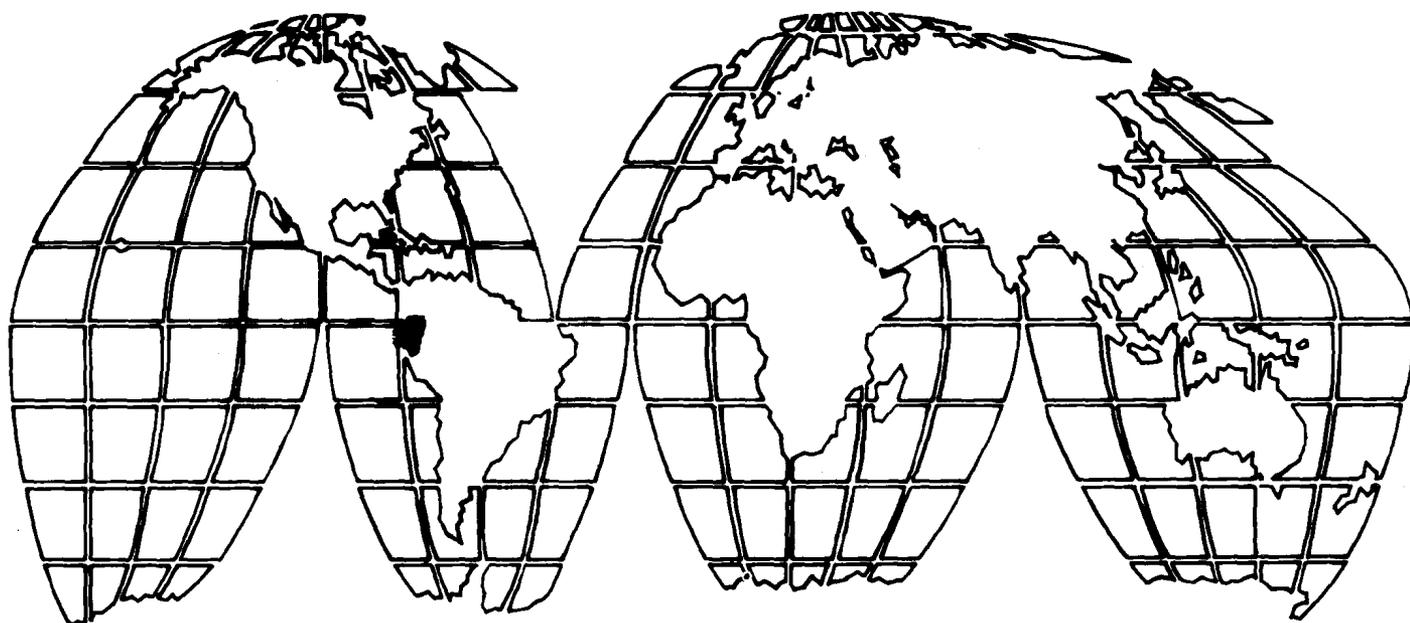


A.I.D. Project Impact Evaluation Report No. 21

Ecuador: Rural Electrification

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June 1981

Agency for International Development

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(continued inside back cover)

ECUADOR

RURAL ELECTRICIFICATION

PROJECT IMPACT EVALUATION NO. 21

by

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The views and interpretations expressed in this report are those of the authors and should not be attributed to the Agency for International Development.

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Foreword

In October 1979, the Administrator of the Agency for International Development requested the start of an Agency-wide ex-post evaluation system focusing on the impact of projects in several representative substantive areas of the Agency's program selected by A.I.D.'s most senior executives. The impact evaluations are to be performed by Agency personnel and result in a series of studies which, by virtue of their comparability in scope, will ensure cumulative findings of use to the Agency and the larger development community. This study of the impact of A.I.D. Rural Electrification activities in Ecuador was conducted in August 1980 as part of this effort. A final evaluation report will summarize and analyze the results of all the studies in each sector, and relate them to program, policy and design requirements.

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EXECUTIVE SUMMARY

In August, 1980 an Evaluation Team visited Ecuador to assess the impact of several small rural electrification projects funded by A.I.D. between 1964 and 1975. Our assignment was to go beyond the results of any particular project to look at what rural electrification had contributed to Ecuador's development. The four areas visited - Santo Domingo, Daule, Santa Elena and Ambato - provided a crazy quilt of differing geographical, climatic, socio-economic and cultural characteristics in a country of great diversity, but a unifying theme emerged. Despite the long time span of A.I.D. involvement and complex, intervening programs in road construction, colonization and land reform, it became clear that electrification had played a substantial role in building market towns and regional service centers.

Santo Domingo de los Colorados, for example, now processes agricultural products in some 67 plants served by an A.I.D.-assisted electric cooperative and handles a wide range of repair and minor production needs of one of the nation's major crossroads. The town and the surrounding area are far more important today than they could have become without a reliable supply of electricity. Santa Elena, a coast town located more than two hours by car from the nearest major city and surrounded essentially by desert has become a thriving summer resort and service center - a result we believe would not have occurred without readily available electric power. Electric power also contributed significantly to the growth of Daule and Ambato as market towns.

While commercial and industrial users of electric power were people of relatively higher incomes, these activities provided significant numbers of jobs, readily available markets for local agricultural products, supplies of needed inputs and other important benefits for the poor - trickle down economics that appeared to have worked.

At the residential level, the number one desire of those surveyed was not electricity, improved health services or education, but rather easy access to clean water. "Productive" home uses of electricity were not of major importance. It is not used to any important extent directly in agricultural production and though significant home commercial uses were found, the overall impact of electrification in this regard was modest. Moreover, electricity does not seem to be causing little "Abe Lincolns" to sit up and study later at night. The overwhelming evening activity of homes surveyed was relaxation, radio and a lot of television. But in the 630 plus homes surveyed in Santo Domingo - 85% of which had per capita incomes below \$375 per year - electrification was highly prized and surprising numbers of refrigerators, radios, televisions and irons were found. At these income levels, even buying on credit, it appears that residents are prepared to make significant sacrifices of other immediate needs to get the added comfort and leisure that electricity makes available.

But electric power in Ecuador is grossly underpriced. Because of the country's petroleum boom and the reaction of past governments to political pressure, the price of regular gas is \$0.18 per gallon (less than one third the cost of production) with the price of diesel and similar oils used to generate the vast bulk of Ecuador's electricity priced proportionately. The result is a vast subsidy of petroleum prices estimated conservatively at U.S. \$2 billion per year - a sum which, if properly used, could end

the problems of Ecuador's rural poor in short order. But the distribution of political power in Ecuador is not likely to produce such a result in the foreseeable future. These and other forces, far beyond the power of small A.I.D. projects to affect, are nevertheless a fact of life in countries we attempt to assist.

