Survey
- Table C-2 -- Institutional Profile of Cooperatives in Survey
- Table C-3 -- Operating Revenues, Expenses, Margins, and Ratios of Cooperatives in Survey
- Table C-4 -- Financial Profile of Cooperatives in Survey
- Table C-5 -- Energy Use Profile of Cooperatives in Survey.

Data for these statistical tables of each of the seven cooperatives comes from the cooperatives' office records and from NEA reports.

Bataan:

Bataan Electric Cooperative (BATELCO) is the only one of the seven survey areas which is close to a large metropolitan center. It serves most of the peninsula across the bay from Manila -- a service territory mostly rural but with an increasing number of industrial complexes. Headquarters town is Balanga.

Its energization in October 1973 was one of the earliest in the NEA program. Service had reached 92% of the barangays in the province by the end of 1980, and the rate of additional consumer connections was beginning to slow down. Its growth rate of 10% in 1980 was the lowest of the seven systems studied. Its total number of consumer-members was the largest -- 36,453. It also had the most extensive electric system, with 1,015 kilometers of distribution line, and the largest staff -- 222 employees.

All of Bataan's power is purchased from NPC. Average power cost per kWh purchased was ₱0.34 in 1980. Average retail rate to consumers was ₱0.62 per kWh in 1980. The cooperative's electric sales were 35.5 gWh in 1980, the highest level of the cooperatives in the survey. KWh sales to industrial users was increasing at an annual rate of 18% during 1980, but increase in total kWh sales was 8%, the lowest of the seven systems surveyed.

Monthly residential use averaged 44 kWh, the highest in the study. Bataan had the lowest proportion of residential consumers paying minimum bills -- 24.8%. Average monthly power consumption for commercial use was 393 kWh and for public facilities it was 395 kWh. Both figures are the highest of the seven electricity suppliers surveyed.

System losses as reported were excessive, which indicates a need for study of and possible improvement in billing and collecting procedures.

Controllable operating expenses were found to be at acceptable levels. Current financial returns were found to be low. Inherently, higher system financial returns exist. At the

end of 1980, the system was delinquent by ₱1,725,000 on its power bill to NPC. However, it had made payments of ₱565,300 in advance of due date on its NEA loan servicing as of June 1981.

The cooperative did not hold an annual membership meeting in 1980, due to a pending court action concerning a previous election.

#### Cagayan I:

This cooperative served 14,082 consumers in 93 barangays (30% of the barangays in the service area) during 1980. Headquarters is in Solano.

The service area is the broad Cagayan Valley, which drains northward in the northeast portion of Luzon Island, centered at the provincial capital of Tuguegarao. This is considered a potentially rich agricultural region, and is the focus for a number of rural developmental programs. The area is connected with Manila by highway and air.

Net utility plant valuation at end of 1980 was ₱12,744,000, the lowest of the seven systems surveyed.

Of the seven electric cooperatives surveyed, Cagayan I was the only system which was not supplied with NPC power. Like 33 other NEA borrower systems on the smaller islands or in remote regions not yet reached by the transmission grid, Cagayan I Electric Cooperative (CAGELCO I) generated its own electricity with a diesel plant. Consequently, cost of power for the cooperative was higher (₱0.77 during 1980) than for the other cooperatives. Average retail selling price was ₱1.12 per kWh in 1980.

Similar to Bataan, the system experienced an excessive level of system losses during the 1978 to 1980 study period.

Financial operating losses have been experienced since energization, but this situation should turn around now that the cooperative has shut down its generating plant and connected to the NPC grid during September 1981. The system as of June 1981 was in arrears ₱632,000 on its NEA loan account.

Residential and commercial electric sales increases for 1980 were lowest among the cooperatives, suggesting that power costs have dampened system demand growth.

Cooperative district and annual meetings were held during each year of the study period. About 30% of the membership attended the district meetings while only about 4% of the members attended the 1980 annual meetings.

The cooperative reported significantly lesser industrial electric sales but significantly greater irrigation sales than any other cooperative. Over 50% of residential consumers consumed 10 kWh or less during 1980, a much higher percentage of minimum bill users than in any other of the cooperatives surveyed.

#### Davao Norte:

Davao Norte Electric Cooperative (DANECO) is one of two cooperatives in the survey serving a predominantly Moslem population. The area is in the southeastern part of Mindanao Island at the south end of the Philippine archipelago. Montevista is the headquarters town.

The system has grown rapidly since the first energization in November 1975. Increase in consumers in 1980 was at a rate of 40%, the highest of the seven cooperatives studied. Year-end figures showed 13,935 consumers in 106 barangays. Utility plant growth during 1980 was 63%. Net utility plant valuation was ₱25,260,000, second highest of the surveyed systems. The system had 494 km of line.

Power for Davao Norte is generated at the Marie Christina hydro plant and is supplied through the NPC grid at ₱0.14 per kWh, identical to Lanao Norte, the other cooperative surveyed in Mindanao. Power costs were lower than for the other five cooperatives surveyed. Average retail rate to consumers was ₱0.46 per kWh in 1980.

Consumer accounting and administrative expenses were exceptionally high in comparison with other cooperatives. The reported ratio of 84 consumers per employee was exceptionally low indicating that manpower utilization and office procedures patterns should be reviewed. Significant operating margins were experienced during 1980 (₱1,691,000) but the cooperative was in arrears on its NEA loan account and its NPC power bills.

Electric sales increased dramatically during 1980 — 142%, greater than any other cooperative. Much of this is explained by system rapid expansion during the year. System energy losses were at acceptable levels.

The 1980 annual meeting of the cooperative was attended by more than 5,000 members, more than a third of the entire membership.

#### Iloilo I:

Iloilo I Electric Cooperative (ILECO I) is located on the south edge of Panay Island. The cooperative served 15,629 consumers during 1980 through a distribution system of 417 km. Service was provided in one-third of the barangays scattered through the service area. Headquarters is at Tigbauan.

Wholesale power is purchased from the Panay Electric Company and the National Power Corporation. All power purchased is diesel generated and therefore high cost (₱0.61 per kWh purchased during 1980). During 1980, 10.7 gWh of power was purchased, the smallest amount purchased among the systems surveyed. Electric sales (9.0 gWh) were also the lowest. Average retail rate to consumers was ₱1.11 per kWh in 1980.

Despite high retail rates to consumers and moderate plant expansion (17%), energy sales increased 45% during 1980 over the previous year. This increase was second highest to Davao Norte. Twenty industrial consumers accounted for 38.7% of total sales, while 8,928 residential consumers accounted for 45.9%. Average monthly use for public facilities was much lower than in the other cooperatives surveyed — 21 kWh.

The cooperative was delinquent in payment of its power bills by ₱899,000 but current on its payments due to NEA at end of 1980. It experienced a very poor (75%) collection rate on consumer accounts billed during the year and reported a one-year backlog of accounts receivable on electric bills on its financial books.

There was a change of managers in 1981. Over 30% of its membership attended district meetings during 1980.

### Lanao Norte:

Lanao Norte Electric Cooperative (LANECO) is located in the northwest portion of Mindanao, which serves a largely Moslem population. The system lies immediately west of the NPC hydro generating plant at Marie Christina, which provides its wholesale power at the low rate of ₱0.14 per kWh. Average retail rate to consumers was ₱0.38 per kWh in 1980, the lowest of the seven systems surveyed. Headquarters is at Tubod.

Consumer density at end of 1980 was 22 per kilometer of line, least dense of any of the seven cooperatives. Utility plant growth was 8% during 1980, second slowest among the cooperatives.

Consumer electric bill collection efficiency has been poor. The cooperative was in arrears on its NEA loan accounts as of June 1981 by ₱345,900.

The cooperative did not hold an annual meeting in 1980, citing guerilla activity as the reason. However, district meetings were held with 13% of members attending.

### Negros Oriental I:

This is the smallest and the most recently energized of the seven cooperatives surveyed. There were 6,416 consumer members in Negros Oriental I Electric Cooperative (NORECO I) at end of 1980, and 262 km of distribution line. It was first energized in April 1978, and serves the east side of Negros Island north of Dumaguete. From headquarters in Bindoy, it has extended service to 25% of the barangays in its area.

Power is purchased from NPC over its island grid. Average power cost per kWh was ₱0.33 in 1980. Basic retail rate to consumers was ₱0.54 per kWh in 1980.

The cooperative has grown rapidly since energization. There was a 31% increase in consumers served during 1980 and a 28% increase in electric sales during the year. System energy losses were lower than all other cooperatives. However, consumer bill collection efficiency was also lowest, mainly because the large sugar mill which accounts for 82% of system energy sales was delinquent in paying its account. During the survey (December 1981), the sugar mill paid its outstanding billings and the cooperative, in turn, is now current on its wholesale power bills to NPC. Loan repayment, pursuant to NEA policy, is scheduled to commence during 1983.

Administrative costs per consumer for this system appear to be the highest of all systems surveyed. This may be explained in part by this cooperative's relatively new status. Negros Oriental I has 73 employees. This is the smallest staff of the seven in the study. The board and general manager take pride in well developed member relations and community relations. Members are required to attend an orientation session prior to connection for service. District and annual meetings of the cooperative draw from a quarter to half the members.

The cooperative experienced the lowest monthly electric use from residential consumers (23.2 kWh) and commercial consumers (49 kWh) of any of the systems, during 1980.

### Quezon I:

Quezon province is southeast of Manila on Luzon Island. Quezon I Electric Cooperative (QUELCO I) has a long, irregular-shaped service area, relatively isolated and rural. The headquarters is in Pitogo.

There were 23,335 consumers served by the cooperative over 430 km of distribution line at the end of 1980, generating a ratio of 54 consumers per kilometer of line, the highest density of the seven cooperatives surveyed. One-third of the barangays in the service area were being served.

Dramatic expansion of the system took place during 1980 with a doubling of plant investment being made and consumers served increasing 34%. In respect to sales volume and plant size, it was second largest of the cooperatives surveyed.

System energy losses were not excessive, and bill collection was significantly better than all other cooperatives surveyed. All NEA loan account payments due have been paid, with the cooperative making advance payment (P250,000) to NEA on its loan account as of June 1981.

Nearly 40% of residential consumers are minimum bill users (10 kWh or less per month). Quezon I was the only cooperative reporting an appliance sales service department, which gives technical counseling to consumers on electric energy use.

Growth rate in utility plant was the highest of the seven systems, nearly doubling during 1980. Investment in distribution plant of P28,837,000 represents the highest amount of any of the cooperatives selected for study. Service is provided in a third of the barangays in the service area.

Connected to the NPC Luzon grid, Quezon I has a comparative low wholesale power rate of P 0.36 per kWh in 1980. Its controllable operating costs are also on the low side, compared to the other cooperatives in the study. The ratio of consumers to employees is the best of the systems surveyed. Average retail rate to consumers was P 0.67 per kWh in 1980.

Financial return on investment shows a high 8.3% on the books of Quezon I. Of the seven cooperatives, this one has the best record for collecting bills from consumers. System power losses also appear to be the lowest -- an almost unbelievable 3%.

TABLE C-1. OPERATIONS PROFILE OF COOPERATIVES IN SURVEY

	Bataan	Cagayan I	Davao Norte	Iloilo I	Lanao Norte	Negros Oriental I	Quezon I	All Projects	Notes
1. General Information									
Year of energization	10-73	12-75	11-75	11-74	11-74	4-78	3-76		
Headquarters location	Balanga	Solana	Montevista	Tigbanan	Tubod	Bindoy	Pitogo		
General Manager's name	Hermes B. Bite*	Preciosimo C. Bunagan	Jose T. Amacio	Sofronio G. Rodrin	Isagani R. Rabino	Sunny R.A. Madamba	Ernesto Pablo		Suspended 12/81.
Board President's name	Wilfredd O. Tagle	Domingo M. Matanny	Eusebo G. Manuel, Jr.	Avito S. Saclauso	Manuel V. Pangilinan	Glaro T. Estorco	Ernesto S. Altamira		
2. No. Barangays in Service Area (1980)	215	307	277	710	NA	273	647		
No. served - 1980	198	93	106	238	173	67	215		
No. served - 1979	182	91	86	218	153	65	153		
No. served - 1978	NA	68	69	187	130	49	116		
1980 % served	92%	30%	38%	34%	NA	25%	33%		
3. Consumers Served									
1980	36,453	14,082	13,935	15,566	15,629	6,416	23,335	125,416	
1979	33,056	12,296	9,932	13,286	13,190	4,880	17,390	104,030	
1978	30,002	8,906	8,055	10,830	11,056	2,314	12,311	84,474	
1980 % increase	10%	15%	40%	17%	18%	31%	34%	21%	
4. Utility Plant (P 1,000)									
1980	22,518	12,744	25,260	20,503	20,142	16,424	28,837	146,428	
1979	21,900	11,418	15,490	17,552	18,591	14,586	14,582	114,119	
1978	17,769	10,329	13,396	NA	NA	10,527	13,238	NA	
1980 % increase	3%	12%	63%	17%	8%	13%	98%	28%	
5. Kilometers of Distribution Lines (Consumers/km.)									
1980	1,015 (36)	480 (29)	494 (28)	417 (37)	707 (22)	202 (22)	430 (54)	3,745 (33)	
1979	971 (34)	470 (26)	405 (25)	357 (37)	629 (21)	185 (26)	311 (56)	3,328 (31)	
1978	954 (31)	409 (22)	308 (26)	267 (41)	557 (10)	173 (13)	185 (67)	2,881 (30)	

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TABLE C-1. OPERATIONS PROFILE OF COOPERATIVES IN SURVEY (Page 2)

		Bataan	Cagayan I	Davao Norte	Iloilo I	Lanao Norte	Negros Oriental I	Quezon I	All Projects	Notes
6.	GWH Purchased (or generated)									
	1980	49.4	13.2	19.2	10.7	16.2	15.3	24.1	148.1	
	1979	45.1	11.8	8.1	7.8	12.6	11.9	19.7	117.0	
7.	GWH Sold									
	1980	35.5	9.7	17.5	9.0	14.5	14.8	21.4	122.4	
	1979	32.8	8.4	7.2	6.7	11.9	11.7	18.1	96.8	
8.	% System Energy Loss									
	1980	28	29	9	15	10	3	11	17	
	1979	27	25	11	14	5	1	8	20	
	1978	25	22	18	14	20	5	8	19	

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TABLE C-2. INSTITUTIONAL PROFILE OF COOPERATIVES IN SURVEY

	Bataan	Cagayan I	Davao Norte	Iloilo I	Lanao Norte	Negros Oriental I	Quezon I	All Projects	Notes
(1) Organization Structure (1980)									
• Office General Mgr.	x		x	x	x	x	x	6	
• Office Services Dept.	x	x		x	x	x	x	6	
• Eng. & Constr. Dept.	x		x					2	
• O & M Department	x		x					2	
• Member Services Dept.	x	x		x	x	x	x	2	
• Power Generation Dept.		x						6	
• Sub-Offices (for District)		x						1	
• Engineering Department			x	x	x			3	
• Constr./Operations Dept.		x		x	x	x		4	
• Eng. & Maintenance Dept.						x	x	2	
							x	1	
(2) Organization Staffing (1980)								33	
• No. employees	222	93	165	102	130	73	137	922	
• No. men employees	161	68	135	79	102	61	108	714	
• No. female employees	61	25	30	23	28	12	29	208	
• No. college degree employees	67	37	66	61	31	30	35	327	
• No. employee separations	11	NA	11	NA	NA	2	4	NA	
• Manager separation	1	0	0	0	1	0	1	3	
• Consumers per employee *	164	151	84	153	120	88	170	136	* Excluding unskilled casual employees.
(3) Meeting Attendance									
- Annual Meeting									
• No. 1980 (% of members)	0	500 (3.6%)	5,082 (36%)	1,248 (8%)	0	1,542 (24%)	NA		
• No. 1979 (% of members)	NA	490 (4.0%)	3,396 (34%)	1,393 (10%)	1,602 (12%)	2,361 (48%)	NA		
• No. 1978 (% of members)	NA	350 (3.9%)	1,516 (19%)	511 (5%)	2,266 (20%)	NA	NA		
- District Meetings									
• No. 1980	0	1,370 (29%)		4,805 (31%)	1,022 (13%)	1,468 (69%)	NA		
• No. 1979	NA	1,060		2,521	1,378	2,337	NA		
• No. 1978	NA	1,030		973	1,025	NA	NA		

\* Excluding unskilled casual employees.