The bottom line for future activities, we believe, is that rural electrification remains an appropriate concern for A.I.D. and other development agencies especially where there is significant potential for the development of market towns, as part of a strategy of integrated rural development. Indeed, a market town without a reliable supply of electricity in the last quarter of the 20th century is almost unthinkable. Given the press of other basic needs and the strong local political pressures which already exist to extend electrification, however, A.I.D.'s role might best be limited to technical assistance and training in the context of the kind of integrated rural development projects in which A.I.D. has special expertise. Major investments in hardware may be more appropriately left to the cooperating government or other international financial institutions. But more needs to be learned about the relationship between electricity and regional growth. It may be, for example, as one regional company engineer speculated, that once a community has electricity and some significant resulting local production, it also has clout to demand clean water, better schools and better health services.

Finally, this report is the first of the impact evaluations to use, as a major empirical foundation, a broad survey involving some 630 households and over 3,200 people. It was conducted with the aid of an Ecuadorian sociologist/regional planner in the Santo Domingo area. Our effort was experimental and we learned much in the process, but we believe that the survey added fascinating data which we could not otherwise have obtained and that it also served as a safeguard against bias or hasty conclusions. While we do not believe that the kind of impact evaluations that the agency is trying to do ever can be reduced to data from questionnaires, we urge that local social scientists be involved and that similar surveys be considered as a contributing element in future impact evaluation efforts.

ACKNOWLEDGEMENTS

The evaluation team would like to express its sincere appreciation to USAID/Ecuador for its invaluable cooperation in the preparation of this report, beginning with Director John Sanbrailo, who, ironically was a young intern in the Ecuador Mission when some of these projects were being implemented; and including especially Gary Vaughn, our control officer, Carmen Carrillo, our secretary, and Stella Barbera and Gonzalo Calderon for their help with many administrative needs.

We are also indebted to the Director and staff of the Ecuadorian National Electricity Institute (INECEL), the management of regional electric companies, Sr. Manuel Carrion and the fine staff of the Santo Domingo Electric Cooperation and others too numerous to mention.

Finally, our deepest thanks to several people in AID/Washington for their most generous help - especially Clarence Zuvekas for his helpful comments on drafts, Cathy Gleason and her staff for their patient struggle to process the data and finally Christine Given, Jeannette Oliver and Patricia Jones for their outstanding secretarial contributions.

We dedicate the report to Juan Carlos Vallejo, a ten year old Ecuadorean who, with his father Lic. Hugo Vallejo of INECEL, accompanied us on part of our visit. We wish him a bright future.



I. PROJECT SETTING - INTRODUCTION

Ecuador's widely diverse geographic, ethnic, cultural, and economic patterns make it difficult to isolate one particular development activity - in this case, rural electrification - and draw definitive conclusions as to its effects. It is impossible, for example, to ignore other major development phenomena, such as road construction, agricultural development, which occurred either concurrently or within a relatively close time frame. The problem is compounded when, as in the present case, two of the major activities evaluated involved A.I.D. inputs some 15 years ago.

During the course of this evaluation the team visited: (1) the "frontier town" of Santo Domingo, which was virtually isolated from the rest of society, inhabited solely by the Colorado Indians, until the first dirt road was cut through the mountains in 1940 to the capital - it is now one of Ecuador's most important agricultural areas and commercial crossroads; (2) the important rice-growing area around Daule, on the coast and Santa Elena, largely a desertified area which now principally serves the important tourist trade on the Santa Elena peninsula - both are areas marked by a great deal more "modernity" resulting, in part, from close geographic proximity to Guayaquil; and (3) Ambato, in the traditional central sierra, which still clearly demon-

ny between the existence of a large hacienda society and a wide
Previous Page Blank ndios (very small farms). In each area, the team had to consider
ment phenomena which led to the area's current social and economic
configuration in order to answer the following questions: What role has electrification
played in the development of rural areas of Ecuador? Who has benefitted from
electrification and how? How successful has the cooperative form of organization
been? Where does electrification rank among the priority needs and aspirations of
Ecuador's rural poor and how does rural electrification fit, both politically and economi-
cally, in relation to Ecuador's overall energy needs and problems?

We encountered both positive and negative effects of A.I.D.'s electrification activities in Ecuador. We were at times astonished by the lack of sophistication of A.I.D.'s early efforts and alternately impressed with undeniably positive results. Finally, we tried to look at how a "neutral" technology like electric power was affected both by local political forces and to some extent by the ups and downs of U.S.-Ecuadorian relations. In each of the areas mentioned above, the team followed miles of distribution lines to local homes and businesses making direct contact with hundreds of Ecuadoreans. We spoke with small rice farmers, medium-sized coffee and hemp growers, owners of small saw mills, and processors of coffee and rice, all of whom are now receiving electric service. We also talked with many other people, (such as the members of the Cristobal Colon Coop near Santo Domingo during their monthly meeting), who are struggling to bring the distribution lines to their communities. In addition to these direct contacts, the team contracted an Ecuadorean sociologist/regional planner and in cooperation with him conducted a questionnaire survey of over 630 households and 3,200 individuals. 1/ From the wealth of data and opinion collected, a complex political/economic picture emerged which must be placed in the context of Ecuador's recent history.

In 1960, Ecuador was largely agricultural with its population of about five million people essentially divided between the central mountainous areas (sierra) and the tropical coastal lowlands. Outside of the two major urban centers of Quito and Guayaquil, electricity, where it existed, was provided either by a tiny privately owned diesel

generator or by one of 1200 small plants operated independently by municipalities. Service was typically limited to a few evening hours - with frequent outages for extended periods. Total public generating capacity in the country was 90 KWH per capita per year (as compared with common U.S. household usage of 1000 KWH per month). No specific data exist from the early sixties on rural electrification as such, but government figures (which we believe to be on the optimistic side) indicate that today only 46% of the total population receives electric service, including 94% of urban households, but only 11% of rural dwellings. Until 20 years ago no national electric system existed and no central government ministry or agency was concerned with or had the capacity to design or implement a national electrification plan. 2/ Significant developments in the 1960's affected both the future of Ecuador and A.I.D. activities. A plague caused serious damage to Ecuador's banana production, but major oil discoveries in the late sixties placed enormous new revenues in the hands of the government, beginning in 1972. This, in turn, started a contest among public agencies for the new resources and created the temptation, to which the government succumbed, to provide petroleum products to the society at highly subsidized prices -with resultant impacts on the price of electric power as well as on energy consumption patterns in the society as a whole. Finally, in the late sixties a dispute between the U.S. and Ecuador (among other countries) over fishing rights led to a period of confrontation in U.S.-Ecuadorian relations which affected A.I.D. activities. 3/

II. PROJECT DESCRIPTION

Between 1964 and 1972, A.I.D. extended three loans, totalling \$5.8 million, to the Government of Ecuador to assist in financing and implementing rural electrification projects in selected parts of the country. Of this total amount, \$4.53 million was utilized and the rest deobligated. In addition to these three loans, \$873,000 of an earlier 1962 feasibility study loan (518-L-017) totalling \$2.0 million was used to finance two hydroelectric studies by U.S. consultants; these formed the technical and financial basis for projects which were subsequently funded by the Inter-American Development Bank (IDB). Over a thirteen year period from 1962 to 1976, A.I.D. loan financing of rural electrification activities in Ecuador amounted to \$5,626,000 - less than 5% of A.I.D. obligations during the period. Individual project commitments and outputs were as follows: 4/

Loan 518-L-023 - August 1964 - Santo Domingo Rural Electric Cooperative \$650,000

Outputs - Construction of building housing 1,380 KW generating plant; installation of a distribution substation; 140 km of distribution lines; technical assistance to coop management; and rehabilitation, inspection and shipping of three 450 KW generating units which had been donated from U.S. Government excess property.

Loan 518-L-024 - August 1964 - Electric Power (Santa Elena) \$700,000 5/

Outputs - Building to house 3,600 KW generating capacity financed by EXIMBANK; 20 km of transmission lines into Salinas and Punta Carnero; 5000 KVA substation and distribution network for La Libertad, Salinas, Santa Elena and Ballenita; 400 KW station and distribution network for Playas area; balance used by INECEL for technical assistance, construction and communication equipment.

Loan 518-L-035 - June 1970 - Rural Electrification - \$3.55 million (11 planned subprojects)

Outputs - Power transformers for 19 substations (total capacity 75.3 MW); 278 km of 69 KV transmission line; 1,058 km of 13.8 KV transmission line; distribution

systems for 34,000 new user connections; 27 construction and maintenance vehicles and 22 lineman tool kits. 6/

It is vital to note from the outset that this assistance was directed to procurement of hardware with only minor amounts going to technical assistance and training. These loans were conceived and implemented in the pre "New Directions" era. Linkages between project inputs and benefits to the rural poor were not examined. Indeed such terms as "rural poor," "poor majority," or "A.I.D.'s target group" - standard terminology in the 1980 A.I.D. lexicon - do not appear in the project documentation. This is not intended as a critical statement, but rather a historical one. The overall goal was, simply, to electrify. 7/

Despite the absence of impact analysis in project design, however, it is clear that the cooperative model was intended as a way to work on the political and social aspects of economic development through the promotion of grass roots decision-making. As one project paper plainly stated:

"The provision of electric power brings to a rural area a resource unique in its potential for changing community life. When power is provided through a proven social institution - the cooperative - this potential for change has the best chance to contribute to the formation of an increasingly responsive and responsible democratic society." 8/

This strategy was in part a response to fears in the early 60's, that the Castro revolution would spread to other Latin countries, with Ecuador high on the list.

Finally, Mission activities in rural electrification did not in any sense represent either a coherent, focused program or a broad systems approach. The mission did not, for example, decide to concentrate on strengthening the capacity of the Ecuadorian National Electricity Institute (INECEL). Neither did it decide to minimize its contacts with the central government and choose to build local or regional systems from the bottom up. Instead, it became involved with both INECEL and various local communities. Site selection appears to have responded in part to the desires to strengthen certain existing regional systems and in part from A.I.D.'s desire to push the cooperative model in selected local communities. Indeed, interviews with A.I.D. personnel who were in the Mission in 1970 indicated that this division of effort probably reflected a split among Mission officers on how to approach the problem. Engineers and loan officers tended to associate closely with INECEL's technical approach while Mission social development officers (responding to the legislative exhortations contained in Title IX) were pushing the grass roots, cooperative-building approach. 9/ A total of eight entities, including two cooperatives (one which failed in 1976) and six regional companies were assisted under the three A.I.D. loans. A significant increase in physical and technical capacity appears to have resulted under each. The development impact is analyzed below.

III. PROJECT IMPACTS - FINDINGS

The team visited three of the eight entities assisted under the three loans -the coop at Santo Domingo, Daule (served by a coop until 1976) and the Santa Elena Electric Company. For comparative purposes we also visited the Ambato Electric Company which, though it has received no A.I.D. assistance, has nevertheless taken an active interest in rural electrification. Since each of the sites visited has distinct socio-economic characteristics 10/, and the impact of electrification has been different, a summary of findings in each area follows. Table 1 of Annex 7 provides an overall

matrix comparison of the impact in the four areas. In Part IV we attempt to synthesize major findings.

A. Santo Domingo

1. General Description of Area

In 1964, an A.I.D. loan helped establish a rural electric cooperative for the Santo Domingo area. The coop began with 380 members - all in the "urban" area which then had about 10,000 people. Another 10,000 people lived within a 25 mile radius of the town. Today Santo Domingo is a city of about 50,000 with another 110,000 nearby rural inhabitants. It is a noisy, disorderly crossroad for transportation with the coast which is often the butt of derogatory comments by Quito's urbane business and professional class - but the town serves as the economic and financial center of the area, with industry, commerce/transport and services employing over 75% of the economically active population. In the rural area, on the other hand, over 80% of economic activity is in agriculture. While banana production has dropped significantly during the past five years, it still remains a mainstay of the rural economy, along with African palm, hemp, coffee, cattle and other export crops. Median land size is relatively large for Ecuador, in the 25 hectare range, though much remains to be fully cleared.

2. Impact of Rural Electrification

As an integral part of the overall investment package in the region, including such other items as agrarian reform activities, road construction and credit availability, electrification had an obvious and positive impact on the growth of Santa Domingo as a regional service center for a vast and economically important agricultural area. Over 75% of the urban economically active population in 1974 was engaged in industry (including construction), commerce, transport, finance or services. The majority of these jobs probably would not exist without regular electric service. In the area of commerce, most stores remain open in the evening to serve rural inhabitants; as a result, commercial uses of energy are second only to residential uses, accounting for 30.8% of the coop's sales in 1979. Small metal-mechanic and automotive repair industries have increased as Santo Domingo has grown as a transportation center. A second area of major impact which we can attribute primarily to electrification has been the growth of medium-sized agro-industry in the area. This has taken place both within the town of Santo Domingo, as well as in and near the agricultural producing areas, and includes plants processing coffee, hemp and milk products, several medium-sized sawmills and three or four plywood producers.^{11/} Their presence in the area has benefitted rural producers by providing a steady market for farm production as well as increasing local value added, some of which accrues to area farmers. In 1967, the cooperative had five industrial subscribers; in 1979, there were 67, the majority small to medium-sized.