TABLE C-2. INSTITUTIONAL PROFILE OF COOPERATIVES IN SURVEY (Page 2)

	Bataan	Cagayan I	Davao Norte	Iloilo I	Lanao Norte	Negros Oriental I	Quezon I	All Projects	Notes
(4) Consumer Complaints Service									
No. 1980	104	NA	3,907	490	1,012	NA	19		
No. 1979	98	NA	420	503	1,020	NA	33		
No. 1978	NA	NA	510	869	936	NA	59		
Billing									
No. 1980	138	NA	NA	350	180	NA	10		
No. 1979	144	NA	NA	380	135	NA	28		
No. 1978	NA	NA	NA	450	215	NA	20		
(5) Load Promotion Activities (1980)									
. Appliance Demon. Courses	No	NA	No	No	NA	No	Yes		
. Appliance Sales Serv. Dept.	No	NA	No	No	NA	No	Yes		
. Technical Counseling	No	NA	No	No	NA	No	Yes		
. Commercial consumers			Yes	Yes	No	Yes	Yes		
. Industrial consumers				x		x	x		
. Public facility consumers				x		x	x		
. Other				x			x		

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TABLE C-3. OPERATING REVENUES, EXPENSES, MARGINS AND RATIOS OF COOPS. IN SURVEY

		(P1,000)								Notes
		Bataan	Cagayan I	Davao Norte	Iloilo I	Lanao Norte	Negros Oriental I	Quezon I	All Projects	
(1)	Operating Revenues									
	. 1980	21,890	10,847	8,068	10,000	5,541	7,961	14,424	78,681	
	. 1979	14,133	6,345	6,990	5,941	5,144	6,990	7,488	53,031	
	. 1978	11,648	4,047	4,696	4,740	3,087	990	5,477	34,685	
(2)	Operating Expenses									
	- Power Costs									
	. 1980	16,808	10,173*	2,648	6,513	2,328	5,025	8,793	52,288	* Generation cost.
	. 1979	11,263	5,727	3,921	4,219	1,573	3,774	4,927	35,404	
	. 1978	7,972	3,330	2,947	3,763	1,243	733	3,502	23,430	
	- O & M Expenses									
	. 1980	966	262	894	221	409	464	732	3,548	
	. 1979	965	225	485	207	232	244	474	2,836	
	. 1978	801	164	291	167	178	86	261	1,948	
	- Consumer Accounting Expenses									
	. 1980	1,231	293	790	561	428	151	666	4,120	
	. 1979	898	149	382	355	353	71	492	2,700	
	. 1978	699	85	214	305	236	18	386	1,943	
	- Admin. & Gen. Expenses									
	. 1980	1,309	836	1,158	553	637	839	993	6,325	
	. 1979	956	365	683	388	564	524	790	4,270	
	. 1978	734	259	408	303	479	148	644	2,975	
	- Depreciation Expenses									
	. 1980	954	237	887	521	371	650	850	4,470	
	. 1979	665	439	488	420	490	432	400	3,334	
	. 1978	560	656	365	294	308	261	359	2,803	

TABLE C-3. OPERATING REVENUES, EXPENSES, MARGINS AND RATIOS OF COOPS. IN SURVEY (Page 2)

	Bataan	Cagayan I	Davao Norte	Iloilo I	Lanao Norte	Negros Oriental I	Quezon I	All Projects	Notes
(3) Utility Operating Margins (A-B)									
. 1980	572	(-954)	1,691	1,631	832	2,390	7,530		
. 1979	(-614)	(-564)	1,031	352	1,932	405	4,487		
. 1978	327	(-15)	38	(-84)	77	(-222)	(-204)		
(4) Ratios									
- % (O&M Expenses/Utility Plant)									
. 1980	4.3%	2.1%	3.5%	1.1%	2.0%	1.6%	2.5%	2.7%	
. 1979	4.4%	2.0%	3.1%	1.3%	1.2%	1.7%	3.3%	2.5%	
. 1978	4.5%	1.6%	2.2%	NA	NA	0.8%	2.0%	NA	
- P (Cons.Actg. Exp./Consumer)									
. 1980	33.77	20.81	56.69	36.04	27.38	23.53	28.54	32.85	
. 1979	27.17	12.12	38.46	26.72	26.76	14.55	28.29	25.95	
. 1978	23.30	9.54	26.57	28.16	21.35	7.78	31.35	NA	
- P (Adm. & Gen. Exp./Consumer)									
. 1980	35.91	59.37	83.10	35.53	40.76	130.77	42.55	50.43	
. 1979	28.92	29.68	68.77	29.20	42.76	107.38	45.93	41.05	
. 1978	24.47	29.08	50.65	27.98	43.32	63.96	52.31	NA	
- % O & M, Cons.Acctg. & Adm. <sup>1/</sup> Expenses/kWh Sold									
. 1980	9.9	15.4	16.2	15.0	10.1	57.7 <sup>2/</sup>	11.1	13.1 <sup>2/</sup>	<sup>1/</sup> Philippine centavos.
. 1979	8.6	9.4	21.5	15.4	9.6	47.5 <sup>2/</sup>	10.1	11.5 <sup>2/</sup>	<sup>2/</sup> Excludes sugar mill.
. 1978	7.4	9.2	15.4	12.7	5.8	43.3 <sup>2/</sup>	8.0	NA <sup>2/</sup>	
- % (Depreciation Exp./Utility Plant)									
. 1980	4.2%	1.9%	3.5%	2.5%	1.8%	4.0%	2.9%	3.1%	
. 1979	3.0%	3.8%	3.2%	2.4%	2.6%	3.0%	2.7%	2.9%	
. 1978	3.2%	6.4%	3.0%	NA	NA	2.5%	2.7%	NA	

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TABLE C-4. FINANCIAL PROFILE OF COOPERATIVES IN SURVEY

(1) % Financial Return (Utility/Operations Margins/Utility Plant Margins)	1980	2.5%	(7.5)%	6.7%	8.0%	6.8%	5.0%	8.3%		
	1979	(2.8)%	(4.9)%	6.7%	2.0%	10.4%	13.3%	2.8%		
	1978	NA	NA	NA	NA	NA	NA	NA		
(2) Collection Efficiency (Year ending June)	1980	86%	86%	85%	75%	75%	74%	92%		
	1979	87%	79%	93%	74%	76%	59%	92%		
	1978	86%	80%	89%	79%	71%	67%	84%		
(3) Accounts Receivable (Electric Sales/Calendar Day)	1980	54.5	56.2	34.6	359.0	99.5	117.7	31.8		
	1979	56.3	61.3	31.7	359.0	73.5	80.1	31.8		
	1978	NA	NA	NA	NA	NA	NA	NA		
(4) NEA Distribution Loan Account (P1000)	Total Due (principal + interest)									
	1981 (June)	823.2	650.9	580.5	473.9	747.8	-0-	187.6		
	1980	782.0	-0-	-0-	947.9	1,497.4	-0-	-0-		
	1979	348.0	-0-	-0-	-0-	-0-	-0-	-0-		
	Total Paid									
	1981 (June)	1,498.5	19.0	580.0	473.9	373.9	-0-	437.5		
	1980	672.0	-0-	-0-	947.9	1,495.8	-0-	-0-		
	1979	348.0	-0-	-0-	-0-	-0-	-0-	-0-		
	(Arrears) or Net Advances									
	1981 (June)	565.3	(632.0)	(0.5)	-0-	(375.4)	-0-	250.0		
	1980	(110.0)	-0-	-0-	-0-	-0-	-0-	-0-		
	1979	-0-	-0-	-0-	-0-	-0-	-0-	-0-		
	(5) NPC Power Bill Due + Unpaid (P1000)	1980	1,725	NA ***	179	899	NA	1,577	-0-	
1979		1,119	NA ***	248	527	NA	689	NA	*** Generated own power.	
1978		687	NA ***	292	580	99	474	624		
(6) 1980 Data - Prices (P)	Power cost/kWh purchased	0.34	0.77	0.14	0.61	0.14	0.33	0.36		
	Average revenue/kWh sold	0.62	1.12	0.46	1.11	0.38	0.54**	0.67	** Includes sugar central's price contract.	
	Liter kerosene	NA	2.00	3.10	2.00	NA	2.00	2.00		
	Liter diesel oil	NA	2.81	3.23	NA	NA	3.15	3.22		
	Kg. firewood	NA	NA	1.00	2.75 *	NA	0.60	NA	* One day bundle.	

TABLE C-5. ENERGY USE PROFILE OF COOPERATIVES IN SURVEY

(1)	MWH Sales *	Bataan		Cagayan I		Davao Norte		Iloilo I		Lanao Norte		Negros Oriental I		Quezon I		All Projects		Notes
		MWH	%	MWH	%	MWH	%	MWH	%	MWH	%	MWH	%	MWH	%	MWH	%	
	Residential (% change, 1979-80)		6%		6%		122%		34%		7%		52%		39%		21%	Excludes cooperative use and unaccounted sales.
	1980	18,138	51.1	3,754	41.6	4,834	27.6	4,097	45.9	5,247	36.1	1,417	9.3	7,297	34.0	44,784	36.9	
	1979	17,145	52.3	3,554	44.9	2,175	30.1	3,050	49.4	4,920	41.2	932	8.2	5,262	29.9	37,037	39.0	
	1978	14,989	49.7	2,502	45.5	1,885	31.9	2,890	47.5	3,840	30.2	298	23.4	3,994	24.8	30,398	39.1	
	Commercial (% change, 1979-80)		8%		3%		179%		16%		30%		46%		44%		31%	
	1980	6,119	17.2	2,638	29.3	3,245	18.6	605	6.8	3,625	24.9	448	3.1	3,555	16.6	20,235	16.7	
	1979	5,682	17.3	2,551	32.2	1,163	16.1	521	8.4	2,798	23.5	307	2.7	2,472	14.1	15,494	16.3	
	1978	5,259	17.4	1,846	33.6	942	15.9	463	7.6	2,597	20.4	86	6.8	2,472	15.3	13,665	17.6	
	Public Facilities (% change, 1979-80)		2%		7%		173%		23%		29%		120%		71%		22%	
	1980	2,361	6.7	1,200	13.3	611	3.5	414	4.6	543	3.7	234	1.6	479	1.3	5,842	4.8	
	1979	2,308	7.0	1,117	14.1	232	3.2	337	5.5	420	3.5	106	0.9	280	1.6	4,800	5.1	
	1978	2,117	7.0	718	13.1	189	3.2	279	4.5	389	3.1	132	10.4	197	1.2	4,016	5.2	
	Industrial (% change, 1979-80)		18%		356%		140%		80%		41%		(66%)		(1%)		38%	
	1980	7,494	21.1	534	5.9	8,336	47.7	3,451	38.7	4,553	31.3	132	0.9	8,852	41.3	33,352	27.5	
	1979	6,351	19.4	117	1.5	3,466	48.0	1,913	31.0	3,225	27.0	219	1.9	8,936	50.8	24,227	25.5	
	1978	6,534	21.7	2	0.0	2,732	46.2	2,003	32.9	5,270	41.5	10	0.8	8,855	54.9	25,406	32.7	
	Irrigation (% change, 1979-80)		9%		186%		(104%)		(-1%)		28%		(-)		(131%)		60%	
	1980	75	0.2%	512	5.7	21	0.1	-	0.0	294	2.0	-	0.0	2.9	0.0	904	0.7	
	1979	69	0.2	179	2.3	43	0.6	41	0.7	230	1.9	-	0.0	4.4	0.0	566	0.6	
	1978	84	0.3	30	0.5	35	0.6	123	2.0	164	1.3	-	0.0	1.4	0.0	437	0.5	
	Lighting (% change, 1979-80)		8%		(4%)		220%		16%		(16%)		64%		99%		36%	
	1980	1,269	3.6	380	4.2	445	2.5	361	4.0	290	2.0	334	2.3	1,259	5.9	4,338	3.6	
	1979	1,179	3.6	397	5.0	139	1.9	311	5.0	337	2.8	204	2.8	634	3.6	3,201	3.4	
	1978	1,183	3.9	402	7.3	133	2.2	337	5.5	442	5.5	56	4.4	500	3.7	3,153	4.1	

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TABLE C-5. ENERGY USE PROFILE OF COOPERATIVES IN SURVEY (Page 2)

	Bataan		Cagayan		Davao Norte		Iloilo		Lanao Norte		Negros Oriental		Quezon		All Projects		Notes	
	MWH	%	MWH	%	MWH	%	MWH	%	MWH	%	MWH	%	MWH	%	MWH	%		
Other (special) (1 change, 1979-80)												25%			25%			
1980	25	0.1										11,955	82.3			11,980	9.9	
1979	29	0.1										9,556	84.4			9,585	10.1	
1978	13	0.0										690	54.2			703	0.9	
Total (1 change, 1979-80)		8%		14%		142%		45%		22%		28%		22%		28%		
1980	35,481	100	79,018	100	17,492	100	8,928	100	14,552	100	14,570	100	21,444	100	121,435	100.1		
1979	32,763	99.9	7,915	100	7,218	99.9	6,173	100	11,930	99.9	11,324	99.9	17,587	100	94,910	100.0		
1978	30,179	100	5,500	100	5,916	100	6,090	100	12,702	100	1,272	100	16,119	99.9	77,778	100.1		
1980 % Sales of 7 cooperatives		29%		7%		14%		7%		12%		12%		18%				
(2) Average Monthly Use	Cons.	Use	Cons.	Use	Cons.	Use	Cons.	Use	Cons.	Use	Cons.	Use	Cons.	Use	Cons.	Use		
Residential																		
1980	34,370	44.0	12,227	25.6	10,179	39.6	14,442	23.6	13,757	31.8	5,096	23.2	21,233	28.6	111,304	33.5		
1979	31,103	45.9	10,463	28.3	6,703	27.0	12,251	20.7	11,323	36.2	3,977	19.5	15,766	27.8	91,606	33.7		
1978	29,252	42.7	7,251	28.8	5,301	29.6	9,768	24.7	9,207	34.8	1,770	21.2	10,988	30.3	73,537	34.4		
% 1980 Minimum Bill Users		24.8%		54.7%		21.4%		28.0%		32.9%		35.3%		38.4%		35,912	32.3	
Commercial																		
1980	1,296	393	1,068	206	1,988	136	528	95	992	305	538	69	1,445	205	7,855	215		
1979	1,238		1,093		1,700		542		1,098		417		1,026	201	7,114	181		
1978	1,097		941		1,537		524		1,038		224		1,048	197	6,409	178		
Public Facilities																		
1980	498	395	262	382	1,003	51	162	21	267	169	172	113	404	99	2,768	176		
1979	415		221		859		160		259		132		274	85	2,320	172		
1978	375		181		683		141		231		77		190	86	1,878	178		
Industrial																		
1980	23		3		55		20		3		45		4		153			
1979	18		2		32		13		4		35		2		106			
1978	17		1		16		23		5		22		2		86			

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TABLE C-5. ENERGY USE PROFILE OF COOPERATIVES IN SURVEY (Page 3)

	Bataan		Cagayan I		Davao Norte		Iloilo I		Lanao Norte		Negros Oriental I		Quezon I		All Projects		Notes
	MWH	%	MWH	%	MWH	%	MWH	%	MWH	%	MWH	%	MWH	%	MWH	%	
Irrigation																	
1980	4		1		1				116				2		15%		
1979	4		2		1		1		98				4		127		
1978	4		1		3		1		57				2		110		
Lighting																	
1980	262	404	521	61	706	53	414	73	494	49	565	49	247	425	3,209	113	16%
1979	278		515		637		319		408		319		298	177	2,774	96	
1978	257		531		515		373		518		221		81	617	2,496	105	
Total																	
1980	36,453		14,082		13,935		15,566		15,629		6,416		23,335		125,416		21%
1979	33,056		12,296		9,932		13,286		13,190		4,880		17,390		104,030		
1978	30,002		8,906		9,055		10,830		11,056		2,314		12,311		84,474		
(3) Profile of Major Types of Community Service Consumers (1980)	No.		No.		No.		No.		No.		No.		No.		No.		
Health clinics/hospitals	56		25		58		18		56		21		38		272		
Schools/colleges	80		60		62		68		81		40		71		462		
Chapels/churches	110		15		27		21		26		37		74		310		
Markets/plazas	24		7		16		20		25		18		25		135		
Airports/bus depots	4		3		3		-		-		-		24		34		
Telephone/telegraph	9		2		4		15		-		1		31		62		
Water works	81		3		9		2		25		3		6		129		
Total	364		115		179		144		213		120		269		1,404		
Per 1,000 Residential Consumers Served	10.0		8.2		12.8		9.3		13.6		18.7		11.5		11.2		

HOUSEHOLD SURVEY DATA AND INTERPRETATIONS

I. HOUSEHOLD COMPOSITION

The primary topics considered here concern the mix of adults and children living in individual households in 1980 and how this mix has changed since 1978. These findings are derived from residential questionnaire items 14-17, which were included to determine if any relationship existed between family composition and electrification.

a. Adults Occupying Households.

Only 8% of the sample households were occupied by just one adult while 60% were occupied by three or more adults. Presumably most of the latter consisted of offspring over 18 and extended family members. This shows little change since 1978 when approximately 11% of the respondents had only one adult in the household. Interestingly, there is a greater percentage of three-adult households in those areas that are served by electricity, especially in the poblacion, than in the unserved remote barangay households. This 1980 pattern corresponds to the 1978 data where two-adult households are most common among the unserved group, and the three-or-more-adult households are more common among those served by electricity.

There is a strong correlation between the type of house construction material and the number of adults living in the household. That is, the lighter the construction material the higher the percentage of two-adult households but the lower the percentage of three-adult households. By contrast, the three-or-more-adult households are more common in houses made of heavier materials. For example, about one-third of the electrified households in houses made of heavy and mixed materials are occupied by five or more adults while only just over one-tenth of the light material electrified houses contain five or more adults. A similar pattern emerges for the unelectrified house types. Moreover, for every type of house construction surveyed there were fewer occupied by five or more adults in those unelectrified than in the ones electrified. Additionally, each type of unelectrified house had a greater percentage of two-adult households than its electrified counterpart.

No strong patterns emerge when considering adult occupancy by cooperative. Bataan had the lowest percentage of two-adult households (25%) while Quezon I had the highest (47%). Interestingly, 71% of the households surveyed in Bataan had three or more adults occupants while Negros Oriental I and Quezon I, at the other end of the range, had 47% and 43% respectively.

The distinction between two-adult and three-or-more-adult households is less observable when categorized by consumption of electricity. However, an interesting pattern does emerge when considering households occupied by five or more adults. Fifty-five percent of households consuming over 100 kWh monthly contained five or more adults. By contrast, 29% of those households consuming 50 to 100 kWh monthly were occupied by as many adults. From field observation,

these findings are not surprising, since it was observed that the houses surveyed in unelectrified remote barangays appeared to be generally of lower quality construction and size than those surveyed in the poblacion and along the main feeder lines.

As electrical consumption falls below 50 kWh monthly, a slight decline of five-or-more-adult households is observed. These patterns are little changed from those that existed in 1978.

b. Children Occupying Household.

Generally, the number of children occupying the sample households show no strong patterns when considering such variables as access to electricity or amount consumed, type of material used in the construction of the house, or the cooperative to which the household belongs. Households with four or more children comprise approximately 38% of the households surveyed. The shares of households with one, two, or three children are about equal for the remainder of the households. At any rate, four-or-more-children households are 50% to 100% more common than any of the other categories.

In most studies relating income to offspring it is found that lower income families typically have more children. Some confirmation of this was found. The light material households had the highest percentage of four or more children (39%) followed by the mixed (29%), and heavy (28%).

There is little that can be drawn from the data when households are categorized by location or electric use level. However, households that consume more than 100 kWh monthly reported fewer childless households than did the other power use classifications.

2. OWNERSHIP OF HOUSE AND LAND

Approximately 88% of families in the study sample own their homes while only 63% own the land. Thus, one-quarter of the house owners do not own the land upon which the house sits. There is little variation among the percentage of homeowners when the sample is stratified by location. Ninety-four percent of the poblacion respondents own their homes and 70% own the land. By contrast 92% of the unelectrified respondents own their homes but only 48% own the land.

When the sample is stratified by the quality of housing, the percentages of respondents who own their house are remarkably constant. They range from 92% in the heavy construction house in unelectrified remote barangays to 86% in the light, served. No strong correlation between house type and house ownership appears to exist. However, the heavier material households own a greater percentage of the plots and display a smaller differential between home ownership and land ownership. Moreover, in every case, fewer of the unserved respondents own their own land than do their served counterparts.

Ninety-eight percent of the respondents in the Cagayan I service area own their home while 83% own their land. This was not only the highest percentage of each of the seven service areas but also the smallest divergence between home ownership and land ownership. By contrast, 75% of the respondents in Davao Norte

own their homes and 52% of the respondents in Quezon I own their land. The largest divergence was in Bataan where 93% own their house but only 55% own the land.

Unexpectedly, those households consuming over 100 kWh monthly have the smallest percentage of home ownership (85%) while those consuming 0-10 kWh have the highest (98%). There is a weak but positive correlation between average monthly electrical consumption and the percentage of homeowners on their own land. Thus, the divergence between house and land ownership diminishes as consumption of electricity rises.

#### Irrigation of Adjacent Land.

Overall, only 13% of the households surveyed owned adjacent land that was irrigated. Of these, just over half used gravity irrigation systems. For the unserved households surveyed, 17% reported owning or renting land that was irrigated, while the other three sample house locations reported less levels of such activity.

Of the various house types surveyed, the unelectrified "heavy" material households had the greatest percentage of owned or rented adjacent land that was irrigated (35%), with the "heavy" material served households having the next highest percentage (19%). By cooperative, Iloilo I reported the most households owning or renting adjacent irrigated land (34%), with Negros Oriental I and Quezon I reporting the least percentage of households owning or renting, 5% and 4% respectively.

### 3. HOUSING QUALITY STATUS

#### a. Type of Floor.

Of all households surveyed, 40% had cement floors, followed by bamboo (27%), wood (20%), tile (8%), and bare (5%). Cement flooring was also most common in all house sample locations except for the unserved remote barangay areas where it accounted for less than one-third of the flooring. Bamboo was the material most used for flooring here, accounting for 41% of all floors in the unserved households.

When responses were categorized by house type, logical results were observed. For houses made of "heavy" materials, about 70% had cement floors whether served by electricity or not. Bamboo was the primary flooring material of households made of "light" materials, where it served 57% of the electrified households in this category and 73% of these unelectrified homes. Wood was the next most prevalent floor type for "light" material houses. No houses made of "light" materials had tile floors and few had floors made of cement. For electrified houses made of "mixed" materials, 56% reported having cement floors, but for unserved "mixed" material houses only 26% had cement floors. The most prevalent flooring for the unserved "mixed" households was bamboo (34%).

Cement floors were most prevalent in all but one of the cooperative areas, ranging from 36% to 46% of the houses where interviewees were made. In Davao Norte, however, wood floors comprised 46% of the house floors with cement accounting for 35% of house flooring. The greatest variety of floor types was reported in Quezon I where 37% had cement floors and other floor types ranged from 14% to 19% of the sample.

b. Number of Bedrooms.

Houses with two bedrooms were more prevalent than any other kind (34%). However, 40% of the households had at least three bedrooms. Sixty-nine percent of unserved remote households had two or fewer bedrooms while only 42% of households in the poblacion had two or fewer. By contrast, 27% of the poblacion residents had four or more bedrooms compared with 10% of the households in the unserved remote areas.

"Heavy" material households that were served by electricity had a much larger share of respondents with four or more bedrooms (73%) than did their unserved counterparts (19%). "Light" material households generally had the fewest bedrooms with not much variation in the number of bedrooms between those that have access to electricity and those that do not. "Mixed" material unserved households had fewer bedrooms than those "mixed" material households served with electricity.

Two-bedroom houses were most prevalent in all cooperative areas except in Quezon I where one-bedroom houses predominated. As expected, there was a high correlation between electrical consumption and the number of bedrooms. Four or more bedrooms are most prevalent among households consuming over 100 kWh per month, two bedrooms in the 10-50 kWh category, and one bedroom in the zero to 10 kWh range.

c. Purchases of Furniture.

Almost two-thirds of the households surveyed neither added nor replaced living room furniture since 1978. However in remote barangays, 44% of electrified households purchased furniture during the last 2 years while only 24% of equivalent households in the unelectrified control group of remote barangays made such purchases.

The purchase of furniture is strongly correlated with type of material used in housing construction. For example, for every classification of house type surveyed, there was a higher percentage of unserved respondents that bought no furniture than the served households in the same category. As expected, the heavier the house type, the more purchases of furniture were made. Fifty-nine percent of families in "heavy" material houses with electricity made some kind of living room furniture purchases compared with 44% in "mixed" material houses and 20% in "light" material houses.

In every cooperative service area, less than one-half of the respondents made purchases of living room furniture. Forty-nine percent of all the sample households in Lanao Norte bought furniture and only 28% of respondents in Quezon I did so.

As with the purchases of clothes, the purchase of furniture is highly correlated with the amount of electricity consumed. Fifty-six percent of those households consuming over 100 kWh monthly had bought furniture in the last two years. This drops to 44% for those households in the 50-100 kWh per month range. Only 19% of minimum kWh users reported furniture purchases.

#### 4. OCCUPATION AND INCOME

##### a. Occupation of Male Head of Household.

Forty-two percent of the households surveyed indicated that the male head of household was employed as a farmer or fisherman. The remainder of the responses were about equally divided among five other occupational categories used in the survey. A tabulation of all responses on occupation is included (Table D-1 below) to show percentages by location, type of house construction, and cooperative service area.

Two-thirds of the respondents in the unserved remote barangays indicated their occupation as farmer or fisherman. This was also the primary occupation grouping in the electrified remote barangay and along main feeder lines (47% and 38% respectively). In the poblaciones one-fifth of the respondents reported that the male head of household was in clerical, sales, or crafts occupations, while another one-fifth indicated professional, and still another one-fifth responded "other or retired."

When stratified by house construction material, respondents in "lighter" material houses were likely to be a farmer or fisherman (42%). This response dominated also in the "mixed" material (34%) and "heavy" material households (26%). However, in the "heavy" material households, clerical, etc. (20%) and professional occupations (22%) were also heavily represented.

Farmer/fisherman occupations appear rather evenly divided among the cooperative service areas. The largest percentage of professionals that head households was in Cagayan I (25%) while the lowest was in Davao Norte (3%).

There is a weak negative correlation between the amount of electricity consumed monthly and the percentage of households responding "farmer or fisherman". Also, there is a weak positive correlation between electric use and the percentage of households reporting "professional."

##### b. Household Income.

Of all the households surveyed, over one-quarter reported having present incomes exceeding 1,000 pesos per month, while 16% had incomes less than 200 pesos per month. About 20% indicated that incomes were higher since 1978, while about 38% said that income had declined.

As expected, the unserved remote barangay areas had a larger percentage of respondents with monthly incomes lower than 200 pesos (24%), while 11% of the poblacion residents had such low incomes. On the other hand, main feeder electrified residents had only 7% of the households with over 2,000 pesos per month while 12% or 13% of electrified households in poblaciones and electrified remote barangays had such high income. Interestingly, poblacion residents had the highest percentage of respondents claiming that their incomes had increased since 1978 (28%) as well as the highest percentage claiming that their incomes had declined (42%). Of the unserved remote households, on the other hand, only 8% indicated a higher income since 1978, while 35% said their incomes had decreased.

TABLE D-1. OCCUPATION BY HEAD OF HOUSEHOLD  
(By Percent of Sample Responding)

Category	No. in Sample	Unemployed	Laborer	Farmer, Fisherman (Non-laborer)	Clerical Services, Sales, Crafts	Professional	Other or Retired
Entire sample	400	10	13	42	15	10	10
Location	400						
Poblacion	99	9	12	16	21	20	21
Feeder line	102	13	13	38	15	14	8
Remote	102	10	18	47	13	5	8
Unserved	97	7	10	67	9	3	3
House Class	400						
Heavy (electrified)	100	9	7	26	20	22	16
Heavy (unelectrified)	25	8	16	48	12	8	8
Mixed (electrified)	102	9	15	34	17	12	14
Mixed (unelectrified)	35	6	14	66	9	3	3
Light (electrified)	101	14	21	42	12	5	7
Light (unelectrified)	37	8	3	81	8	0	0
Cooperative	400						
Bataan	57	10	11	37	28	9	5
Cagayan I	57	4	5	46	5	25	16
Davao Norte	60	15	25	45	8	3	3
Iloilo I	55	11	9	43	13	11	13
Lanao Norte	52	4	8	46	23	13	6
Negros Oriental I	59	7	22	32	14	8	17
Quezon I	60	17	12	45	12	5	10.

There is a very strong correlation between the type of material of which the house is constructed and income, as anticipated. This validates the use of "heavy", "mixed", and "light" construction houses as a rough basic indicator of household economic level. In every case, a higher percentage of the unserved respondents for each house class surveyed reported an income of under 200 pesos monthly than their served-house-class counterpart. In addition, for each house class, the percentage of unelectrified households had a smaller portion earning over 1,000 pesos per month or more than its electrified counterpart. Also, for each house class, those electrified had a higher percentage of respondents claiming an increase in income since 1978 than the unserved households of the same type.

When the sample households were categorized by cooperative service areas, the responses indicated moderate variation. Cagayan I had 33% of its respondents earning over 1,000 pesos monthly and 40% earning less than 500 pesos per month. By contrast, only 15% of surveyed households in Davao Norte made over 1,000 pesos monthly while 42% made less than 500 pesos per month. Moreover, there was wide variation in the percentages of respondents claiming that their incomes had increased since 1978. Only 3% of Bataan's respondents indicated an increase in their incomes as did 38% of the respondents in Quezon I. The households showing increases in the other cooperative areas ranged from 13% to 26%. Quezon I also had the smallest number of respondents reporting a drop in income (21%) while in Iloilo I one-half of the respondents reported drops. Bataan had one-fourth of its respondents reporting a drop in income. It was, by far, the most stable cooperative area with 72% claiming no change in household incomes since 1978. This is almost twice the next highest percentage of respondents claiming no change. Davao Norte, the second most stable cooperative income area, had 46% of its respondents claiming no change.

As expected, a strong positive correlation existed between income and electricity usage. For instance, no respondent consuming 50 or more kWh per month in 1980 made less than 200 pesos per month, and only 12% of the households consuming 15-50 kWh per month received that low an income. Moreover, 31% of those consuming over 100 kWh per month had monthly incomes over 2,000 pesos and 52% had monthly incomes over 1,000 pesos.

Somewhat surprisingly, there seems to be no strong trend or relationship when changes in household incomes are stratified by electrical consumption. The lowest percentage of respondents reporting an increase in income was by the group consuming 0-10 kWh monthly (14%), while the next lowest group was in the 50-100 kWh range (15%). The other three electric consumption categories had between 24% and 26% of their respondents indicating an increase in income. The households in the group that consumed over 100 kWh monthly, as well as the 15-50 kWh group, both had 36% of their respondents indicating a drop in income, while the other groups had 43% claiming a decline.

Table D-2 presents income percentages by location, house classification, cooperative service area, and kWh usage.

TABLE D-2. HOUSEHOLD INCOME (PESOS PER MONTH)  
(By Percent of Sample Responding)

<u>Category</u>	<u>No. in Sample</u>	<u>Under 200</u>	<u>200-500</u>	<u>500-1,000</u>	<u>1,000-2,000</u>	<u>Over 2,000</u>
Entire sample	347	16	28	29	16	10
Location	347					
Poblacion	90	11	24	36	16	13
Feeder	85	19	35	22	17	7
Remote	89	17	24	32	16	12
Unserviced	83	24	42	16	5	13
House Class	347					
Heavy (s)	84	2	18	25	30	25
Heavy (us)	21	5	29	14	14	38
Light (s)	87	32	38	24	5	1
Light (us)	32	44	44	9	3	0
Mixed (s)	93	12	27	40	14	8
Mixed (us)	30	17	50	23	0	10
Cooperative	347					
Bataan	37	8	43	19	11	19
Cagayan I	55	20	20	27	20	13
Davao Norte	53	6	36	43	9	6
Iloilo I	53	13	36	30	11	9
Lanao Norte	51	26	22	27	18	7
Negros Orienta <sup>1</sup> I	54	22	30	24	7	17
Quezon I	44	27	36	9	16	11
kWh Usage	240					
0-10 kWh	39	31	31	21	15	3
10.1-15	46	35	24	30	9	2
15.1-50	83	12	31	31	17	8
50.1-100	43	0	33	30	21	16
Over 100	29	0	17	31	21	31

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c. Purchases of Clothing.

Of all the households surveyed, about one-third said that they had bought in the last 3 months they had bought either no new clothes or work clothes only; one-third bought both work and leisure clothes; and the final one-third bought work, leisure, and formal wear.

Poblacion residents generally purchased more clothes than did households in the other household sample locations. Forty-four percent of the poblacion respondents bought work, leisure, and formal wear, in contrast to 23% of the unserved remote barangay respondents. Moreover, only 6% of poblacion residents bought work clothes only, while unserved remote households reported 16%.

There is a high correlation between the type of household construction material and the type and amount of clothes purchased by their occupants. In every case the unserved respondents indicated fewer purchases of all three type of clothes than did their served counterparts.

d. Cropping on Household and Non-adjacent Land.

Overall, 58% of the households interviewed reported raising food crops on land adjacent to the house or on non-adjacent land. For electrified households in the poblaciones, 45% reported raising crops, as well as 47% along the main feeder lines and 69% in remote barangays. In remote barangays not yet electrified 73% reported raising food crops. From field observation and comments this disparity between crop production by electrified and unelectrified households appears to be related more strongly with access to roads than with any other factor, including the availability of electric service. Apparently, therefore, lack of access to market roads makes householders more dependent on their own food resources. The disparity was apparent for all house classes surveyed:

<u>House Class</u>	<u>Electrified</u>	<u>Unelectrified</u>
"Heavy" material	61%	84%
"Mixed" material	52%	67%
"Light" material	47%	71%

When the responses to the question are categorized by the amount of electric energy consumed, it is noted that 63% of minimum bill households (10 kWh or less monthly) reported raising crops, while only 44% of households using more than 100 kWh per month reported raising crops. In view that the table above indicates that families in electrified "heavy" material houses crop land to a greater degree than those families in electrified "light" material houses, and in view that the survey generally demonstrates that income, house type, and electric consumption are related, an interesting correlation appears to exist between cropland utilization and electric energy consumption. This might be usefully explored in more detail in some future study.

A great disparity in household food cropping was reported among the cooperatives surveyed. Over 70% of the households surveyed in Cagayan I, Lanao Norte, and Iloilo I reported raising crops, while only 28% of the houses surveyed in Bataan reported raising crops. The proximity of Bataan to Manila and its more developed

road network and commercial activity appear as the major factors explaining this disparity.

e. Livestock Production.

Sixty-three percent of the households surveyed raise livestock; 73% raised livestock at unelectrified houses in the remote barangays; 63% at electrified houses in remote barangays and along main feeder lines; and 55% at electrified houses in the poblaciones. Comparing type of houses and electrified versus unelectrified houses, findings similar to those with food crop production were reported:

<u>House Class</u>	<u>Electrified</u>	<u>Unelectrified</u>
"Heavy" material	63%	81%
"Mixed" material	61%	75%
"Light" material	58%	65%

As with food crop responses, more minimum bill householders (77%) reported raising livestock than did households using over 100 kWh per month (44%). Similarly, a greater percentage of the households surveyed in the Cagayan I service area (85%) reported raising livestock than those in Bataan (33%). Over 50% of the households surveyed in each of the other five cooperative service areas raised livestock. Again, it is noted that road inaccessibility appears to be a major factor requiring unelectrified households to rear livestock with greater frequency.

f. Fish Pond Production.

In some rural areas of the Philippines fish pond production is an important activity. For the particular locations selected for the Electrification Impact Survey, fish pond production was reported as an infrequent household activity. Only 3% of all households surveyed engaged in such activity. However, for electrified "heavy" material houses the reported level was 8%. The same percentage was reported from the survey of all sample households in Lanao Norte.

g. Home Business and Handicraft Activity.

Question 59 asked whether anyone in the sample households engaged in a business or performed a service for income based in the home. Five percent of respondents reported there was such home-based enterprise that contributed more than 50% of the household's cash income. Another 5% reported such activity that contributed 25 to 50% of monthly cash income. Yet another 10% of respondents reported that 10% to 25% of household income came from such activity. Electrified houses reported slightly higher home business income levels than unserved houses. In Negros Oriental I, slightly more than half the households in the survey reported some income from household-based business or services.

Question 60 inquired about handicraft items, food, or other products made or prepared in the household and sold. Two percent of all households reported that such sales made up more than 50% of the household's cash income. Thirteen percent reported such activity contributed more than 10% of cash income. Again, respondents in the Negros Oriental I service area reported the highest percentage of such activity with 32% of households reporting some income of this type.

## 5. HEALTH AND NUTRITION

### a. Health Clinic Availability.

Measuring electrification impact on the lives of people in rural areas and small towns must include how it contributes to health care. Question 96 asked: "Do you have a health clinic or hospital available nearby?" Question 97 asked: "Does the clinic or hospital have electric lights and equipment?" Interviewers registered "yes", "no", and "do not know."

Health clinic availability varied strikingly in accordance with house location. Sixty-four percent of respondents in electrified remote barangays reported nearby rural health clinics or hospitals while only 43% in unelectrified barangays reported such health and medical facilities. Responses were much higher along the main feeder (87%) and in the poblacion (95%).

In the poblaciones, 96% of those interviewed said the clinics were electrified; along the main feeder the response was 77%, and in the electrified barangays it was 42%. In the barangays not yet electrified, 26% reported that their nearby medical or health facility had electric lights and equipment. Interviewers reported that a number of respondents commented favorably and at length about the advantages of electricity for sterilization, refrigeration, and emergency treatment at night.

It may be of some interest that familiarity with the availability of health and medical facilities cut across lines of economic status as reflected by type of housing. For example, those in "heavy" material houses responded 82% "yes", "mixed" responded 81%, and "light" 84%. There was significant differentiation of health clinic availability by region, with Negros Oriental I households reporting 90% availability and Iloilo I, Cagayan I, and Quezon I 67%, 68% and 69% availability respectively. A similar finding was noted in response to the question about electrified clinics and hospitals, with Lanao Norte as well as Negros Oriental I on the high end and Iloilo I, Quezon I, and Cagayan I again at the low end.

### b. Source and Use of Water.

Three questions concerning household water use were asked. Question 71 asked the source of water. Question 61 asked, "Do you drink water that has been boiled, in your household?" and then asked what percentage of such water was boiled with electric appliances of any type.

Based on 388 replies, from unelectrified remote barangays as well as from electrified households in all three survey categories of location, it was found that:

- 41% used water from a well with manual pump at the house
- 17% used water from a community well or spring
- 10% used water from a community system with electric pumping
- 7% used water from river, lake, pond, ditch, or rainwater
- 6% used water from a well with electric pump at the house
- 5% used water from a community gravity system
- 4% used water from a variety of other sources.

A well with electric pump supplied household water for 19% of respondents in the Lanao Norte electrified area and for 16% in Bataan. These are cooperative systems with low residential rates for electric energy.

Municipal or barangay water systems pumped by electricity were supplying 31% of surveyed households in Bataan, 29% in Cagayan I, and 26% in Negros Oriental I. All three of these cooperatives are participants in the NEA program to promote barangay water systems.

It was found that 83% of all respondents did not drink boiled water at home. Eighty-nine percent of unserved respondents did not drink boiled water at home. Only 5% of electrified households used electric appliances to boil drinking water to any significant degree.

Question 62 inquired about the family's normal bathing practice. Ten percent of the respondents bathed inside the house with warm water. One-third bathed indoors with cold water. The remaining 57% bathed outdoors with cold water.

An equal percent (7%) of households in electrified remote barangay and in unserved remote barangay bathed indoors with warm water. Not surprisingly the highest percent of households reporting indoor bathing with warm water was from electrified "heavy" material houses (15%).

c. Household Illnesses.