The direct impact of rural electrification on agricultural production per se has been neutral in the area. The team saw no evidence of electricity being used for irrigation pumps or livestock purposes, and it is the commonly held opinion in the area that the major impetus to agriculture came about as a result of exogenous factors already in motion prior to electrification - e.g., colonization, agrarian reform and road construction. Electrification has been of secondary importance, but nonetheless positive in terms of the local economy. The growth of commercial outlets marketing agro-inputs and products, as well as the emergence of small and medium scale agro-industry, has benefitted area farmers.

The residential use of electricity, in both urban and rural areas, accounted for 37.5% of energy sold in 1979, following a trend since the earliest days of the cooperative. In the areas covered by our socio-economic survey (see Annex 8), 63% of families surveyed had electricity (ranging from nearly 86% in urban Santo Domingo to only 30% in the Santo Domingo-Alluriquin area). Of these, the majority of families surveyed had one or more electric appliances: 50% had electric refrigerators, about 60% each had televisions and radios; and 42% had electric irons. Over 50% of the electrified households had six or more light bulbs. Based on incomes in the area, the median income was 4,500 sucres per family per month, or \$375 per capita per year, it appears that these appliances were in large part purchased on credit. The purchases also appear to reflect significant sacrifices by the purchasers in terms of foregoing other immediate needs and indicate the strong desire of very modest homes for electric appliances. Residential use of electricity in the areas surveyed had a multiple purpose in 33% of the cases. In 23% of residences surveyed, electricity had a commercial as well as residential use (in the urban area of Santo Domingo this figure was slightly over 30%), though in some the "commercial" use was limited to selling cold drinks from a home refrigerator. Seven percent of families also used their residence for artisan activities, with 3.5% claiming "other" uses.

The impact of electrification on the provision of health and education services has been low to moderate. While cooperative records show that a total of 28 health posts are electrified, most apparently do not have refrigeration; on the other hand, nearly all schools are electrified, but a visit to several indicated that use of electricity was minimal. In urban Santo Domingo, however, a substantial evening literacy program is conducted. Electrification is also important to secondary school shops and laboratories, as well as to the regional hospital which obtained x-ray equipment only after the coop began providing 24 hour service. Electricity also made possible double shifts at secondary schools and saved the cost of building more facilities in Santo Domingo.

B. Daule

1. General Description of Area

The town of Daule is located 45 kilometers to the north of the industrial and commercial center of Guayaquil. The town itself has a population estimated at 12,000 inhabitants, with the rural area it serves accounting for another 90,000 people. Historically, the area has been one of the most important rice producers in Ecuador, although currently production is down some 40% from mid 1960's levels. The agricultural area is characterized by a number of large producers (the 1974 Agricultural Census reports 31 holdings of over 500 hectares) interspersed with minifundios — 51% of all parcels are less than two hectares, with an additional 28% in the two to five hectare range.

2. Impact of Rural Electrification

Impacts observed by the team were as follows: Agricultural. The team did not observe direct applications of power from the public system in agricultural production. Though the major crop is irrigated paddy rice, the pumps we saw operating were small, portable, diesel-powered models. Indirect benefits to rice farmers from the presence of local processing plants are covered on the following page.

Commercial. Our visit to the town of Daule revealed several substantial commercial establishments stocked with a wide range of electrical appliances and apparently doing a lively business. Refrigerators and television sets were the leading items of interest. Repair shops for electrical equipment and metal work shops using electric tools were also common as was commercial refrigeration in stores and restaurants. In addition, data for 1980 show over 1300 users of the public system in the "commercial" category, indicating that electrification is perceived to be an advantage to the vast bulk of the area's commercial establishments. Commercial establishments used 35 to 40% of kilowatt hours billed in the area, indicating that uses other than lighting are probably significant. Much more rapid commercial growth in the area probably cannot be expected, however, due to its proximity to Guayaquil.

Industrial. The major industrial use of electricity in the area is for rice processing (though one major brick plant is a consumer). Because rice mills need not be large to be economic, farmers with 50 to 100 hectares in rice as well as some of the rice cooperatives do their own milling. Due to regulated prices for sales to rice mills, the marginal benefit to farmers or coops processing their own rice is about 20%. In addition, for those who cannot process their own rice, the existence of nearby milling facilities eliminates the need for intermediaries. At the outset, however, the Daule coop was singularly unsuccessful in attracting rice millers as users. Several people we talked to complained about unreliable service or high installation costs, but we were more inclined to believe those who mentioned that they did not convert because they already had their own small diesel plants which were still running well. The number of industrial users - principally rice mills - has tripled since 1974 but system users still constitute only about one fourth of the rice mills in the service area. Thus, while rice milling is vital to the economy of the area, and while processing requires electric power, the presence of rice mills cannot be attributed to the project. However, those operating from the system do experience lower costs and we would expect the trend to increased connections to continue as existing private plants wear out.

Residential. The team's observations of residential use in the area were limited. Of the campesino homes visited, several had refrigerators, TVs or both. Electric water pumps for readily available ground water were also used at several of the houses. Distribution lines have not, however, reached far from trunk or principal subsidiary roads so that these observations are not presented as typical of uses by the area's smallest farmers.

Provision of social services. Aside from observation of several schools and health posts on the main road east of Daule which were served by electricity, the only information available on this subject came from the regional manager of INECEL Guayas who indicated that it is now company policy to connect all schools, health posts and social security centers and to continue service whether or not bills are paid.

C. Santa Elena

1. General Description of the Area

The area served by the Santa Elena Company consists mainly of the counties of Santa Elena and Salinas both located on the Santa Elena peninsula, 125 km west of Guayaquil. In the 1940's the area was characterized by abundant vegetation, and supported a moderate-sized lumber industry, used primarily in boat construction. During the 1950's and '60's, the results of progressive deforestation were exacerbated

by drought. Economically viable agriculture is possible only in the northern parts of the area, where relatively large farms produce some cotton and smaller parcels are dedicated largely to melons and a few food crops. Only 41% of the economically active population in rural areas was dedicated to agriculture in 1974, and indications are that this percentage is dwindling.

The major economic activity of the area has become tourism with a concomitant rise in commerce and the service industries. The beach resorts of Salinas, Ballenita and Punta Carnero have become a magnet for the urban upper-middle and upper classes of Guayaquil and Quito which effectively double the area's population during the summer season from December to April (the estimated inflow during the season is 100,000 persons - up from 20,000 in 1970). Complementing tourism, major economic activities include some small-scale petroleum drilling, fishmeal processing, industrialization of fish products for human consumption (which grew significantly during the 1970's) and small scale production of furniture with wood imported from other parts of Ecuador. Two army bases and the air force and navy service schools located in the area have also contributed to population and employment growth.

2. Impact of Rural Electrification

Once again, while the situation is too complex to permit simple causal connections, our own observations and local accounts of the area's development indicate that it is unlikely that this otherwise marginal area could have become a successful tourist area without a reliable supply of electricity. It is also clear that development of this tourist center has brought substantial benefits to significant numbers of area residents, including both the new and the original permanent residents, as well as seasonal visitors. Nationally, the development of the area has been an important addition to the growth of jobs and incomes. However, within the zone, most direct benefits to date have gone to the upper-middle and upper income classes that are definitely not in A.I.D.'s target group. In its own terms, the project is nevertheless a success story - though it's not likely that it would have been funded by A.I.D. using today's standards.

Agricultural. Although crop cultivation did not seem to be affected by the presence or absence of electricity, demand for food products has increased in the area as the permanent and seasonal population has increased. The extent to which this demand is being met locally is uncertain, but probably most comes from outside the area. The remaining portion, however, - primarily fruits and vegetables - could be important to some local farmers.

Commercial. All manner and size of hotels, guest houses, retail sales outlets, banks and other service organizations have set up shop in the area to attend the needs of the population. These have provided a major source of employment in the area. In this sense, electrification has had a high impact on the zone.

Industrial. Electrification has had only a moderate, primarily indirect, impact on industry. Furniture making is the major industry affected by electrification. The number of shops has tripled to 150 now, with most of the increased production staying in the area. Many of these shops are small, however, and do not use much electrical equipment; even the largest we visited, which use numerous electric tools, do not use a great deal of electric power. The expanded employment they offer is significant, nonetheless -in the range of 1000 jobs. The larger (and older) industries (fish packing, fishmeal, petroleum refining) have their own diesel generating equipment, but most of these will probably buy electricity from the company as their generating

equipment wears out. This should help to keep these companies competitive. Finally, the local construction industry has grown tremendously as a result of the resort boom. Construction jobs are relatively easy to get and the area, like everywhere else in the world, needs more skilled building tradesmen.

Other Comments. The team doesn't believe that electrification has had much impact either on the provision of social services outside the major towns or on most of the other topics we were interested in. However, it is clear that women, especially, have been benefitted through the resort-related service jobs created - perhaps more directly than in any of the other areas we looked at - and energy costs for the area, as a whole, are lower now than they otherwise would have been for the same level of service.^{12/} Rural residents are receiving electricity, even though the company indicated that in many cases the longer distances required to extend distribution lines to rural areas increase overall maintenance costs. The company management told the team that rural electrification was a social obligation, one we suspect they only grudgingly accept, but that rural electrification will never be profitable for the company. (Last year, over \$1 million of profits were invested in extending the rural distribution system.) At peak demand times during the tourist season, rural clients are rationed to provide enough electricity to the towns. This says a lot about the company's day-to-day priorities.

D. Ambato

1. General Description of Area

The city of Ambato, located 140 km south of Quito in the Province of Tungurahua, is a growing regional center currently fourth in size in Ecuador (after Guayaquil, Quito and Cuenca). The capital of Ecuador's "fruit and flower" province, the city serves as an important industrial and commercial center for one of the country's most productive agricultural areas. The economic activity of the rural areas of the province is overwhelmingly agricultural, involving nearly 73% of the economically active population. Major production, in addition to fruits and flowers, is in foodstuffs (corn, onions, potatoes, yucca, etc.). Land holdings are characteristic of much of Ecuador with production divided among a few large hacienda producers and large numbers of small farmers whose average land extension is estimated at between one and a half and two hectares. Ambato and surrounding areas are also noted for the quality of its handicrafts, including weavings, knit goods, shoes and wood carvings.

2. Impact of Rural Electrification

Because of the regional company's aggressive program to promote and extend electrification to the rural areas, the impact of rural electrification in the Province of Tungurahua was probably the highest of any of the four areas visited during the evaluation. With over 700 km of distribution lines, the program is reaching farther than any of the others. In addition, the company has promoted the participation of campesino groups in providing labor, materials and, when possible, financial contributions in order to extend rural electrification even further.

The major impact of rural electrification in terms of raising income levels of rural inhabitants is a result of the growth of small industry and artisanry activities. Electrification has made possible the installation of small carpentry shops, producing furniture as well as artisan goods, appliance repair shops, small feed mills, and agricultural implement shops in rural areas. While the energy consumed in most of these is minimal, they provide off-farm employment and provide needed services

to local producers. The handicraft industry of Ambato is, for the most part, a product of the spare time of rural women. Two farm women in Huambalo, a small agricultural village some 45 km from Ambato, showed us hand-embroidered shawls and knit sweaters which they produce on a piece basis for a wholesaler in Ambato. With residential electricity, they can work at night and thereby double their production, resulting in an additional 500 suces a week in family income. Similar arrangements exist in many households in the area with the wholesaler's truck making weekly rounds to deliver wool and pick up finished pieces.

In agriculture, a low but positive impact was seen, primarily as a result of the establishment of a series of feed mills and the expansion of the poultry industry. Small poultry producers frequently have their own mill, resulting in significant savings over purchasing commercially available feed; in addition, one very small producer visited had constructed his own crude, but effective, incubator.

While Ambato, as a major urban area within Ecuador, would ordinarily be a natural recipient of migrants from surrounding rural areas, local officials claim that migration to the city has slowed significantly in recent years. While their claims that electrification has played a major role in this shift may be exaggerated, the trend does reflect growing employment opportunities in smaller, urban-like areas within the agricultural zones.

In both health and education, electrification appears to be having a high impact on improving the quality of life of rural inhabitants. Virtually every school is electrified in areas which are connected, and the province has adopted a vigorous program of adult literacy, using local schools during the evenings. The company reported that most health posts are also electrified; one health post had an electric hotplate which it used for sterilization as well as a small refrigerator for vaccines. The nurse reported that this was typical in most of the area.

While the evaluation team spent a relatively short time in the Ambato area, it appears that the Ambato system was working effectively in promoting and supplying electrification to rural areas, and that electrification was having a positive influence. These conclusions were probably influenced by the general dynamics of the entire area, which contrast sharply with the general situations in Daule and Santa Elena. The area is rich in agriculture and supports a thriving urban economy. The electricity company is managed by an unusually dynamic and young group. When asked by the evaluation team why the company was promoting electrification in rural areas, when urban expansion is far more lucrative, the general manager responded that the social costs of not electrifying the rural areas (in terms of increased migration, underemployment, etc.) would in fact be greater than the financial costs associated with continuing the expansion program.