Of all households surveyed, 47% of persons interviewed reported an increase in bed-confining illnesses since 1978 while only 12% reported a decrease. Each household location also indicated a general rise in the amount of sickness by head of household, with the greatest increase occurring in the remote areas where 57% reported more illness and only 10% reported a decrease. The smallest increase in illness occurred along the main feeder line where 40% of respondents reported more sickness and 15% reported less.

Both poblacion and remote served areas fell between these bounds. However, the household head in unelectrified remote barangays reported the lowest decrease in sickness out of all house samples (8%).

When stratified by house type, the responses gave the expected results. Generally, the lighter the materials used in construction of the house, the greater was the increase of illnesses by household head since 1978. Moreover, the "heavy" material households that are served by electricity had 43% of the respondents report a rise in illness thus representing the smallest percentage increase of all served households (only 15% reported decreases). What is more, the "heavy" material households that are not served by electricity had 52% of its respondents report a rise in sickness and only 4% reporting a decrease. Surprisingly, persons interviewed in unelectrified "light" material houses reported less increase in illnesses (43%) than their served counterparts (59%), and less decreases (6% compared to 12% for served households).

Of the seven cooperative service areas, Lanao Norte reported the largest increase in respondent illnesses (65%) as well as the lowest decrease (2%). By contrast, only 37% of the respondents in Bataan indicated illness increases, while 14% reported a decrease. The largest number of decreases occurred in Davao Norte and Iloilo I where 22% and 23% indicated less sickness.

In considering illnesses of others in the household besides the person interviewed, approximately one-third reported that no other member of the household had been confined sick in bed either during the 1978-1980 period or in 1981. On the other hand, 54% of all the households reported that other members had experienced illness in both periods. For all four sample locations, those reporting illnesses in one period but not the other were less than 10% of the responses for each case. In poblaciones, approximately an equal number of respondents indicated that no illnesses had occurred in the household in either period (43%), as did those who responded that illnesses occurred in both periods (45%). All other locations had nearly twice the number reporting illnesses in both periods as those reporting illnesses in neither period.

Cagayan I was the only cooperative area showing a significant number of "no illness" responses in either period (52%) over "illness" in both periods (37%). Households in the Bataan area, on the other hand, reported the largest excess of illness-in-both-period responses (70%) over illness-in-neither-period responses (26%). Surprisingly, households consuming over 100 kWh of electricity per month showed the greatest excess of illnesses in both periods (61%) over reports of no illnesses in either period (25%). The smallest excess of illnesses in both periods over reports of no illnesses in either period was indicated by households in the 10-15 kWh and the 15-50 kWh range (differential 13%).

Any relationship between illness and electrification is difficult to discern.

d. Meat Consumption.

The majority of all households surveyed presently eat meat two or three times a week while two-thirds of the households eat meat at least twice a week. Seventy-one percent of the households reported that their meat consumption had been stable since 1978. The remaining 29% of the households were equally divided between those that increased and those that decreased meat consumption.

There was a large divergence in meat consumption between households of the poblacion and those in the unserved remote barangay areas. Three-quarters of the poblacion residents ate meat at least twice a week but only 58% of the unserved households ate as much meat. Moreover, almost three times as many unserved households ate meat less than once a week (15%) as those in the poblacion (6%). This represents little change since 1978.

Families in houses constructed of "heavy" materials, as expected, ate more meat than those of "light" and "mixed" materials construction. In addition, the availability of electricity made no difference here. There was a slight reduction in the amount of meat consumed by electrified "heavy" material households since 1978 but, surprisingly, no change in similarly constructed households that were unserved. "Light" material households generally increased their consumption of meat, but consumed significantly less meat than in any of the other house types. Of the "mixed" material households, 76% of those with electricity consumed meat at least twice a week, while only 58% of those that were unserved households ate as much.

Residents of Bataan ate the lowest amount of meat with 17% of the households consuming meat less than once a week, and only 53% eating it at least twice a week. Twenty-one percent of the households of Iloilo I reported a decline in meat

consumption since 1978. Nevertheless, only 3% of these households reported eating meat less than once a week while 86% ate meat at least twice a week. In addition, 46% of Iloilo I households ate meat four or more times a week.

No respondent that consumed fifty or more kilowatt hours of electricity a month ate meat less than once a week. There is a strong correlation between electrical consumption and the consumption of meat at least twice a week.

e. Consumption of Dairy Products.

Two-thirds of all respondents consumed milk, eggs, or cheese at least twice a week. This represented almost no change from the pattern in 1978. Poblacion residents, however, ate significantly higher amounts of dairy products than did residents of the unserved remote barangay areas. Fifty-one percent of the residents in the poblacion consume dairy products four or more times a week while only 19% of the unserved respondents consume as much. Additionally, about 9% to 10% of all electrified households consume dairy products less than once a week, as opposed to 19% of those unserved. Although two-thirds of the poblacion residents reported no change in the consumption of dairy products since 1978, 23% reported a reduction in consumption, while 8% increased consumption. Three-quarters of the unserved residents indicated no change, while 14% increased consumption and 11% decreased consumption. The largest net increase of dairy product consumption occurred in those households living along the main feeder line. Twenty-two percent of those households reported increased consumption while only 11% reported a decrease.

For every category of house construction material, a greater portion of unserved households consumed dairy products less than once a week than did their served counterparts. Moreover, for each house type, a greater share of served households consumed dairy products more than four times a week than did their unserved counterparts. "Heavy" material households generally consumed the most dairy products and "light" material households the least.

Consumption of dairy products typically declined slightly in relation to increased consumption of electricity, but this correlation was not strong at lower levels of electric use.

f. Consumption of Canned and Preserved Foods.

Consumption of canned and preserved foods show few interesting results that add information on food consumption. Almost two-thirds of all households surveyed ate canned or preserved foods at least once a week. In general, the consumption of this food has shown an overall improvement since 1978. A slightly greater share of poblacion residents consumed canned or preserved foods than did residents of the unserved remote barangay areas.

Unserved households ate less canned and preserved foods than did households that use electricity. "Heavy" and "mixed" material households with electricity ate such food more often than those in unserved households; however, families in "light" material houses with electric service ate canned foods more often than families in electrified "light" material houses.

Even though residents of Bataan ate canned and preserved foods less often now than in 1978, they still had the largest percentage of households consuming such food.

by contrast, households in Negros Oriental I and Iloilo I showed a sharp increase in consumption since 1978. There, residents generally consume less than in the other cooperative areas.

There was a slight positive correlation between electrical consumption and the amount of canned or preserved food consumed.

g. Consumption of Fresh Fruit.

Forty percent of all households surveyed ate fresh fruit four or more times a week. Eighty-seven percent of the households in the poblacion consumed fresh fruit at least twice a week, compared with 70% and 73% of residents in the remote served and unserved areas respectively. Residents in the poblacion showed a general decline in their fruit consumption while consumption levels in all other house sample locations were relatively stable.

There appears to be little difference in the amount of fresh fruit consumed by house type. Also, there is little difference between the served and unserved categories. One exception can be made, however, for the "light" material households, where 78% of the served residents ate fresh fruit at least twice a week but only 57% of the unserved did.

Variations in fruit consumption by cooperative area appear to be small. All cooperatives, however, except for Negros Oriental I and Quezon I reduced their consumption of fresh fruit since 1978. Cagayan I showed the largest decline by far.

6. HOUSEHOLD ACTIVITIES AFTER SUNDOWN

a. Night Study.

Filipinos have an extremely high regard for education. Education furthermore is given a high priority among the developmental programs of the Government of the Philippines. One aspect of this emphasis on education is the school lighting program sponsored by the National Electrification Administration in coordination with the rural electric cooperative.

The cooperatives have competed for high marks in the number of schools and number of classrooms connected to the electric lines. The program was launched in 1976, and by the end of December 1978 the cooperatives had electrified 1,813 schools with 18,026 classrooms in their service areas.

By the end of 1980, there were 3,285 schools electrified with 38,743 classrooms.

In many locations the cooperatives made the connection free of charge. The electrification emphasized lighting, but provided much more: power for electrical equipment and in some instances piped drinking water and kitchen cooking facilities for hot school lunches.

A tabulation at the end of 1978 counted 8,008 adults and out-of-school youth in cooperative service areas who graduated from evening vocational courses while 300,687 other students were enrolled for formal high school and college courses offered in evening classes made possible by electric lighting. By the end of 1980, there were more than 100,000 graduates from these evening courses.

In respect to household study activity at night, overall results of the Impact Study were as follows:

- 37% - no night study activity by family members at home
- 7% - 1 day or less per week of night home study activity by family members
- 10% - 2 to 3 days per week of night study activity
- 31% - less than 2 hours per day of night study activity
- 15% - more than 2 hours per day of night study activity.

Considering the number of households which do not contain students (retired couples, for instance), this tabulation indicates a very high level of night-time study activity by family members.

Of paramount interest in the study was the comparison of the level of home study at night in remote barangays with electric lights and those without. For the former, there was some level of night-time studying activity at 63% of the homes. For the latter it was 51%. Moreover, daily night study activity was reported by 47% of the electrified homes surveyed, and only by 34% of surveyed homes without electric lights. Daily night study activity levels differed only slightly among the electrified households in the three kinds of location surveyed: remote barangays, along the main feeder, or in poblaciones.

Daily night study levels differed only slightly among types of electrified houses surveyed, but significantly among unelectrified house classes surveyed. For unelectrified houses, the level of daily night studying was substantially higher for "heavy" material houses (46%) than for "light" material houses (26%). In view that lower-income remote barangay families generally live in the "light" material houses, it becomes apparent that where there is no electrification, the poor do not have as much opportunity for studying at home at night as when electrification is made available.

Significant variation also was reported among the night study activity of the seven cooperative service areas surveyed. Cagayan I reported the highest levels of daily night study activity (70%), and Davao Norte the lowest level (27%). In view that the Cagayan I area reported the highest level of household monthly peso incomes and the Davao Norte area the lowest level of monthly peso incomes, positive correlation appears to exist between area income level and night study activity.

b. Other Household Activities after Sundown.

In addition to leisure and educational activities, electric lighting in the home can extend the hours for additional productive activities by members of the household. The questionnaire for the Impact Study inquired about the extent to which some of these activities were practiced in electrified homes as compared to a control group of unelectrified homes. With handicraft activity at "mixed" material households as the only exception, such activities were reported somewhat more prevalent for all three classes of electrified house types surveyed (see Table D-3 below). Evening household productive activity does not appear directly related with service area income variations.

TABLE D-3. HOUSEHOLD ACTIVITIES AFTER SUNDOWN BY TYPE OF HOUSING  
 (Percentage of Sample Reporting Activity)

<u>Activity</u>	<u>Heavy House Construction</u>		<u>Mixed House Construction</u>		<u>Light House Construction</u>	
	<u>Electrified</u>	<u>Not Electrified</u>	<u>Electrified</u>	<u>Not Electrified</u>	<u>Electrified</u>	<u>Not Electrified</u>
Cooking	65	62	67	64	61	61
Housework	58	54	50	44	48	37
Sewing	21	12	21	8	17	3
Handicraft	11	8	7	10	10	3
Repairs	16	12	10	8	9	0
Job-related work	28	19	19	17	18	8

### Cooking:

Sixty-two percent of households interviewed in unelectrified remote barangays did some cooking after sundown. In remote barangays with electric lighting, 67% did some cooking after sundown. Along the main feeder lines the households which cook after sundown made up 54% of the survey sample, while in the poblaciones the proportion was 72%.

In the service area of Negros Oriental I, 93% cooked after sundown, in contrast to Quezon I, where only 39% did.

### Housework:

In 47% of interviewed households some housework is done after sundown in unelectrified remote barangays, but in those with electric lights 50% do some housework after sundown. Responses indicated 44% did housework after sundown in homes along the main feeder lines. In the poblaciones the figure was 63%.

In Davao Norte's service area 80% of those interviewed reported doing housework after sundown. By contrast Cagayan I and Quezon I respondents indicated only 27% and 28% respectively did housework after sundown.

### Sewing:

Surprisingly, only 7% of households interviewed in unelectrified remote barangays did sewing after sundown, while 20% did some sewing after dark in the remote barangays with electric lighting. About the same percentage was reported along main feeder lines and in the poblaciones.

Looking at the responses from each of the seven cooperative service areas, Negros Oriental I was high with 33%. Bataan, Cagayan I, and Quezon I each responded with a low 7%.

### Handicraft:

Seven percent of those questioned in unelectrified remote barangays make handicraft items after sundown. The proportion in remote barangays with electric lighting was 10%. About the same percentages were found along main feeder lines and in the poblaciones.

By cooperative service area, Lanao Norte respondents were highest with 23%. Bataan was lowest with 2%.

### Maintenance Repair Work:

The statistical difference reported in maintenance repair work in the home after sundown in unelectrified and electrified remote barangays was significant -- 6% in the first and 16% in the latter. There was 12% reported along the main feeder lines and 5% in the poblaciones.

By cooperative service areas, 24% was reported in Lanao Norte and 20% in Negros Oriental I, but only 2% in Bataan.

### Job-related Work at Home:

Respondents in unelectrified remote barangays reported 14% doing job-related work in the home after sundown, while in remote barangays with electric lighting 16% was reported. Along the main feeder lines, there was a figure of 26%, and in the poblaciones, 23%.

Negros Oriental I responded high with 49%; Lanao Norte had 47%. The lowest report for a cooperative service area was at Bataan with 4%.

## 7. ELECTRICAL APPLIANCES IN THE HOME

All households on the lines of the electric cooperatives have electric lighting. The Impact Survey inquired with a series of questions about the use of electrical appliances. The early feasibility studies for rural electrification in the Philippines (before the oil crisis of 1973) had anticipated considerable purchase and use of electric fans, irons, refrigerators, radios and TV, and equipment for cooking and heating water.

Table D-4 shows the percentage of households with selected appliances, by location and type of house construction.

### a. Cooling and Ventilating Methods.

Just over one percent of electrified households surveyed used air conditioners, but 39% used electric fans. The highest percent of electric fan usage was in the poblacion (46%), with about one-third of households using fans in both the main feeder and remote areas.

A very strong positive correlation exists between household construction material and use of electric fans. Sixty-five percent of the "heavy" material households made use of electric fans and 39% of the "mixed" material households, but only 13% of those constructed of "light" materials.

Bataan and Quezon I reported the highest percentage of households using electric fans (46% and 42% respectively), with the lowest percentage being reported at Iloilo I (17%).

A strong positive correlation also exists between electric fan usage and the amount of electricity consumed. Three-quarters of the households using over 100 kWh monthly reported using electric fans, but one-half of those in the 50-100 kWh month range. As electricity consumption continued to decline, so did the use of electric fans.

### b. Clothing-related Appliances.

Of all households in the sample, 87% reported using some type of clothing-related appliance, with the use of flat irons predominating. No household reported using electric washers or dryers, and only three respondents reported an electric sewing machine, but 32% of households with electric service had electric irons. The ownership of manual sewing machines was reported by 19% of total households. Use of manual sewing machines was reported slightly higher for main feeder and poblacion (22%) than for remote electrified areas (16%).

TABLE D-4. SELECTED ELECTRIC APPLIANCES IN SURVEY HOUSEHOLDS  
(By Percent of Sample Responding)

Appliance	Entire Sample	Location			House Class		
		<u>Poblacion</u>	<u>Main Feeder</u>	<u>Remote Barangay</u>	<u>Heavy</u>	<u>Mixed</u>	<u>Light</u>
Fan	39	46	38	33	65	39	13
Iron	32	43	26	25	37	36	22
Refrigerator or freezer	35	41	41	23	71	29	5
Stove or other cooking appliance	4	5	5	3	9	3	1
Radio	18	16	17	21	13	19	22
Television (color + b/w)	34	49	38	30	63	40	14
Tools	9	4	15	6	16	5	5

Of the poblacion households 43% reported use of electric irons, while about one-quarter of electrified households along the main feeder and in remote areas reported electric irons. Ownership of electric irons was more common in the "heavy" and "mixed" material households than in the "light" material households.

Households in Bataan had the largest percentage of households reporting the ownership of electric irons and the next highest was Lanao Norte. Households in Negros Oriental I reported the highest percentage of manual sewing machine ownership (42%) with the next highest percentage being reported in Lanao Norte (26%).

c. Refrigeration Appliances.

More than a third of respondents with electric service reported electric refrigeration equipment in the household. These included electric mini-refrigerators, full-size electric refrigerators, and electric freezers (4% of households).

The percentage of households with refrigeration facilities was highest along main feeder and in the poblacion (41% in each).

By cooperative service area, Lanao Norte reported the highest percentage of households with refrigeration facilities (47%) and Cagayan I reported the lowest (18%). Therefore, a direct relationship appears to exist between cost of power and use of electric refrigeration.

Almost three-quarters of the "heavy" material houses had some form of refrigeration facilities, but only 5% of the "light" material houses had any.

d. Cooking Equipment.

Three-quarters of all respondents used wood, charcoal, or sawdust for household cooking, while one-fifth used kerosene or gas cooking equipment. Only 4% reported using electric cooking appliances. Electrified households along the main feeder, and in poblacion and remote areas were surprisingly similar in their use of cooking equipment and fuels. A greater percentage of unelectrified households used wood, charcoals, sawdust, etc. (88%), while only 8% used kerosene or gas stoves. It was noted that a greater percentage of served households than unserved households used kerosene or gas for cooking.

About 9% of "heavy" material households used electric stoves, while only 3% of the "mixed" material and 1% of "light" material households did.

Households in the Bataan area had the lowest percentage reporting use of wood stoves (38%) while reporting the highest usage of kerosene or gas stoves (52%). Davao Norte respondents had the highest percentage of use of wood (charcoal, sawdust, etc.) stoves (88%), and the lowest percentage of reported use of kerosene or gas stoves (7%).

When the data was stratified by consumption of electricity, a high positive correlation was observed between the amount of electricity consumed and the percentage use of electric stoves. Moreover, a high negative correlation was also observed between kWh usage and the percentage of households using wood, charcoal, or sawdust stoves.

e. Radio and Television.

Of all the households surveyed, 84% had some form of electronic communication item found in the house. One-third of electrified households had black and white or color TV sets, and about one-fifth used electricity-powered radios. Over 80% of the households in the unserved areas used battery operated radios, while 5% reported use of battery operated TVs.

The ownership of TVs was very highly correlated with the type of material used for house construction. Sixty-three percent of the heavy material households served by electricity owned either a color or black and white TV. By contrast, 40% of the "mixed" material households with electricity owned TVs, as did only 14% of the "light" material households.

Fifty-three percent of the households in Bataan owned TVs (black and white and color), while only 19% of households in Quezon I and only 22% in Negros Oriental I had TV sets.

A very strong correlation existed between the monthly kWh usage and the percentage of households reporting ownership of TVs. Of those households consuming over 100 kWh per month, 88% reported ownership of TVs, while only 15% of those households in the 0-10 kWh monthly usage category had TVs.