IV. PROJECT IMPACT - ANALYSIS

A. Cooperatives and Rural Electrification

A.I.D. funded rural electrification projects, as designed, were to have benefitted eleven entities within Ecuador - six private companies and five cooperatives. Only two cooperatives were formed, however, the Santo Domingo Rural Electric Cooperative, which is still functioning and is solidly entrenched as a cooperative, and the Daule Cooperative, which functioned for only a few years before its assets and operations were taken over by INECCEL in 1976. The three cooperatives which were to have been formed and assisted under Loan 035 (Macas, Tena and Quinde) were never constituted as cooperatives; however, two of them, Macas and Tena in Ecuador's eastern region, received financing under the loan as companies.

Since A.I.D.'s zeal in promoting cooperatives as an institutional mechanism for extending rural electrification in Ecuador met with such limited success, it is worthwhile to examine why this concept did not catch hold. At the outset, knowledgeable Ecuadoreans with whom the evaluation team met almost uniformly rejected the overall cooperative model as appropriate for the country. While some savings and loan associations have been successful, most agricultural cooperatives were formed for one specific reason - usually to get land title, though sometimes to pressure the government for irrigation or farm-to-market roads - and once that need has been filled, the cooperative became inactive. In the Santo Domingo area, for example, it was reported that some 300 agricultural cooperatives were formed in the 1960's, whereas only about 30 are active in 1980. The reasons given for this phenomenon are varied, but the observation most frequently heard was that Ecuadoreans, in general, are "uniquely individualistic" and unless a clearly perceived gain accompanies their association into a group they would prefer to work on their own. In the case of rural electrification, however, "individualism" versus "cooperativism" does not appear to be the issue. The apparent success of Santo Domingo has been largely determined by factors other than "cooperative mystique" and the failure of Daule as a cooperative was largely due to economic reasons and its proximity to Guayaquil, and not to the fact that it had been organized as a cooperative. That Macas, Tena and Quinde were never constituted as cooperatives reflects an error in Mission strategy - trying to build a cooperative movement from the top down, rather than trying to build grass roots support for the concept. INECEL, under Loan 035, was ultimately responsible for the formation of the local electric cooperatives, and INECEL's policy (implicitly, if not overtly) has never favored the cooperative movement in electrification.

The various cooperatives are discussed below.

1. Santo Domingo

The Rural Electric Cooperative of Santo Domingo was founded by a group of local businessmen who found that their electrification aspirations were shared by agricultural colonizers. The area was undergoing rapid expansion as a result of government programs to settle the rich agricultural area surrounding the town of Santo Domingo. From its earliest days, the cooperative was supported by the urban commercial elite, many of whom had strong economic and political ties with Quito and Guayaquil, as well as a number of active agricultural cooperatives which were still in the process of obtaining land titles. When the cooperative was founded in 1963, INECEL was still a fledgling organization (founded in 1961) and did not have either the financial or political clout it was to obtain in the 1970's. The cooperative still retains the support of a wide variety of commercial, industrial and agricultural interests, in a geographic area which has become a major economic growth pole in the country. In summary, the cooperative was an offshoot of organized local interests and those interests maintain their support to the present. By offering services, such as appliance sales, at less than commercial interest rates and favorable credit terms, it has insured goodwill among its members. However, evidence of broad and active participation among the membership was lacking. Only a small percentage of members attend annual meetings and our survey found that only 5% of those served by the coop even knew that they were members. The coop probably has, however, had some positive impact on local community groups, at least to the extent required to organize labor and other local contributions required to get transmission lines into new areas.

2. Daule

The case of Daule is very different. First, the agricultural sector of the area has traditionally been dominated by a number of very large rice growers,

almost all of whom had their own electrical generation capacity. They represented both the political and economic elite of the area, and their interests were clearly tied to the commercial interests of Guayaquil rather than the small farmers of the Daule area, who were the original members of the Daule cooperative. Nonetheless, as the cooperative got under way with the assistance of an NRECA advisor, demand for increased power generation grew, primarily from the urban residential sector. Without the backing of the large rice growers, however, the cooperative found itself unable to pressure INECCEL to provide additional financing to expand the system in rural areas. The coop had hoped for major assistance from A.I.D., which apparently had been promised but which never materialized. With Guayaquil only 45 km away, cost efficiencies dictated hooking Daule onto the Guayaquil system, a move which the relatively unorganized small farmers and urban dwellers were unable to countermand. An added factor, explained by one ex-officer of the cooperative in Daule, was political in nature. At about the same time that the Daule cooperative began to experience severe financial difficulties as a result of its inability to expand services, U.S.-Ecuadorean relations were suffering. ^{13/} The heavy NRECA-A.I.D. involvement in forming the cooperative was seen as suspect by some people, including influential government officials. While this may not have been a critical variable, it did coincide with the military government's decision to hook up small, relatively inefficient power systems to the national grid as well as its implicit policy not to promote cooperatives in the country.

3. Macas, Tena and Quinde

The burden of creating the three proposed new rural electrification cooperatives was placed on INECCEL under Loan 035. The project paper states that there were "strong indications" that these areas would have appropriate human resources, initiative and ability to organize and develop the cooperatives, but does not elaborate. Under the project, technical assistance loan funds were available to INECCEL to establish a "section to be responsible for the promotion, organization and administration of the electric cooperatives." Loan-funded technical assistance would assist INECCEL in these tasks. Such a section was, in fact, duly created by INECCEL but never received significant support from INECCEL management.

In hindsight, the strategic error is obvious. For one thing, INECCEL's early relationships with the Santo Domingo Rural Electric Cooperative were good in the late sixties and there was no reason to anticipate that as INECCEL grew, in both financial and technical terms, it would begin to look upon fledgling cooperatives, which possessed only a minimum of technical skills, more as a nuisance than a positive force in expanding electrification. Second, the political climate of Ecuador changed drastically between the time the project was authorized and disbursement actually began. The military government, which came to power in 1972, was openly leery of cooperatives and in this context, in 1975 (when the entire loan program was reviewed and revised) INECCEL had very little interest in establishing the type of cooperative network envisioned in the Loan Paper. Its clear mandate from the central government was to electrify, and its perceived interests were to accomplish this within a framework which maximized technical and financial considerations and central control and which left the creation of participatory organizations out of the equation. It is unclear whether Macas and Tena ever even knew that they had once been destined to adopt a cooperative form of electrification. There is certainly no evidence that when INECCEL arranged with the municipalities of Macas and Tena for direct operation and management of the electric services any organized outcry of protest was registered from parties which favored a cooperative.