Electric-powered radios were in inverse ratio to TV for the three location and the three classifications of housing qualities (see Table D-4).

f. Tools and Equipment.

The large majority of all households surveyed possessed manual tools (70%). Nine percent of houses with electric service reported electric tools. Only 4% of the respondents in the poblaciones have electric tools, while 15% and 6% respectively have electric tools and equipment along the main feeder line and in remote barangays. In houses made of "heavy" materials a greater percentage of respondents reported electric tools (16%) than in either of the other two house classes (5%).

Only 3% of all respondents in Cagayan I reported having electric tools and equipment but 12% of all households in Bataan made such response.

Households consuming greater amounts of electricity were generally more likely to possess electric tools and equipment than were lower consumption households.

g. Water Pumps.

Seven percent of electrified households owned personal electric pumps. These served 12% of the households in the poblaciones, 8% of those along the main feeder, and 2% of electrified houses in the remote areas. In addition, 21% of households in the poblaciones and 13% of households along the main feeder used water supplied from an electrified community water system. Only 3% of remote electrified households had access to such a system.

h. Water Heating.

Seventy percent of all households in the sample reported using charcoal, wood, or other fuels to heat water for household washing of any kind. Only 1% of electrified households reported using electricity for heating water. Four-fifths of those few households that did report using electricity for heating water fell within the 15 to 50 kWh per month power usage classification.

i. Agricultural Use of Electricity.

Only 3% of electrified households reported using electricity supplied by the cooperative for some agricultural purpose other than irrigation. The use of electricity for non-irrigation, agricultural purposes shows no tendencies or pattern when the responses are stratified by various criteria.

j. Planned Appliance Purchases.

Question 88 in the residential portion of the Electrification Impact Survey looked to the future: "Do you or any member of your household plan to buy electric appliances or equipment during the next year?"

This could be answered "yes" or "no" or "do not know". A second portion of the question asked, "Please tell me what type of electric appliances or equipment you plan to buy next," if the respondent had already answered "yes" to the initial question. Then a third part of Question 88 asked, "What has kept you from buying this piece of equipment in the past?"

Findings for this multiple-part question can have importance in the interpretation of electrification impact:

- (1) On the households served;
- (2) On merchants whose economic well-being depends on sales;
- (3) On the viability of the power supplier which has built a distribution system to fit projected use of electricity; and
- (4) On agencies which supply the funding for rural electrification as one of many development programs.

Forty-three percent of the respondents in the study told the interviewers they planned to buy electric appliances or equipment during the next year. Whether the household was situated in the poblacion, along the main feeder line, or in a remote barangay seemed to make little difference. The percentages were 40% for poblacion, 44% for main feeder, and 48% for remote barangay which had electric service. The surprise came in finding that 34% of the 105 households in unelectrified barangays answered "yes", that they intended to make purchases in the next year. The explanation of such response may be the expectation that the cooperative will be building lines to that location within the next year; but inquiry at the cooperative headquarters showed that some were not scheduled for service within that time frame.

activity. For the particular locations selected for the Electrification Impact Survey, fish pond production was reported as an infrequent household activity. Only 3% of all households surveyed engaged in such activity. However, for electrified "heavy" material houses the reported level was 8%. The same percentage was reported from the survey of all sample households in Lanao Norte.

g. Home Business and Handicraft Activity.

Question 59 asked whether anyone in the sample households engaged in a business or performed a service for income based in the home. Five percent of respondents reported there was such home-based enterprise that contributed more than 50% of the household's cash income. Another 5% reported such activity that contributed 25 to 50% of monthly cash income. Yet another 10% of respondents reported that 10% to 25% of household income came from such activity. Electrified houses reported slightly higher home business income levels than unserved houses. In Negros Oriental I, slightly more than half the households in the survey reported some income from household-based business or services.

Question 60 inquired about handicraft items, food, or other products made or prepared in the household and sold. Two percent of all households reported that such sales made up more than 50% of the household's cash income. Thirteen percent reported such activity contributed more than 10% of cash income. Again, respondents in the Negros Oriental I service area reported the highest percentage of such activity with 32% of households reporting some income of this type.

Examining the replies of residents in each of the seven cooperative service area produced the following spread of "yes" responses:

Cagayan I	60%
Quezon I	49%
Negros Oriental I	48%
Davao Norte	46%
Iloilo I	43%
Lanao Norte	38%
Bataan	19%.

This wide variation in response may be related to a combination of factors including the cost of electricity and years of service.

Looking at plans to purchase appliances by economic level of the households, it is instructive to find that 46% of respondents in "heavy" material houses said "yes", while only 38% of those in "light" material houses reported plans for purchases. Forty-nine percent of those in "mixed" material houses said they had plans for purchases. Appearing to be in opposition to this indication, the tabulation by kWh usage showed those using the most electricity to be the lowest in planning for purchase of appliances (24%). This could signify, however, that households in this classification already had purchased significant appliances and were using them -- thus accounting for their high kWh consumption. More than 40% of the minimum bill consumers said they had purchase plans.

What purchases were households in the sample anticipating? Here is the listing:

37%	named TV as the next purchase
18%	named refrigerator
13%	named stereo/phonograph
13%	named electric fan
6%	named electric iron
4%	named electric stove or range
3%	named cassette tape recorder
2%	named electric incubator lights
2%	named radio.

As may be noted, about one-half of the anticipated purchases involve radio/TV/stereo equipment, while 30% involve appliance (i.e., refrigerators, irons, stoves, lights) directly applicable for productive end-uses.

The primary reason given why the particular appliance was not purchased in the past by electrified households can be summarized as follows:

High cost of equipment (or can't afford)	57%
Lack of credit	26%
Electric power reliability or cost	14%
Availability of new equipment	3%

100%

Monetary constraint therefore appears the overwhelming reason for not purchasing appliances. Poor service appears only a secondary constraint since it was cited

respectively. A similar finding was noted in response to the question about electrified clinics and hospitals, with Lanao Norte as well as Negros Oriental I on the high end and Iloilo I, Quezon I, and Cagayan I again at the low end.

b. Source and Use of Water.

Three questions concerning household water use were asked. Question 71 asked the source of water. Question 61 asked, "Do you drink water that has been boiled, in your household?" and then asked what percentage of such water was boiled with electric appliances of any type.

Based on 388 replies, from unelectrified remote barangays as well as from electrified households in all three survey categories of location, it was found that:

- 41% used water from a well with manual pump at the house
- 17% used water from a community well or spring
- 10% used water from a community system with electric pumping
- 7% used water from river, lake, pond, ditch, or rainwater
- 6% used water from a well with electric pump at the house
- 5% used water from a community gravity system
- 4% used water from a variety of other sources.

basically only by Cagayan I households as the primary factor for not purchasing appliances. Availability of appliances appears an insignificant factor causing households to delay desired appliance purchases.

## 8. LABOR AND COST SAVINGS

To ascertain the extent of productive use of electricity in households, two parallel questions were asked. Question 86 inquired:

"Do you use any electrical equipment in your home that reduces normal housekeeping chores?"

Of the entire sample, 71% gave a negative answer. Fourteen percent replied use of electric equipment having "great positive effect" in reducing normal household chores. An additional 9% indicated "moderate positive effect." It should be noted that the wording of the question eliminates electric lights. Only equipment such as electric irons, sewing machines, etc. would be considered.

As should be expected, the highest percentage of positive responses were found in "heavy" constructed houses and the lowest in "light" houses. In examining use of electrical equipment that reduces normal housekeeping chores by the several categories of kWh usage, it was found that neither the minimum bill consumers nor the heavy users (over 100 kWh per month) appeared to benefit as much as those in the middle--using from 15 to 50 kWh per month.

In the service areas of Iloilo I and Cagayan I respondents perceived the greatest reduction in household chores -- 34% and 33% respectively replying great or moderate positive effect. Bataan was lowest with 9%.

Question 87 asked:

"Do you use any electrical equipment in your home for business purposes or to produce products for sale?"

Only 11% gave a positive response to this inquiry, and these were evenly distributed among households in the poblacion, along the main feeder line, and in the remote barangay. As in the previous question, the heaviest positive response was obtained from respondents in "heavy" construction houses. Heavy positive response also came from those with high kWh consumption (over 100 kWh per month).

In the service area of Negros Oriental I, 18% of respondents perceived a "great amount" or "some" money saved or generated from use of electric equipment in the home for business purposes or to produce products for sale.

A question related to Nos. 86 and 87 inquired:

"Outside the convenience that it gives your family, does the availability of electric lighting save your household money?"

Responses to the interviewers could be:

illness occurred along the main feeder line where 40% of respondents reported more sickness and 15% reported less.

Both poblacion and remote served areas fell between these bounds. However, the household head in unelectrified remote barangays reported the lowest decrease in sickness out of all house samples (8%).

When stratified by house type, the responses gave the expected results. Generally, the lighter the materials used in construction of the house, the greater was the increase of illnesses by household head since 1978. Moreover, the "heavy" material households that are served by electricity had 43% of the respondents report a rise in illness thus representing the smallest percentage increase of all served households (only 15% reported decreases). What is more, the "heavy" material households that are not served by electricity had 52% of its respondents report a rise in sickness and only 4% reporting a decrease. Surprisingly, persons interviewed in unelectrified "light" material houses reported less increase in illnesses (43%) than their served counterparts (59%), and less decreases (6% compared to 12% for served households).

Of the seven cooperative service areas, Lanao Norte reported the largest increase in respondent illnesses (65%) as well as the lowest decrease (2%). By contrast, only 37% of the respondents in Bataan indicated illness increases, while 14% reported a decrease. The largest number of decreases occurred in Davao Norte and Iloilo I where 22% and 23% indicated less sickness.

- ...no
- ...a minimal amount of money
- ...a moderate amount
- ...a significant amount.

Only 11% said they had no savings. Twenty-one percent reported significant savings, and another 39% had moderate savings.

Significant savings were claimed by 31% of households along feeder lines, and that was double the percentage in the poblacion or in a remote barangay. Savings were reported in an almost equal number of "heavy", "mixed", and "light" construction houses, but significant savings were specified by 26% of respondents in "heavy" houses against 17% in "mixed" and 19% in "light" houses. Households which believe they saved the most money by having electric lighting were users in the middle bracket of energy users -- from 15 to 50 kWh per month.

By cooperative service area, the responses showed a wide spread with households in Cagayan I and Negros Oriental I reporting a perception of greatest savings and those in Bataan the least. The tabulation follows:

TABLE D-5. PERCEPTION OF SAVINGS FROM HOUSEHOLD ELECTRIFICATION

(By Residents in Surveyed Service Areas)

<u>Cooperative Service Area</u>	<u>No Savings</u>	<u>Minimal Saving</u>	<u>Moderate Saving</u>	<u>Significant Saving</u>
Bataan	23%	42%	19%	16%
Cagayan I	0%	32%	50%	18%
Davao Norte	7%	20%	30%	43%
Iloilo I	14%	32%	34%	20%
Lanao Norte	19%	21%	44%	16%
Negros Oriental I	0%	33%	47%	20%
Quezon I	16%	16%	42%	9%

These households were then asked what they "normally do with any money...saved by using electricity". It was found that the great majority used such savings for general family needs and essentials including foodstuffs. Only a small amount was spent for electric appliances and hardly any on recreation. Here is the tabulation:

General family needs and essentials	39%
Foodstuffs	33%
Savings or emergencies	6%
Education	6%
Clothing	5%
Business investment	5%
Home improvements	3%
Electric appliances	3%
Recreation or decorations	1%

## 9. MONTHLY KILOWATT-HOUR USAGE

Annual kilowatt-hour billings for the years 1978, 1979, and 1980 were obtained for respondents interviewed from the offices of the seven cooperatives. Unfortunately,

TABLE D-6. 1980 HOUSEHOLD AVERAGE KWH USE PER MONTH  
(By Percent of Sample Responding)

Category	No. in Sample	0-10	10.1 - 15	15.1 - 50	50.1 - 100	Over 100
Entire sample	289	15	20	36	16	13
Location						
Poblacion	100	13	16	38	16	17
Feeder	104	12	21	36	20	11
Remote	85	20	23	35	12	9
House Class						
Heavy	97	4	11	34	24	27
Mixed	98	9	21	40	19	10
Light	94	32	28	35	5	0
Cooperative						
Bataan	45	2	7	44	16	31
Cagayan I	45	18	42	29	9	2
Davao Norte	27	7	15	48	30	0
Iloilo I	44	32	14	30	18	7
Lanao Norte	43	12	23	35	23	7
Negro Oriental I	40	7	28	33	12	20
Quezon I	45	22	11	40	11	16

data on only 289 of the 315 residential consumers interviewed were obtained for 1980 kWh consumption, and only 179 for 1978 usage. Missing data from 1978 was most pronounced for households in Bataan and Davao Norte, caused by a shortage of time available to the survey coordinators at those cooperatives. Table D-6 shows the number of responses (only 27 from Davao Norte) as well as the percentages computed for the several comparisons.

The electrical usage data, gathered from billing records in the offices of the cooperatives, indicates a strong positive correlation between the level of the materials used in house construction and the amount of electricity consumed per month. In almost one-third of the "light" material houses consumption was less than 10 kWh per month in 1980 while none of the respondents in "light" material houses were listed as consuming over 100 kWh a month. By contrast, just over one-quarter of the families in "heavy" material houses consumed over 100 kWh monthly, but only 4% reported consuming less than 10 kWh a month. The 15 to 50 kWh range predominated in all three types of house construction surveyed.

One-third of all households consumed between 15 to 50 kWh of electricity per month in 1980, while one-fifth consumed between 10 and 15 kWh. Twenty percent of the households in remote areas consumed less than 10 kWh per month while 17% of the households in the poblacion consumed more than 100 kWh monthly.

Bataan households showed higher percentages of heavy consumption than any other cooperative area, with almost one-third of households consuming over 100 kWh per month in 1980. Only 2% of Bataan households in the survey consumed less than 10 kWh per month. Iloilo I households showed almost one-third of the households consuming less than 10 kWh per month. Again, the 15-50 kWh monthly usage range dominated the cooperative areas, except for Iloilo I and Cagayan I where 42% of the billing records indicated that they consumed between 10 to 15 kWh per month.

Instead of the full 45 responses for kWh usage from each cooperative service area, the survey data for 1978 includes only the following: Bataan 4, Cagayan I 24, Davao Norte 7, Iloilo I 33, Lanao Norte 41, Negros Oriental I 25, and Quezon I 45. This gap in data impairs to some extent the analysis of energy consumption changes on a cooperative comparable basis.

Recognizing the statistical limitation of such data for Bataan and Davao Norte, the following is the pattern of increases and decreases in consumption of electricity from 1978 to 1980 for the remaining service area:

<u>Cooperative</u>	<u>% Showing Increase</u>	<u>% Showing Decrease</u>
Cagayan I	46	54
Iloilo I	73	27
Lanao Norte	78	22
Negros Oriental I	52	48
Quezon I	87	13.

As indicated in the tabulation above, Cagayan I is the only system reporting a net decrease in respondent kWh use. It was the only system of the seven sampled which was generating power from oil-burning diesel engines during the period surveyed and consequently had the highest retail rate. In the fall of 1981, Cagayan I was

TABLE D-7. CHANGES IN HOUSEHOLD KWH CONSUMPTION, (1978-80)  
 (By Percent of Sample Responding)

<u>Category</u>	<u>No. in Sample</u>	<u>Decrease</u>	<u>Increase</u>	<u>No Change</u>
Entire Sample	179	27	73	1
Location	179			
Poblacion	75	35	64	1
Feeder	66	29	71	0
Remote	38	10	90	0
House Class	179			
Heavy	65	26	72	2
Mixed	63	32	68	0
Light	51	23	77	0
kWh Usage	179			
0-10	19	39	61	0
10.1-15	32	44	56	0
15.1-50	70	24	74	2
50.1 - 100	35	20	80	0
More than 100	19	10	90	0

connected to the Luzon grid and is expected to have much lower rates for its consumers. It will be interesting to look at the kilowatt-hour consumption figures in 1982 or 1983 for another comparison of increases and decreases. Negros Oriental

I, which shows only a few more increases than decreases, also has had a very high retail rate because it is not tied into either the Luzon or the Mindanao grid.

The few responses from Bataan and Davao Norte showed increases in use of electricity. A positive correlation therefore appears to exist between retail rates and kilowatt-hour use increases.

Table D-7 records the percentage of changes in kWh consumption by location, house construction rating, cooperative service area, and usage level. Overall, of the 179 responses obtained, 27% indicated use decreases and 73% indicated use increases. The percentage of use increases was greater in houses of "light" material construction than in "mixed" or "heavy" material construction. This suggests that households at the low end of the economic scale are increasing their use of electricity faster than those at the upper levels.

## 10. SERVICE PERCEPTIONS

### a. Outages.

Good electric service has to be reliable. "Outages" (or "brownouts", to use the Philippine term) only produce an irritating and negative psychological effect on customers, but they cause damage measurable in pesos. Freezers and refrigerators without power over a period of time result in food spoilage. Power tools and electrical equipment are useless during outages and run up labor costs and production losses. Banks and offices depending upon computers can lose data processing programs underway. Enterprises can be seriously handicapped by power failure. For residential consumers there can also be peso losses, but where electric service is new and kilowatt-hour consumption is still low, the interruptions may be considered more of a nuisance than a serious economic loss.

By industry standards in fully developed countries, the record of "brownouts" in the Philippines would be considered unacceptable. Service interruptions are not only relatively high for the rural electric cooperatives but for Manila (served by MERALCO), and in other urban systems as well.

Some interruptions can be directly traced back to the local distribution system and may result from natural causes such as typhoons or from poor line maintenance. Much of these, though, originate in the power grid of the National Power Corporation. Consumers are generally unaware of this distinction, and unless the cooperative informs its members, they are likely to blame all brownouts on their local cooperative.

To ascertain the level of outages at the cooperatives, study interviewers asked residential consumers:

"Think back over the past 2 months and add up the number of days your electricity has gone off or the service was not available for a period of more than one hour. How many days in the past 2 months has this happened?" The questionnaire provided coding for six different answers.

Of the 314 households interviewed, 31 did not know or could give no specific answer. The remaining 283 in the sample responded as follows:

16	never
94	one day
83	between 1 and 2 days
43	between 3 to 5 days
47	more than 5 days.

In general, the remote barangays appeared to have fewer outages than the poblacion and feeder-line households experienced.

The pattern of outage reports by sampled consumers in the seven cooperative areas showed wide variations. Interestingly, there were no outages lasting 5 days or more for either Iloilo I or Negros Oriental I. Both are on islands not usually subject to typhoon damage. As indicated in the table below, higher levels of outages furthermore appear to exist at the two cooperatives (Bataan and Quezon I) served by NPC on the Luzon grid, an area susceptible to typhoon damage. Interestingly, Cagayan I also located in Luzon grid, but not receiving NPC grid power at the time of the survey had a lower level of outages. Davao Norte and Lanao Norte are located in Mindanao, and are served by the NPC Mindanao grid in an area of low typhoon incidence. They also had low levels of outages reported.

TABLE D-8. RESPONDENTS REPORTING 3 OR MORE DAYS OF OUTAGES (1 HOUR OR MORE) over PAST 2 MONTHS

Bataan	78%
Quezon I	52%
Cagayan I	33%
Lanao Norte	21%
Iloilo I	14%
Davao Norte	7%
Negros Oriental I	3%.

b. Respondents' Cooperative Service Ratings.

A consumer's estimate of good service rests on many other factors besides outages. The survey questionnaires, however, did not incorporate such salient factors as voltage fluctuation, courtesy of employees, accuracy in billing and collections, and the quality and quantity of the cooperatives' membership and public relations programs. In view of the recognized relatively high level of outages on the lines of the electric cooperatives compared to U.S.A. standards, Question 99, "Does the NEA electric cooperative give you good service?" was added to the interview to ascertain the overall perception of service performance from the rural Filipino electric consumer perspective.

This interview question called for a "yes" or "no" reply. Surprisingly, the overall response to the question showed a 95% favorable declaration by the members in the survey sample. The 14 "no" replies were evenly distributed among poblacion, main feeder line, and remote barangay. There was also no significant difference in distribution of "no" responses by type of house, or by amount of kilowatt-hour of electricity used.

Responses categorized by each of the seven cooperatives, however, showed a marked difference of opinion about quality of service. The sampling in the service area of Lanao Norte was 100% favorable, while only 76% answered favorably in Quezon I. Second lowest was Bataan, with an 81% favorable rating. It is possible that the large proportion of unfavorable responses in Quezon I could have been influenced by the timing of the interviews, which were made during three days immediately following "Anding", Luzon Island's worst typhoon in two years, which cut off power in many areas.

In retrospect, the usefulness of this question was limited in view that a comparative and parallel survey of non-cooperative consumers such as those served by MERALCO was not undertaken. Such a survey undoubtedly would shed greater light on this question, but was not possible with the limited time and funding provided for the study.

## 11. MEMBERSHIP PARTICIPATION

### a. Cooperative Meeting Attendance.

An underlying factor which may affect consumers' attitudes about their electric service is ownership, which carries with it the opportunity to speak out and to vote for Board Directors at an annual meeting. This is an essential element in any cooperative enterprise. Question 90 asked:

"Do you (head of household) ever go to any of your electric cooperative meetings, like meetings of the board of directors, general membership meetings, District/Municipal Electrification Committee meetings (DEC/MEC) or community information meetings?" Replies were recorded by the interviewer as "no" or by frequency of attendance.

Overall, the survey revealed that 60% of the membership sample attended one or more meetings of the cooperative during the year. One caveat must accompany this figure. It was learned during the survey that two of the cooperatives held no annual membership meeting in 1980-1981. These were Bataan and Quezon I. Respondents from both of these cooperatives reported significantly lower levels of meeting attendance.

Most members attended one meeting a year. Those who live in "heavy" material houses reported a slightly better attendance than those in "mixed" material housing, and those in "mixed" material houses attend slightly better than those in "light" material houses. The same economic stratification is shown in measuring attendance by levels of kWh usage. Generally speaking, it appears that those householders using more electricity attend more meetings.

Meeting attendance by cooperative differentiation is revealing and important. Ninety-three percent of the consumer sample in Negros Oriental I attend at least one meeting a year. For other cooperatives, the percentages were:

Lanao Norte	88%
Cagayan I	75%
Davao Norte	74%
Iloilo I	45%
Quezon I	30%
Bataan	27%.

Records at the offices of the cooperatives and the National Electrification Administration, along with conversations with officials at both levels indicated a relationship between meeting attendance and the level and quality of the cooperative's activities through its membership programs department. Attitudes expressed by the members of the Board of Directors and by the General Manager also were an input factor to consider.

Negros Oriental I requires each new consumer-member to participate in an orientation training session before connection to the electric lines for service. In conversations, the General Manager and all members of the Board (except two who could not be reached in the limited time available) volunteered strong feelings in support of control of the cooperative by its member-consumers as owners.

Question 91 and 92 asked about meeting attendance by other people in the interviewed household and about meeting attendance by neighbors. They were intended as a measure of validation for Question 90, and did indeed support in a general way the findings on meeting attendance by the head of the household.

b. Ownership Recognition.

The final question asked of electrified residential consumers concerned their perceptions of ownership of their electric cooperative, in order to ascertain to what degree the member-owned cooperative approach is understood. Question 100 asked:

"To the best of your knowledge, is the electric cooperative which serves this house...

- ...owned by the Government?
- ...owned by NEA?
- ...owned by the Cooperative's Board of Directors?
- ...owned by the Cooperative's General Manager?
- ...owned jointly by the consumer-members?
- ...Do not know."

Of the 314 replies, 68% recognized that they themselves were joint owners. Others replied as follows:

Owned by NEA	13%
Owned by Government	7%
Owned by Board of Directors	4%
Owned by General Manager	1%
Do not know	7%.

The breakdown of responses by cooperative is enlightening. Every respondent but one in the service area of Negros Oriental I identified the cooperative as jointly owned by its consumer-members. The response in Cagayan I indicated recognition of consumer ownership by 96%. Davao Norte and Bataan showed close to two-thirds of interviewed consumers identifying ownership in the hands of the consumer-members. Quezon I had 15% replying "do not know". Less than half of respondents in Iloilo I and Lanao Norte recognized their joint consumer ownership. In the latter province, 55% thought the electric system was owned by NEA or the Government. In Iloilo I, 18% believed the board of directors was the owner.

TABLE D-9. MEMBER RECOGNITION OF COOPERATIVE OWNERSHIP  
(By Percent of Sample Responding)

<u>Cooperative</u>	<u>No. in Sample</u>	<u>Owned by Government</u>	<u>Owned by NEA</u>	<u>Owned by Cooperative's Board of Directors</u>	<u>Owned by Cooperative's General Manager</u>	<u>Owned Jointly by Consumer-Members</u>
Bataan	45	2	31	2	0	64
Cagayan I	45	0	2	0	2	96
Davao Norte	45	20	4	0	2	67
Iloilo I	45	4	7	18	2	47
Lanao Norte	44	25	30	0	0	45
Negros Oriental I	45	2	0	0	0	98
Quezon I	45	0	20	7	0	58

## 12. IMPACT PERCEPTIONS OF ELECTRIC SERVICE

### a. Safety and Security and Electric Lights.

To evaluate the impact of the electrification program, the survey questionnaire went beyond considerations of objective measurement such as how much energy was used and how it was used. It was also deemed necessary to ascertain the subjective perceptions of respondents to the electric service provided them -- what people think about it and how they feel about its value. Two questions sought opinions about the importance of electric lighting for personal safety and security. The first asked about indoor house lighting. The second asked about outdoor/public lighting.

Question 66 asked: "How important is inside house lighting to your personal safety and security: essential? important, but not necessary? or not necessary?" There were 406 responses to the question. All but two of those who did not respond lived in unserved remote barangays and had no experience with electric lighting.

Overall, 90% said household lighting was essential or necessary for personal safety and security. Only one respondent said it was not important. He lived in a "heavy" material house along the main feeder line in Iloilo Province. Responses were almost identical for households in the poblacion and along the main feeder, with slightly less positive response made by households located in remote electrified barangays.

Responses were almost identical also from all three grades of houses surveyed, with "important, but not necessary" responses reported by less than 10% of those in any grade. It is interesting to note that households reporting the highest monthly usage of electricity yielded the strongest perception of house lighting as being essential and necessary for safety and security. Comparing the seven cooperative service areas, Cagayan I had the highest percentage of respondents perceiving house lighting to be essential or necessary (100%), while Iloilo I had the lowest level of such perception (71%).

Perhaps the former response may be somewhat related to the more recent introduction of electrification in the areas surveyed and therefore a higher appreciation of the added security provided by electric lighting.

Question 67 asked: "How important is outdoor/public electric lighting to your family's safety and security: essential? necessary? important, but not necessary? or not necessary?" There were 394 responses to the question, fewer than for Question 66. Again, some residents in unelectrified remote barangays did not answer this question, presumably due to lack of experience with electric lighting. As in the previous question, there was a high response (88%) that outdoor/public lighting was either essential or necessary. Less than 4% said it was not necessary, and more than half of these were in unserved barangays.

Households in the poblaciones responded 93% in judging that outdoor/public lighting was essential or necessary for the family's safety and security. Those along main feeder or in remote electrified barangays registered 90%.

Respondents in "heavy" and "mixed" material houses gave 92% support for this view, while those in "light" material houses registered 87%. Ninety-two percent of those in "heavy" material houses in unserved remote barangays also answered "essential" or "necessary". Again, those respondents consuming the highest amounts

TABLE D-10. HOUSEHOLD PERCEPTION OF SECURITY FROM INDOOR LIGHTING  
 (By Percent of Sample Responding)

<u>category</u>	<u>Nc. in Sample</u>	<u>Not Necessary</u>	<u>Important</u>	<u>Necessary</u>	<u>Essential</u>
Bataan	60	0	1	12	87
Cagayan I	60	0	0	15	85
Davao Norte	56	0	20	39	41
Iloilo I	59	2	27	49	22
Lanao Norte	53	0	13	17	70
Negros Oriental I	60	0	3	30	67
Quezon I	58	0	7	43	50

TABLE D-11. HOUSEHOLD PERCEPTION OF SECURITY FROM OUTDOOR/PUBLIC LIGHTING  
(Percent of Sample Responding)

<u>Category</u>	<u>No. in Sample</u>	<u>Not Necessary</u>	<u>Important</u>	<u>Necessary</u>	<u>Essential</u>
Entire Sample	394	4	8	31	57
Cooperative					
Bataan	59	0	2	27	71
Cagayan I	60	0	2	20	78
Davao Norte	56	4	14	55	27
Iloilo I	51	18	12	39	31
Lanao Norte	52	6	15	15	64
Negros Oriental I	60	2	0	22	77
Quezon I	56	0	14	43	43.

of electricity were the ones who most strongly believed outdoor/public lighting essential or necessary for safety and security.

Regional differences were marked, with Cagayan I showing 100% and Bataan 98%, and Iloilo I low at 71%. Whether this says something about the effectiveness of security measures in the different areas, or whether it reflects the extent and quality of street lighting provided cannot be determined in the present study.

b. Family and Community Well-being.

A more general finding of impact perception among household respondents comes from Questions 94 and 95. Question 94 asked: "How has the availability of NEA cooperative electric service affected the economic and social well-being of your family? Would you say it has: a negative effect? no effect? a slight positive effect? a great positive effect?"

Of the total 308 households with electric service which responded to the question, 58% said electric service had a great positive effect on the family's economic and social well-being. Another 35% said it had a slight positive effect.

It was in the poblacion that the highest perception percentage of great positive effect was registered -- 65%; with remote barangay and main feeder residents each at 55%.

By type of housing, 63% of those in "heavy" material houses replied "great positive effect", compared with 60% in "light" material houses and 51% in "mixed" material houses. Considering perceptions by how much electricity households used, it was interesting to note that more minimum bill consumers than high users considered electricity to have great positive effect on the family's economic and social well-being. Of those using not more than 10 kWh of energy per month, 64% replied "great positive effect", while 53% of those using more than 100 kWh reported "great positive effect".

There was a sizable spread among the cooperative service areas in the percentage of respondents who thought their families received great positive effect -- 80% in Cagayan I and only 40% in Quezon I.

A related question in the survey asked: "How necessary would you say the availability of electric service is to the economic and social well-being of your community? Would you say it is: essential? necessary? important? or not necessary?" This was answered by all but five of the residential consumers in the survey, and by 44 residents in barangays not yet electrified. Of the whole sample, 57% answered "essential", 19% "necessary", and 23% "important". Only three of the persons interviewed thought electric service was not necessary.

Sixty-one percent of respondents in the poblaciones and in the unserved remote barangays of the sampled cooperatives said "essential". In the electrified remote barangays the finding was 57% and along the main feeder lines it was 51%.

Comparing the responses by persons in the three types of houses surveyed, there was no significant difference. However, looking at the responses from the various cooperative service areas, there was again large variance. Eighty-nine percent of the respondents in Cagayan I said availability of electric service was essential to the community. Bataan came up with 86%. At the other end of the scale, Iloilo I

showed only 36% for "essential", and Quezon I registered 25%. Such large variation concerning impact perceptions among the various cooperative areas is quite striking and should be of concern for future study investigation.

TABLE D-12. HOUSEHOLD PERCEPTION OF ELECTRICITY IMPACT  
ON FAMILY ECONOMIC AND SOCIAL WELL-BEING  
(By Percent of Sample Responding)

Category	No. in Sample	Negative Effect	No Effect	Slight Positive Effect	Great Positive Effect
Entire sample	324	3	4	35	58
Location (308)*					
Poblacion	103	2	1	32	65
Feeder	101	2	1	43	54
Remote	104	2	10	34	55
House Class (324)**					
Heavy	110	2	1	34	64
Mixed	108	1	9	41	49
Light	106	6	2	32	60
Cooperative (324)**					
Bataan	50	0	8	42	50
Cagayan I	45	0	0	20	80
Davao Norte	46	6	9	26	59
Iloilo I	44	0	0	43	57
Lanao Norte	43	5	0	35	60
Negros Oriental I	54	4	0	39	57
Quezon I	42	5	12	43	40

\* Excludes 16 unserved.

\*\* Includes 16 unserved responses.

TABLE D-13. HOUSEHOLD PERCEPTION OF ELECTRICITY IMPACT  
ON COMMUNITY ECONOMIC AND SOCIAL WELL-BEING  
(By Percent of Sample Responding)

<u>Category</u>	<u>No. in Sample</u>	<u>Not Necessary</u>	<u>Important</u>	<u>Necessary</u>	<u>Essential</u>
Entire sample	355	1	23	19	57
Location (355)					
Poblacion	103	1	21	17	61
Feeder	104	1	26	22	51
Remote	104	0	21	22	57
Unserved	44	2	27	9	61
House Class (355)*					
Heavy	114	1	18	18	62
Mixed	124	1	24	19	56
Light	117	1	27	19	53
Cooperative (355)*					
Bataan	57	2	2	10	86
Cagayan I	45	0	2	9	89
Davao Norte	55	2	44	15	40
Iloilo I	44	0	30	34	36
Lanao Norte	48	0	29	17	54
Negros Oriental I	58	0	14	22	64
Quezon I	48	2	46	27	25

\* Served and unserved combined.

ENTERPRISE SURVEY DATA AND INTERPRETATIONIntroduction

In 1980 there were 10,903 commercial, industrial, public facilities, and irrigation consumers in the service areas of the seven electric cooperatives where the Impact Survey was made. During 1980 these enterprise consumers accounted for only 11% of all consumers served by the seven cooperatives. However, the enterprises used 60% of the power sold by the cooperatives. As a comparison, in 1980 residential consumers averaged approximately 34 kWh per month while these enterprise consumers used approximately 553 kWh per month. So, while households make up the great preponderance of the cooperative's consumers, the great majority of energy sales goes to agriculture, private small business, and public and community services.

For the study, 350 questionnaires were targeted for enterprise interviews (50 interviews per cooperative area). This sampling accounts for approximately 3% of all enterprises receiving electric service from the seven cooperatives. Two-thirds of the enterprises interviewed were located in rural portions of the service areas; one-third were located in the poblacion (town center). Thirty percent of the enterprises interviewed were agricultural in nature. Another 30% were small private commercial or industrial businesses. The remaining 40% of the interviews came from the public or community service consumers. A listing of the specific type of enterprises interviewed is found in the "Introduction" section of this report.

Viability of the cooperative and economic growth of these enterprises and resulting benefits to the community depend very substantially on how much electricity these enterprises use and how they use it. An important objective of the Impact Survey was, therefore, to ascertain:

- (1) The amount of power consumed by various kinds of enterprise;
- (2) What they do with the power;
- (3) How important they think electric service is in their operations; and
- (4) What the future holds for establishment of new enterprises, their viability and growth potential, and service area employment gains that can be expected in the consumer enterprise sector.

TABLE E-1. ELECTRIC ENERGY USE AND APPLICATIONS IN SELECTED ENTERPRISES SURVEYED  
(Percent of Respondents in Survey Reporting)

Enterprise Class	Median Monthly kWh Use 1980	Increase kWh Use 1978/80	Lighting (Increase Generation) Use	Security Lighting Availability	Indoor fixtures (10 or more)	Cooling Appliance (3 fans + AC) Use	Electric Cooking Appliance Use	Electric Water Pump	Electric Refrigerator Use	Electric Equipment Use	Electric Repair Tool Use	Electric Drying Machine Use	Electric Fabrication Machine Use	Electric Office Machine Use
Agriculture														
Food or grain processing	527	52	41	81	7	10	3	21						
Meat or fish production	200	71	76	65	19	0	7	57	21	24	24	4	41	23
Grain or food production	158	50	28	38	4	4	8	39	32	37	3	3	0	0
Private Small Enterprises														
Manufacturing	120	72	10	42	7	1	12							
Retail (sari-sari)	99	73	43	35	9	22	14	14	22	18	02			
Personal services	154	63	10	67	13	31	20	30	65	27	13		63	37
Restaurants/lodging	654	89	23	75	38	50	13	14	21	47	17		17	9
Public or Community Services														
Government buildings and offices	201	69	26	73	50	55	20	56	21	91	13		4	6
Schools/colleges	79	69	30	62	56	41	26	46	39	63	31		8	13
Clinics/hospitals	181	74	29	79	57	54	57	56	41	36	26		0	24
Churches/mosques	150	74	9	43	35	40	25	38	64	46	06		8	39
Other	269	70	38	77	46	46	0	21	35	37	5		0	24
All Enterprises	154	66	39	63	33	30	19	42	38	42	13		8	21

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## Energy Use

As regards energy use and applications, the following points were ascertained from the information gathered in the survey questionnaires:

- Enterprise usage of electricity on the whole increased during 1978 to 1979 and again from 1979 to 1980.
- During the period 1978 to 1980 approximately two-thirds of the enterprises interviewed reported absolute increases in kWh purchases, while one-third indicated decreases in their energy purchases from the cooperatives.
- Median electric consumption per month in 1980 for the enterprises surveyed was 164 kWh. Average electric consumption per month was 307 kWh.
- Schools (79 kWh), retail shops (99 kWh), and small manufacturing enterprises (120 kWh) recorded the lowest median monthly usage levels in 1980 of the 12 enterprise classes surveyed. Restaurants/lodging establishments (654 kWh), food or grain processing establishments (527 kWh), and other service establishments (369 kWh) recorded the highest median monthly level of electric consumption during 1980.
- Relatively speaking, grain or food production enterprise and schools/colleges had more kWh usage reductions during the period 1979 to 1980 than the other 10 enterprise classes surveyed. Clinics/hospitals and churches/mosques had the greatest proportion of kWh use increases during the period 1979 to 1980.
- In respect to use of electric lighting for income generation, the provision of such lighting seems most important to meat or fish production enterprises and to restaurants/lodging establishments. The provision of such lighting is least important to clinics/hospitals, to churches/mosques, and rural retail shops.
- The provision of electric lighting for security appears extremely important to all enterprises interviewed, except perhaps for grain or food production enterprises, rural retail establishments, and churches/mosques.
- Higher levels of indoor lighting were used by clinics/hospitals, schools/colleges, and government buildings and offices. Lower levels of indoor lighting were experienced at grain or food production enterprises and retail shops.
- Higher levels in use of electric cooling appliances or equipment (electric fans or air conditioners) were experienced at government buildings and offices, clinics/hospitals, and restaurants/lodging establishments. Extremely low electric usage levels of such electric cooling equipment were experienced at the small-scale meat or fish production establishments and grain or food production establishments surveyed.
- Only clinics/hospitals indicated high usage level of electric cooking equipment and appliances. Nearly 60% of all clinics/hospitals surveyed reported use of some type of electric cooking equipment. On the other hand approximately only 15% of the agriculture related establishments interviewed reported use of electric cooking equipment.