B. Impact on the Poor

As indicated earlier, the A.I.D. projects we examined were never specifically designed to provide direct benefits to the rural poor. We did not, for example, observe any significant direct applications of electricity in agricultural production. Neither did we find that small farmers or their children sat up in their homes at night reading or studying. But that is only a small part of the story. What we did find was that electrification made a major direct contribution to the development of Santo Domingo, Santa Elena, Ambato, and to a lesser extent Daule as either regional service centers or market towns. These centers, in turn, have provided substantial indirect benefits to the rural poor in terms of income, employment opportunities, and some social services - including evening literacy programs. One might describe the entire effort as a classic attempt at "trickle down" economics and, horror of horrors, we are tempted to conclude that it worked.

In Santo Domingo, for example, coop records indicate a total of 67 industrial users of which all but one were agro-industry related. Many of these industries were large enough that they clearly could have operated profitably using private diesel plants. The Foresta plywood products factory, for example, which employs 400 workers in three shifts, was clearly in this category as were several palm oil processors visited by the team. But cost savings for various types of agro-industry (estimated to range from .75 sucres to 4.05 sucres per KWH indicate that the presence of power from the coop or public system does help to attract agro-industrial enterprises. 14/ Indirect income benefits to farmers from the presence of such enterprises can only be guessed at, but appear to be substantial. Where husking and drying facilities for coffee or rice are owned by a coop, the value of the resultant crop is increased by 20-40%. But even where products are merely sold to a local processor, the existence of several nearby facilities cuts transportation costs, minimizes the involvement of intermediaries and may, based on comments of both buyers and sellers, result in some price competition. The processing plants also provide regular demand for the area's production as well as additional job opportunities for members of rural families.

In the commercial area, the contribution of electrification to the welfare of the poor in the regions visited, though again indirect, has also been significant -in the medium to high range. In Santo Domingo, commercial users account for over 30% of power sales and any visitor to the town could not fail to be impressed with the number of small woodworking, metal-mechanic, auto and appliance repair shops and other commercial enterprises which use electric power. Similar benefits were observed in Ambato and to a lesser extent in the Daule area. In Santa Elena, significant numbers of service jobs were created from the sharp growth of the Salinas resort area - which is, in turn, traceable to the existence of a reliable supply of electricity. Those employed come from an area where income per capita in 1974 was among the lowest in the country (in the neighborhood of \$100 per capita) and where alternate development possibilities are virtually nil until huge new investments make irrigation of the land possible. In sum, regional value-added, jobs and income from electricity-based industry and commerce has been substantial.

Like others before us, we found the benefits of residential electrification hardest to judge, though a number of findings stood out clearly. Poor people place a high value on electricity and are willing to make significant sacrifices to obtain service. Even when the average hook-up costs in Santo Domingo and Ambato (about 2500 sucres or US \$100) are spread over 18 months, they represent a very substantial investment for most people in the rural areas. Yet, in Santo Domingo, generating capacity is virtually fully loaded and the coop's history indicates that generating capacity - not

the willingness of users to pay connection and membership fees has generally been the constraint. While the study confirmed that the level of electricity use varied directly with income, 84.6% of the families surveyed reported incomes of less than 6,000 suces per month (\$270 per year). Since the government's official minimum income (sueldo vital) is 4,500 suces per month, it is clear that those benefitted fall far below the national per capita income of \$910 and within the range of beneficiaries with which international development agencies are now very legitimately concerned. It is also fairly safe to surmise that at those income levels, even with extensive use of credit, people are sacrificing other important consumption items on a broad scale. It is clear that rural families want the things that electricity can bring, but their reasons are less easily sorted out.

Clearly there are long term savings in using electricity rather than batteries for radios and savings as well as greater comfort in using electricity rather than candles or kerosene for light, but these benefits alone would not seem sufficient to generate much excitement or sacrifice. In Ambato we found evidence of a direct contribution to increased income through night work on knitting and weaving, but the overwhelming home evening activities in Santo Domingo are relaxation, radio and TV. One moving sight during the trip took place in the home of a small rice farmer near Daule to whom we talked as he lay in a hammock in the main room of his small house on a Sunday afternoon. As we talked, two sons, his wife, a daughter and his father watched TV and a look of satisfaction crossed the farmer's face when his aged toothless father, at one point, jumped up grinning and gestured at the screen to call attention to a funny scene. We don't know how to value such events.

It is important to note, however, that our survey in Santo Domingo indicated that water - not electricity - was the need most often expressed by those surveyed, even among those without electricity services. Improved health, education and jobs were also prominently mentioned - indicating that the poor have learned about as much in this area as the development institutions - namely that rural electrification is only one among several important elements sought after in "integrated" rural development and for the creation of an improved quality of life.

C. Rural Electrification - A Tiny Piece in a Much Larger Puzzle

Looking backward, the efforts of A.I.D. and other international financial institutions to help the rural areas through electrification have been overshadowed by larger forces which, to some extent, could not have been foreseen - and which certainly could not have been controlled by any foreign financial institution. Most striking among these developments have been Ecuador's discovery of major oil deposits and the impact of political decisions arising from that discovery on the poor in general and the rural poor in particular. But the same forces which skewed the distribution of land and income in Ecuador appear to have shaped governmental policy on oil with the result that almost half of Ecuador's oil production is sold internally at prices which cover only about one third of the costs of production, processing and distribution. A gallon of gas in Ecuador sells for about U.S. \$0.18 and prices for kerosene and diesel fuel (85% of Ecuador's electricity is diesel-generated) are proportionate. A conservative estimate of the value of this subsidy of internal petroleum purchases is in the range of \$2 billion each year. The principal direct beneficiaries of this subsidy are clearly not Ecuador's poor, and to the extent that the poor do benefit, e.g., through indirect subsidies to public transportation, a direct subsidy from the government for that purpose would be vastly more efficient. In theory, the resources lost because of this policy could, in only a few years, go a long way toward eradicating the problems of the country's poor, but there is no assurance that if the policy were reversed tomorrow the resulting resources would in fact flow in significant part to the poor. Unfortunately, there is virtually no chance that we will find out.