- About 40% of all enterprises interviewed reported use of electric water pumps. Over 50% of meat or fish production enterprises, restaurants/lodging establishments, and schools/colleges had their own electric water pumps at the establishments. Only 15% of personal service shops reported ownership of electric water pumps.
- Approximately 40% of the enterprises surveyed reported ownership of electric refrigeration equipment. About 65% of all retail shops and clinics/hospitals reported ownership of electric refrigeration equipment. Only 11% of the grain and food production enterprises interviewed reported use of electric refrigeration equipment, and only 17% of the other service enterprises interviewed reported the use of such equipment.
- About 40% of all enterprises interviewed reported use of some type of electronic equipment (radio, TV, public address system, etc.). Usage of such equipment was most notable at restaurants/lodging establishments and government buildings and offices. Very low levels of electronic equipment usage were found at grain or food production establishments and manufacturing establishments.
- Exactly 20% of the establishments interviewed reported use of electric repair tools or equipment. Over 30% of clinics/hospitals, manufacturing establishments, "other" public services, and government buildings and offices reported ownership of electric repair tools and equipment. Less than 5% of the establishments at meat or fish production establishments, grain or food production establishments, and churches/mosques reported ownership of electric repair tools and equipment.
- About 10% of the establishments interviewed reported ownership and use of electric drying machines or equipment. Over 30% of personal service shops and manufacturing establishments interviewed reported ownership and use of such equipment. No such equipment was found at government buildings and offices, schools/colleges, and churches/mosques surveyed.
- About 20% of establishments surveyed reported use of electric fabrication machines and equipment. The highest use factor was found at manufacturing units (over 60%) and at food and grain processing enterprises (over 40%). Less than 10% of the schools/colleges, grain or food production establishments, and restaurants/lodging establishments reported use of electric fabrication machines or equipment.
- Approximately 20% of the enterprises interviewed reported use of electric office machines or equipment. Approximately 50% of personal service shops use such equipment, and about 40% of manufacturing, other service establishments, and clinics/hospitals used such equipment. No use of such equipment was found at meat or fish production establishments, or at grain or food production establishments.

In summary, electricity applications differ significantly among the enterprise classes surveyed. Excluding electric lighting application (indoor, security, and income generation) purposes, the following major electric applications typify the enterprises surveyed:

Electric water pump application is the predominant application of electricity for the agricultural enterprises interviewed.

For the manufacturing enterprises interviewed, the use of electricity to run fabrication machines seems most important.

For the retail shops interviewed the use of electricity to run refrigeration equipment is very important.

For the personal service shops surveyed, the use of electricity to run electronic equipment appears quite important.

For restaurants/lodging establishments the use of electricity to run refrigeration is very important.

For government buildings and offices the auxiliary use of electricity to run electronic equipment appears important.

For schools/colleges the use of electricity to run refrigeration seems useful. For clinics/hospitals the use of electricity to run refrigeration equipment appears extremely important.

For churches/mosques the use of electricity for fans or air-conditioning and electronic equipment appears useful as it does for the other service enterprise (class) surveyed.

The data suggests also that:

- Multiple application of electric energy is most common for restaurants/lodging establishments, clinics/hospitals, and government buildings and offices.
- Higher electric energy consumption needs are derived from restaurants/lodging establishments, food or grain processing establishments, and the other service enterprise class surveyed.
- The preponderance of kilowatt-hours used by the enterprises surveyed are applied for work, or productive end use, particularly for pumping water, refrigerating foodstuffs, fabricating products, and for lighting used for and associated with enterprise business activity.

TABLE E-2. ENTERPRISE FORMATION AND YEAR OF ELECTRIC SERVICE

ENTERPRISE CLASS	% Established After 1973	Year Lag (median) in Electrifying Establishment	Year Lag (average) in Electrifying Establishment
<b>Agriculture</b>			
Food or grain processing	63	1	3.4
Meat or fish production	71	0	1.8
Grain or food production	63	1	9.2
<b>Private Small Enterprises</b>			
Manufacturing	65	0	1.6
Retail (sari-sari)	64	0	2.3
Personal services	60	0	1.1
Restaurant/lodging	79	0	0.8
<b>Public or Community Services</b>			
Government buildings & offices	41	0	0.9
Schools/colleges	10	5	10.8
Clinics/hospitals	35	0	4.3
Church/mosques	28	6	19.8
Other	60	0	0.9

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## Enterprise Establishment and Electricity

Nearly one-half of the establishments surveyed started operations prior to 1973, when the first cooperative in the survey (Bataan) was energized. During 1973, 43% of these establishments had some type of electric service prior. Therefore, it appears that 40% of enterprises presently served by the cooperatives either had their own electric generators or were served by privately owned or municipal electric suppliers prior to the energization of the cooperatives; and, it appears the remaining 60% or so can be classified as enterprises either formed after 1973 or enterprises not located in proximity of electric distribution lines during the period of initial cooperative energization.

Nearly three-quarters of the meat or fish production enterprises and restaurants/lodging establishments served by the cooperatives were established after 1973. In view of pre-1973 electric service accessibility and costs (high) in the cooperative service areas, it may be hypothesized that these specific types of enterprises are sensitive to the provision of low-cost reliable electric service as a factor of enterprise formation. Moreover, from the data, a strong relationship also exists between the date of enterprise establishment and the initial date of electric power availability (cooperative or otherwise) in the cases of government buildings and offices, personal service shops, other service establishment and manufacturing shops as well as meat or fish production enterprises and restaurant/lodging establishments. In all cases, the average time lag from date of establishment to the initial date of receiving electric power for these types of enterprises was less than two years. On the other hand, the data indicate very little sensitivity between the availability of electricity and enterprise formation for churches/mosques, schools, and grain or food production establishments. For example, the average time lag between enterprise formation and the initial date of provision of electric service approximates 15 years for these enterprise types.

As regards electricity and how enterprise activity depends on it, over 40% of the establishments surveyed indicated that they would be forced to curtail enterprise operations by at least one-half in the advent that electric service was terminated. Manufacturing, personal services, and food and grain processing activity were most sensitive to the continued availability of electric service. Churches/mosques, schools, and government buildings and office activity were least sensitive to the continued availability of a reliable source of electricity.

In expanding enterprise operations, the availability of reliable electricity appears as an important determinant in the case of meat or fish production enterprises, schools, and the "other" public services. The availability of electricity apparently is not such a determinant in the case of expanding the operations of churches/mosques.

TABLE E-3. ENTERPRISE FORMATION FACTORS  
Selected Factors Determining Enterprise Location  
 (% reporting factor essential)

ENTERPRISE CLASS	Roads	Labor	Raw Material	Private Capital	Public Capital	Electricity
<b>Agriculture</b>						
Food or grain processing	55	26	43	3	11	43
Meat or fish production	42	33	35	21	15	59
Grain or food production	45	38	24	22	25	31
<b>Private Small Enterprises</b>						
Manufacturing	52	48	40	32	16	48
Retail (sari-sari)	22	11	20	6	19	32
Personal Services	43	27	29	10	14	59
Restaurants/lodgings	43	42	38	13	17	81
<b>Public or Community Services</b>						
Government buildings & offices	59	38	28	18	53	50
School/colleges	48	29	31	7	41	47
Clinic/hospitals	54	20	10	18	46	58
Churches/mosques	37	20	18	45	25	53
Other	46	50	67	18	46	54

As regards the underlying factors of enterprise location, transportation availability appears to be most important for food or grain processing, grain or food production, manufacturing shops, government buildings and offices, and schools. The availability of electricity appears to be a leading underlying factor of enterprise location for meat or fish production, retail shops, personal service establishments, restaurants/lodging establishments, and clinics/hospitals. The availability of private capital appears to be the leading underlying factor of location for churches/mosques. The availability of raw materials appears to be the leading underlying factor for the other service enterprises surveyed, particularly for market establishments.

TABLE E-4. ENTERPRISE PRODUCTION LEVEL CHANGES

	<u>No in</u> <u>Sample</u>	<u>Increase</u>	<u>Decrease</u>	<u>No</u> <u>Change</u>
	<u>(Percent reporting changes from 1978-1980)</u>			
Animal production	20	75	10	15
Hectares cultivated	26	15	4	81
Grain production	22	68	27	5
Manufactured units	13	46	39	15
Retail sales	14	93	0	7
Clients served	150	56	21	23

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TABLE E-5. ENTERPRISE HOURS OF OPERATIONS  
 (Percent Reporting Change in Number of Hours of Operation, 1981-78)

<u>Enterprise Class</u>	<u>Increase</u>	<u>Decrease</u>
Agriculture		
Food or grain processing	19	19
Meat or fish production	28	0
Grain or food production	12	4
Private Small Enterprises		
Manufacturing	16	11
Retail + (sari-sari)	24	0
Personal services	17	10
Restaurants/lodging	27	7
Public Community Services		
Government buildings and offices	11	3
Schools/colleges	13	9
Clinics/hospitals	8	0
Churches/mosques	17	6
Other	18	9

### Employment Productivity and Gains

Net business gains were experienced by each enterprise class surveyed. During 1978 to 1980, a net number of enterprises surveyed (35%) experienced an increase in clients served, retail sales increased at 93% (net), manufacturing production increased at 9% (net), and the number of animals and fish units produced and sold increased at 65% (net) of enterprises surveyed. During the same period, on net, the enterprises surveyed (10%) reported increased hours of operations. Hours of operations were expanded most notably for meat or fish production enterprises, retail shops, and restaurants/lodging establishments.

Although 35% (net) of the enterprises surveyed indicated increases in clients served during 1978 to 1980, it should be noted that most of these client gains were reported at schools/colleges, clinics/hospitals, and government buildings/offices. Some net establishment gains in client growth were experienced for personal service shops, and other served establishments. No net establishment gains, however, were experienced in client growth at restaurants/lodging establishments during 1979 to 1980.

TABLE E-6. ENTERPRISE EMPLOYMENT DATA

Enterprise	1980 Full-time Employees					Percent Reporting Changes (1978-80)				
	Total	Male		Female		Male		Female		
	Median	Med.	Avg.	Med.	Avg.	Increase	Decrease	Increase	Decrease	
<b>Agriculture</b>										
Food or grain processing	2	2	4.5	0	1.6	30	7	12	8	
Meat or fish production	1	1	2.2	0	0.4	30	7	4	11	
Grain or food production	1	1	6.1	0	3.1	31	14	11	0	
<b>Private Small Enterprises</b>										
Manufacturing	2	2	9.4	0	4.0	33	11	18	6	
Retail + (sari-sari)	1	0	1.4	1	1.2	25	6	38	13	
Personal services	3	1	1.9	2	2.5	21	21	31	4	
Restaurants/lodgings	6	2	3.0	4	4.9	8	8	17	50	
<b>Public or Community Services</b>										
Govt. buildings and Offices	22	15	28.8	7	11.5	35	18	47	14	
Schools/colleges	20	4	9.9	16	20.3	34	22	44	16	
Clinics/hospitals	14	4	8.7	10	18.1	41	8	39	0	
Churches/mosques	1	1	2.3	0	2.9	0	5	19	0	
Other	11	9	13.7	2	3.9	10	10	9	0	
All enterprises	-	-	-	-	-	28	13	26	9	

As regards full-time employment levels of the establishments surveyed, these following points of interpretation are made:

- Median number of full-time employees surveyed at the following establishments was under three per establishment: all agricultural enterprises, manufacturing shops, retail shops, and churches/mosques. The highest median number of full-time employees was found at government buildings and offices (22), schools/colleges (20), and clinics/hospitals (14). Therefore, most of the enterprises interviewed can be considered small-scale in nature. However, it should be noted that a number of larger enterprises in each enterprise classification were surveyed. This is indicated by noting the average number of full-time employees reported for the enterprises surveyed. For example, the number of average full-time employees at manufacturing shops and other service enterprises exceeded 10 employees per establishment.
- Full-time female employees outnumbered full-time male employees at the following kinds of enterprises: personal services, schools/colleges, and clinics/hospitals. The average number of full-time employees ranged from 2.6 for retail shops to 40.3 for government buildings and offices.
- During the period of 1978 to 1980, a net number of enterprises interviewed (15%) indicated an increase in full-time male employees. All enterprise classes surveyed, except churches/mosques, indicated zero or net gains in full-time male employment. Personal service shops, restaurants/lodging establishments, and other public services indicated zero net gains in full-time male employment. The greatest net number of enterprises recording employment gain in full-time male employment for the period 1978 to 1980 was for clinics/hospitals.

The following interpretations may be made concerning full-time female employment at the enterprises surveyed:

- More enterprises (net 17%) indicated increases in full-time female employment over decreases during the period 1978 to 1980. Full-time female employment gains were made at the following enterprise classes: government buildings/offices, schools/colleges, clinics/hospitals, churches/mosques, retail shops, personal service shops, manufacturing shops, retail shops, food and grain processing, grain or food production and other public services.
- Decreases in full-time female employment occurred at meat or fish production enterprises and restaurants/lodging establishments. It should be noted that these latter two enterprise classes indicated high levels of electric energy application compared with the other enterprise classes interviewed.
- Full-time employment gains for females was focused most notably in public or community services such as government buildings and offices, schools/colleges, and clinics/hospitals. Relatively speaking, full-time male employment gains increased faster in the agriculture and business enterprise classes.

As regards part-time enterprise employees, these points can be made from the data gathered:

Approximately 45% and 30% of the enterprises surveyed indicated the utilization of male and female part-time employees respectively during the current year of the survey.

During 1978 to 1980 there appears to be net employment gains for part-time male employees and a net loss in part-time female employees for the enterprises surveyed. It appears that unskilled, part-time, female employment is being discarded as the enterprises become more sophisticated in their operations and utilize labor saving methods and equipment.

TABLE E-7. ENTERPRISE ELECTRICAL EQUIPMENT LABOR SAVINGS

	<u>Percent Reporting Very High Levels of Savings Derived from Use of Electric Equipment for:</u>	
	<u>Management Use</u>	<u>Employees Use</u>
Agriculture		
Food or grain processing	23	3
Meat or fish production	21	9
Grain or food production	14	0
Private Small Enterprise		
Manufacturing	37	30
Retail + (sari-sari)	22	4
Personal services	31	28
Restaurants/lodging	38	19
Public or Community Services		
Government buildings and offices	17	17
Schools/colleges	18	16
Clinics/hospitals	37	19
Churches/mosques	20	5
Other	17	9

As regards labor savings derived from electric equipment purchased by establishments since 1978 these points may be made:

- Only slightly more than 20% of the establishments which had purchased electric equipment for management use responded that they had achieved significant positive labor saving from such equipment purchased. Greater labor savings from such equipment were derived by manufacturing shops, personal service shops, restaurants/lodging establishments, and clinics/hospitals.
- As regards electric equipment purchased by the enterprises for use by employees, less than 15% of those enterprises purchasing such equipment since 1978 indicated that the use of such equipment provided significant positive labor savings to their operations. Manufacturing shops and personal service shops again, however, reported much higher levels of positive labor savings gains made by the purchases of such electric equipment.
- For those enterprises that had purchased electric equipment for either management or employees' use since 1978, about 80% reported that they had received some level of money savings from the utilization of these electric equipment and appliance purchases. Money savings from the electric equipment was across the board except for electric equipment purchased for employees in the agricultural enterprises. Here, nearly 50% of the respondents indicated that no money savings were derived from the purchases of such equipment. These facts were quite surprising and have great significance when designing future electrification productive use programs for enterprises in development in the Philippines.

As regards enterprise employee training, these points are made:

- About 40% of employees at the enterprises surveyed participated in some type of job-related training program during the year 1981. During 1978 about 35% of all employees participated in such training programs during the year. No significant difference was noted in the proportion of male or female participating in these training programs.
- More male and female employees participated in job-related training programs during 1981 than 1978 for all private enterprises and public facility enterprises surveyed. However, it should be noted that for both male and female employees at agricultural enterprises fewer employees received training during 1981 than 1978.

#### Cooperative Electric Service

About 18% of the enterprises interviewed reported that presently they used a supplemental source of electricity to augment service from the electric cooperative. Much of this may be small generators purchased and used before electric service from the cooperatives was made available. About 12% of the enterprises interviewed showed some dissatisfaction with power reliability service from the cooperatives. Nearly 75% of the enterprises interviewed indicated that electric lighting provided them great security from theft and other crimes.

FIELD COMMENTS ABOUT THE RURAL ELECTRIFICATION PROGRAM

Survey coordinator in Davao Norte:

"I was impressed while working in the province with cooperative employees that the rural electric cooperative is well developed and quite strong. Even though there is a certain amount of disruptive activities in the province, the cooperative seems to be functioning smoothly."

Same survey coordinator:

"It's unfortunate that more time could not have been spent in interviewing more industries. It was obvious to me that the impact of rural electrification was considerable because of the many industries that had sprung up in the province. The affects of rural electrification on the overall economy of the province has been very very substantial."

Mining engineer from Mindoro Oriental with no association with NEA or co-ops:

"People already had electricity. The government gives favors to the co-ops. They took over from the existing systems, but the service is still poor with brownouts. And now the cost (rates) for electricity is much higher. (He was comparing with 1973 rates he remembered.) Local politicians run the co-ops -- the people have nothing to say."

Section head at NEA:

"NEA tried to have real cooperatives and when Mr. Wenner and you were here it worked well, but now the politicians have taken over in many places. The governor or mayor or other official with power uses the co-op. Members still vote, but they know who they are supposed to vote for. An election guide for the co-ops was prepared at NEA, but it was never approved and sent to the co-ops."

American consultant, returning from Zamboanga:

"Diesel plant engineers are being recruited through NEA for work in Saudi Arabia, so there is a continuing need for training new employees. It looks like the co-ops are being used as a training ground for sending people overseas to send money back. At Zamboanga there are frequent brownouts and the rates are high. It should be better when NPC ties Zamboanga to the Mindanao grid."

NEA Official:

"We have high turnover at NEA (quoted at about 10% annually) and in the co-ops. Best employees go to Saudi Arabia for the high wages and bring back enough after 2 years to build a house. We replace them through our training program. Quality and educational level of NEA employees is constantly rising. NEA now has a manual of personnel policies and procedures, and an Employees Handbook is given out at time of orientation."

General Manager of an electric cooperative not surveyed:

"Your survey figures on attendance at annual meetings may be misleading. Many co-ops now number 20 or 30 thousand members. It is very difficult to accommodate all the members who would attend. The co-op cannot afford to feed even a snack to so many. They come great distances for the all-day meeting. There is not enough transportation. Many walk several kilometers. Anyway, the NEA has changed its rules on the quorum, and it is now 5% instead of 15%. Some GMs have had to limit the number who may attend, but this has become involved in local politics."

(Question: What about holding district meetings then, in place of one big meeting?)

"Well, we are doing that in our co-op, and that is also being done in Negros and some other places. But then it is easier for the mayor or other local politicians to control a local meeting, where he is well known. This is especially true since martial law was lifted."

Leading citizen, wealthy and respected, former board member and officer of an electric cooperative in the Visayas:

"Electricity has been a great advantage here. It is better service and cheaper than we had from the municipal plant. We depend on it in our hospital and I want to show you the new lighting we have in our church. We were able to expand and improve our beach resort after the co-op came."

"I left the co-op board because of the local politics. There were three board members who were criticizing the GM. Each wanted the position for himself. But when NEA removed the GM, they sent a new one from NEA, so the board members are now finding fault with the new one. Some people asked me to stay on the board, but I don't like all the struggling for control. The three who want to be the GM have no regard for the members' rights in the co-op -- they just want it for the benefits they can get: jobs for their relatives and the purchasing contracts."

Former maid, working in Manila but with family in Cagayan Valley:

"No, we don't have electricity yet, but we are looking forward to it. I hope we have it by the time I move back up there with my babies."

General Manager of an electric cooperative in Mindanao:

"I don't think you ought to make the trip. I think you would be safe, but there is still a lot of guerrilla activity. They never bother the co-op. I guess they know it would turn the people against them. I think you ought to use local people for the survey. If they are from the co-op, no one will bother them."

College president in Visayas:

"We would like to have a copy of your report. Members of our staff and some of the graduate students will be making studies of how the electric co-ops are helping develop the rural barangays. We are participating in a comprehensive program of rural development, and the electricity is an important part. I have talked with the managers of two co-ops, and many of our students come from rural towns which now have electricity."

Long-time employee of an electric cooperative in the Visayas:

"My family lived here as long as I can remember. Now we have electricity. I like my job with the co-op. The reason there are no irrigation pumps now is because they did not pay their bills. They were supposed to pay at the end of the season, but did not put aside any money. I guess they thought it was just free from the government (the electricity). Yes, the pumps and the electric lines are still there, but (the irrigation associations) don't have the money. Maybe since the rates were reduced this fall... I don't know."

(Question: Were oversized pumps the problem?)

"... not many hectares in the one I know. They complained it (pumping) was too expensive."

Jeepney driver:

"We did not have electricity in our barangay before. In our house we pay only 8 pesos (a month). It cost us more for kerosene. And we have a light on the road in front of the house."

Manager of an electric cooperative (explaining the difficulty in finding unserved barrios for the survey:

"You will have to walk in -- maybe 2 or 3 kilometers. There are no roads there yet. That's why they are still unserved. We are working with the governor's office now to get some sort of road built. Then we can get in there with the truck and materials. They have asked for electricity and we have promised to get in there."

Parish priest in Visayas:

"Oh, yes, we have had better church attendance since the co-op brought electricity. We have lights to use the church in the evening. And electric fans. I think fewer robberies now that there are lights."

Director of an electric cooperative in the Visayas:

"The mayor is trying to run the co-op. When NEA told him he could not be on the board because he is already an elected public official, he tried to run his wife. He is not really concerned about member service and member ownership. Now that martial law has been lifted they (the mayors) think they can run things like they used to."

Owner of a feed mill (asked why he had electric lights but still used gasoline engine):

"It still runs. Yes, I know an electric motor would be cheaper but I can't afford to buy new equipment as long as this still runs."

Owner of a grain mill on lines of same cooperative:

"Electric power was so much cheaper that I simply scrapped the diesel engine I had and started over. Within a year I found my costs were so much lower that I lowered the price I charged for grinding corn by 10 centavos per cavan. Now I have all the business I can handle."

Auto repairman in remote barrio 22 kilometers from main feeder on high mountain plateau (when asked about a man filling 8 cans of water from a flowing pipe and loading them onto a wooden sled pulled by a carabao):

"We used to have to walk to the spring (artesian well in limestone formation). When the co-op built the electric lines, an electric pump was installed and pipes laid to places around the town. Then the municipalidad made a park around the spring, and we have the water right at our door. It's free."

NEA section head:

The co-ops are supposed to send in their annual reports, but very few of them do. Yes, they submit their financial reports but they just don't bother with their newsletters or anything else. Yes, I know they used to when you were here, but they don't think they have to do it now."

Mayor of town in Visayas (asked if necessary to get permit from district military commander):

"No, that's not necessary. I'll notify the barangay captains, though, so you can be sure of cooperation in anything you need. We want to do anything we can that will help the cooperative."

Constabulary officer at Cebu airport who is knowledgeable about electric cooperative in his area:

"People are complaining about rates. The rates are cheaper at the (nei, neighboring) co-op. And brownouts should be announced on the radio."

Parish priest in Visayas:

"Electricity is one of God's great gifts. It is especially helpful for poor people in the rural barangays away from the main roads, so they no longer feel isolated. People used to go to bed when the sun went down. Now they watch TV or study or earn extra money. We can tell the difference in the church. There is better family life. Children watch "Sesame Street" on TV -- it is educational."

Municipal official:

"Some electricity was here for many years -- just 3 hours in the evening. Since the NEA and the co-op came, we have lights in the plaza and people use it at night."

Moslem professional man from Mindanao (in Manila):

"If you understood our politics and our patronage system you would understand why cooperatives will not work in this country. Your kind of democracy works fine in the U.S., but our cultural background teaches us that only a strong man can govern. All this voting! The people will vote the way the sugar plantation owner or the mayor tells them to vote."

General Manager of a cooperative not included in survey:

"Directors now want to be paid a salary for board service (in addition to their fee for attending each meeting.)"

Bakery owner in Visayas:

"The nutribun is one of the best things we have for our children. We are grateful to the Americans for sending us the special flour, and we are careful to see it is not misused. The electric co-op put electricity in the schools, so now there is a feeding program. The children raise vegetables in gardens at school, and they have malungay soup at noon with the nutribuns. You can see from the records how they put on weight during the school semesters. And it costs very little."

Office manager, electric cooperative in Visayas:

"We make sure electric service reaches the poor families in the remote barangays. The minimum rate is just 8 pesos for 12 kWh -- and 60% of our members are minimum bill users. The town just connected had a small diesel generating plant. They provided 4 hours from 6 to 10 in the evening and charged 11 pesos monthly for 10 kWh."

Barrio electrician serving as survey interviewer:

"There was no heavy or solid materials constructed house in the entire barangay. These are poor people, low income and what you find is mostly one or two rooms made of nipa or bamboo, but they like their co-op electricity and were pleased to talk about it."

Woman doctor at small town hospital (not interviewed in survey):

"There are three hospitals I know of in this area where the co-op provides electricity, and many rural health clinics. They all have electricity. We could not operate without it. Electricity is essential -- provides boiling water and steam cabinets for sterilizing, refrigeration for serums and vaccines, night lighting, educational tapes, and slides for nutritional education and family planning, electric drills for dentistry... it is a pleasure to work here."

Mayor of municipalidad in Visayas:

(After lunch at his house) "Over there is a trade school, where electricity by the co-op makes possible courses in tailoring, hairdressing, welding -- things the students did not have before. All around here the schools have water now, with electric pumps. And nearly every barangay has a water pump, too. Farther up the road you will see there is an irrigation pump being installed for 38 hectares of rice."

Another mayor:

"Too many brownouts... just look! No lights since 10 o'clock this morning! Why can't you let us know when you are going to cut off the power? (Addressing the member services director of the cooperative who was with us, having a merienda at the mayor's house.) And I think you should know that some of my people are too poor to pay for electricity, even though you tell me that the kWh are cheaper than kerosene." (This conversation -- not one of the interviews -- lasted for an hour. With my participation it was agreed that the mayor's short-wave radio station could be adapted to compatibility with the co-op facilities, so that the mayor could then notify area people about service interruptions -- most of which are due to NPC as power supplier. It was also found that the mayor did not know about the loan program for housewiring and this was the basis for his comments about the high cost of electricity. When I computed the monthly charge for housewiring plus kWh on my calculator and showed it to be less than kerosene cost even during the first year, the mayor was pleased and agreed to spread the word. This was in a very remote locality, and the cooperative has not had much opportunity to develop an information program locally."

Bill collector for a cooperative:

"When a member says he cannot pay his bill, I explain if he cannot pay then the co-op cannot pay NPC and the power will be cut off to the entire service area. If every member pays, then the GM can reduce line loss and perhaps rates can be lowered. We try to help members understand they are joint owners and responsible."

Owner of hardware store:

"People here in the city seem to buy appliances, but we don't get many customers from out in the country."

Restaurant owner (not interviewed in survey)"

"We have more business now that the electric lines are here." This was in a remote location where co-op lines were about a year old.

NEA official:

"Can you put in your report something to discourage local politicians from trying to take over the co-ops? Since martial law was lifted, some of the mayors and landowners seem to think it is open season to grab control of everything in sight." (I outlined the sellout problem U.S. electric cooperatives had faced and urged strong member information programs as a help.)

Another NEA official:

"A big problem is what is happening between NPC and the co-ops. So many are behind in paying their power bills, and now NPC is threatening to cut them off. All the power contracts come up for renewal next month. It will be impossible for them to meet the NPC demand that those behind in payments post 200% of the normal monthly bill in advance as a continuing deposit. If a co-op is having trouble meeting its monthly bill it certainly does not have cash for advance payment."

President of an electric cooperative in the Visayas:

"We take our position on the board very seriously and guard against anything that would destroy the co-op's democratic operation. All new members must attend an orientation before being connected for service, so they will understand they are responsible as owners. and we train our employees so they can explain things to members. So we think we get fewer complaints. There is a good information program through our member services department and we show how electricity is cheaper than kerosene and safer, too. Our GM has worked out cost data on alternate fuels like coconut husks, stems, etc. I think we have especially good relations with employees. The GM has set up a credit union for them, and a shelter for their motorcycles. Did you see that almost all the staff have motorcycles? It saves time and is not so expensive as jeeps. And gives a sense of pride. The GM rotates staff when he is in Manila, so that is a kind of training and reduces the gap between the GM and employees. We are practicing democracy, not just talking about it. Have you looked through our board policy manual? We got the idea from Ray Shoff and Jay Lasiter when they were here. Also, the co-op issues membership certificates. The members put them on their wall -- you will see them during the survey."

General manager of an electric cooperative in the Bicol (not surveyed):

"I wish you could have attended our annual meeting. We had more than 50% of our membership there."

General manager of an electric cooperative in Mindanao (not surveyed):

"One datu complained to me: 'Allah gave Marie Christina (falls for NPC power plant) to the people. It is a gift. My people do not understand why they should pay for the electricity that comes from it.'"

Survey coordinator in Bataan:

"Upon arriving at this cooperative it was learned that the manager was being investigated and a young lady in charge of the office was the acting manager. I was impressed with how well the cooperative continued to operate even under the adverse circumstances. The president of the board and the board members were spending every day in the cooperative helping with the smooth operation."

Interviewer in Davao Norte:

"Questions which dealt with the interviewee attempting to remember his lifestyle two or three years in the past should be eliminated in future surveys. Obviously they could not remember whether they were better off or worse off two years ago much as we cannot remember our state of affairs two years ago in relationship to today's circumstances."

The above "Field Comments" were picked up by survey coordinators from a wide range of conversations and random remarks during the survey period in November/December 1981. At one point an attempt was made to use a tape recorder for opinions volunteered on the rural electrification program, but recorded comments were less spontaneous, less open. The quotations included in Appendix F are nearly verbatim, written immediately following the conversation. They are random comments, included here to give human flavor to the study. In no way should they be considered a reasoned or balanced evaluation of the rural electrification program.

PHOTOGRAPHS

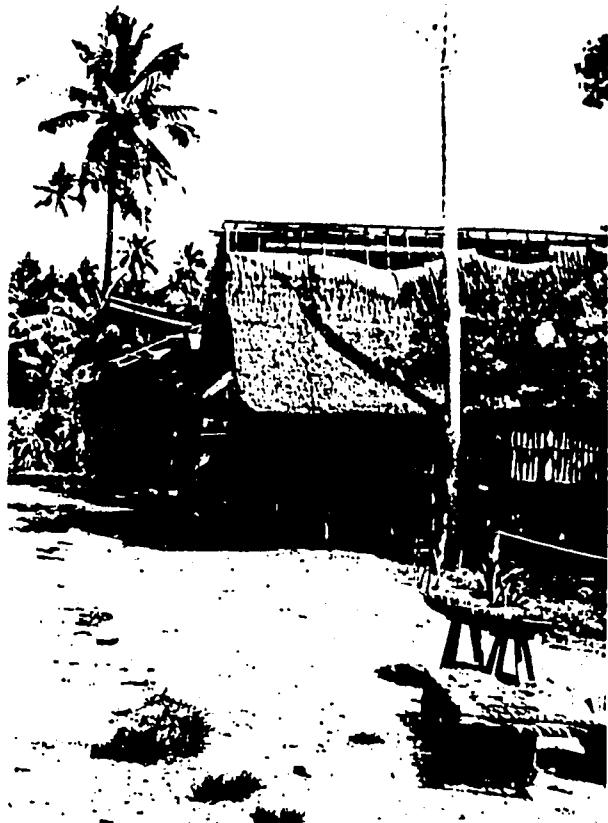
Orientation for  
team of inter-  
viewers (Bindoy,  
Negros Oriental)



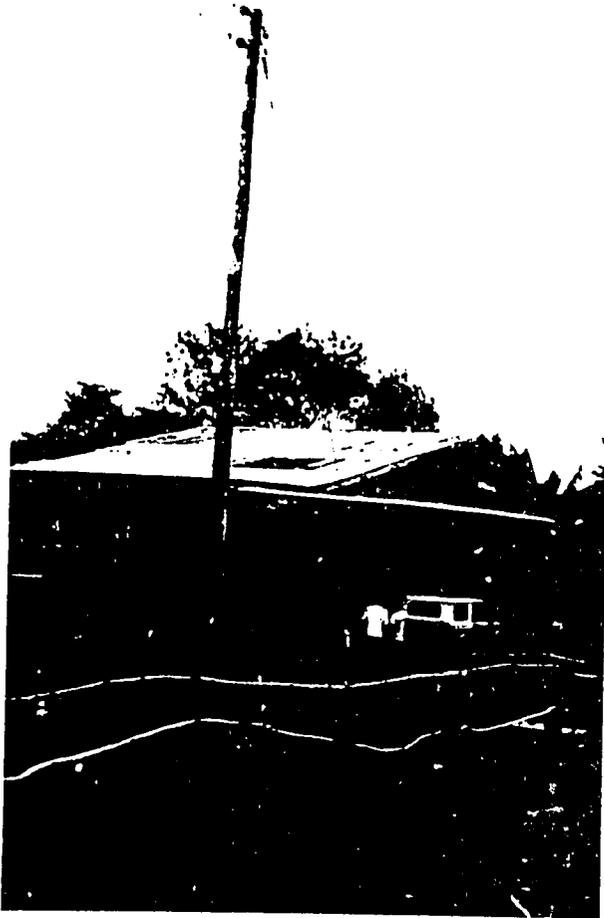
Coordinator as-  
signing survey  
territory to  
interviewers  
(Tigbauan, Iloilo)



Unserved "light" materials house in remote barangay (Mabinay, Negros Oriental)



Electrified "light" materials house along main feeder line (north of Bais, Negros Oriental)



Electrified "mixed" materials house in remote barangay (Mabinay, Negros Oriental)

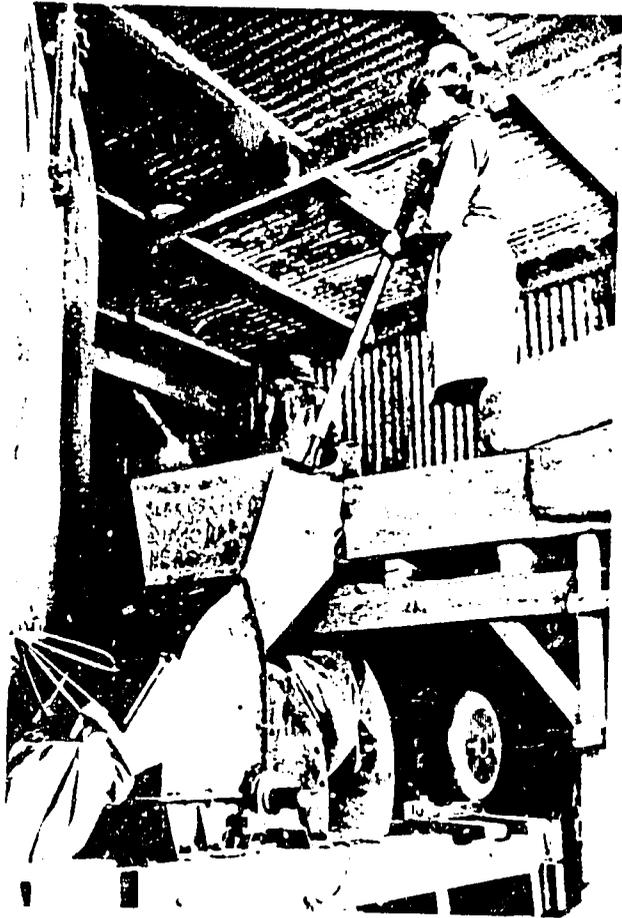


Electrified "solid" materials house along main feeder line (north of Bais, Negros Oriental)

Interview in "mixed" materials house (Miagao, Iloilo)



Feed mill in  
poblacion  
(Jimalalud,  
Negros Oriental)



Enterprise interview,  
at bank established after  
electric service from the  
cooperative became avail-  
able (Miagao,  
Iloilo)





Cooperative headquarters, Bataan Electric Cooperative  
(Balanga, Bataan)

At 1981 annual membership meeting  
(Bindoy, Negros Oriental)



1977

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