Increases in petroleum and utility prices are hot political issues. During the team's visit, in fact, efforts to begin raising the price of gasoline indirectly by putting a new, higher priced grade on the market were greeted with outrage and a national transport strike by a number of opportunistic political groups. The government finally prevailed, however, and can be expected to keep moving in the right direction. A second set of subsidies, provided by artificially low government-fixed food prices, result in a further drain on rural areas for the benefit of the more powerful and better organized urban political groups. Fortunately there are also modest subsidies which operate in the opposite direction. In electrification, urban areas subsidize rural areas, to some extent through hook-up charges which are not sufficiently higher for rural residents in the areas we visited to cover additional costs. Also, commercial and industrial users (who are mainly urban) pay a 10% surcharge on their electric bills which goes to the National Rural Electrification Fund to support expansion of distribution systems into the countryside. Finally, government policy is in the process of establishing a progressive rate structure for electricity which will create incentives for energy conservation and at the same time result in benefits for the smallest residential and commercial users. The overall balance, however, for the rural areas is still strongly negative at present. Nevertheless, the government has already adopted an ambitious electrification program for the next five years which aims at vastly increasing Ecuador's use of its considerable hydroelectric potential and reversing the current dominance of thermal generation. The plan, if successfully completed would save some 6 million barrels of oil per year - or over \$200 million per year at present prices. The plan also aims to expand rural electrification to 700,000 new users - including all persons living in centers having more than 500 inhabitants. For smaller areas, the A.I.D. Mission is examining non-conventional energy sources including mini-hydro and solar applications. Meanwhile, however, small rural users of electricity may see rates triple in the next few years as a result of increased fuel costs and the government's insistence that electric companies earn an adequate return on assets. The profiles of electricity use in Santo Domingo may change markedly in the near future as these new realities are reflected but we would be surprised if large numbers of poor people do not continue to save and to sacrifice to have electricity brought to their homes. Their strong desire for electrification is a political fact of life and is probably already reflected in the ambitious electrification section of the National Development Plan 15/ which a well-organized and competent INECCEL has the capability to carry out. International lending agencies, including A.I.D., can take some credit for this self-sufficiency and probably for the intensity of demand.

V. CONCLUSIONS AND LESSONS LEARNED

1. A.I.D. programs in rural electrification have contributed to the development of market towns and service centers in Ecuador, including a substantial amount of electricity-based service to industry and commerce. While those with higher incomes appeared to make more direct use of electric power, direct and indirect benefits to the poor were substantial. These resulted principally through job creation, access to facilities for processing of agricultural production - in some cases owned by the farmers themselves - and opportunities for small commercial and artisan activities. We therefore conclude that rural electrification is an appropriate concern for A.I.D. and other development agencies as part of a strategy of integrated rural development, especially where there is significant potential for the development of market towns and regional service centers. Except in special circumstances, however, A.I.D. involvement may best be restricted to technical assistance and training rather than hardware. Indeed, while safe water, roads, education or basic health facilities may have a high claim on development resources, the development of a market town in the year 1980 can hardly be imagined without a reliable supply of electricity. The only significant issue in market town electrification is not whether to electrify, but when and how.

2. In the absence of development potential of a market town or regional service center, the claim of rural electrification on investment resources would, at first, seem to be substantially lower if analyzed in established cost-benefit terms. If, for example, the investments we observed had been limited to residential uses, benefits would have been restricted to small commercial and artisan activities in about 25% of the homes with the rest enjoying greater comfort and leisure uses of electricity - with great interest in television. In addition no significant direct applications to agricultural production were noted. Finally, the impact of electricity on social services outside of market towns, while positive, was modest. It is tempting in such circumstances to put electrification aside in favor of other basic needs, but we believe that the question deserves further study. Though safe, readily available water appears to be number one on the priority list of the rural poor in Ecuador, their strong interest in electrification and their willingness to sacrifice significant sums for connection costs and appliances are matters which do not readily find a place in cost-benefit analyses. Neither does the modernizing influence of television in remote rural areas. Because of these factors and the perception of many governments that there is important political value in extending electrification to rural areas, it may be more appropriate to view rural electrification as a significant and desirable part of a complex process of rural development - rather than as a discrete project activity to be analyzed in isolation against other discrete investment choices.

3. The cooperative form, even where successful, did not bear out the more optimistic hopes generally reposed in such institutions in that it did not catalyze significantly greater participation at the local level. This is not surprising given the history which shows that cooperativism in Ecuador was much more an A.I.D. creation than a response to a local desire. Had we not been so involved in coop promotion in the early 60's as a response to Castro's marxist model, A.I.D. might well have discovered more about the political relationship between the municipalities and the central government and designed its electrification activities to strengthen municipal and regional institutions. In any event, however, the coop approach chosen was largely doomed from the day that the Mission decided to work from the top down to create coops through INECCEL rather than attempt to build from the ground up at the local level.

4. In conducting these impact evaluations, we strongly recommend that, where possible, local social scientists be involved to conduct broad surveys of the general type undertaken as part of this study. Though our questionnaire was imperfect and the data obtained were flawed to some extent, since time did not permit the design of a truly representative stratified sample, we found the exercise an invaluable aid in confirming our own more judgmental analyses of the situation. Though all of the team members had considerable field experience and confidence in their ability to "feel out" the truth about the local situation, the survey data served as a double check against bias or hasty conclusions. In the future, with appropriate lead time, a field survey might be completed in advance of the team's arrival for the team to build upon in its own contacts rather than - as in our case - doing both simultaneously. If several studies are to be done in different countries on the same type of project, a basic questionnaire might be worked out for use in all cases, with some additions or deletions permitted to suit local circumstances and team interests. While we are skeptical that the kind of evaluations we are trying to do can really be reduced to data from questionnaires, the availability of comparative and comparable data can't hurt.

FOOTNOTES

- 1/ A detailed statement of the evaluation methodology is contained in Annex 1. The tabulated data resulting from the survey appear at Annex 8. An analysis of these data (including a fuller description of attitudes, socioeconomic characteristics and electrification uses within the area) prepared by Lic. Nelson Romero, our Ecuadorean consultant, is also available for review but is too lengthy for inclusion in this report as is a computerized cross-tabulation of significant variables. Annex 9 contains a bibliography of references used in the text of the report as well as appropriate supporting literature.
- 2/ This changed in 1961 when the Ecuadorean National Electricity Institute (INECEL) was established and given power to create and supervise a nationwide system of regional electric companies. The INECEL system and mode of operations are described in Annex 2.
- 3/ See Annex 4 for an abbreviated chronology of recent Ecuadorean political history and U.S.-Ecuadorean relations. Instability and chronic weakness of the central government have implications for electrification and energy policy generally as do the cohesion and clout of municipal and regional political groups.
- 4/ Annex 5 contains a more complete description of each of the projects.
- 5/ The original loan amount was \$1.6 million but funds designated for the Cuenca area system were deobligated when it proved impossible to negotiate conditions precedent, including one requiring a rate structure which would make the system financially viable.
- 6/ Due to changes described in Annex 5, this equipment was actually used to assist eight subprojects rather than the eleven originally planned.
- 7/ Annex 6 provides an important review of the policy context of these loans and how coops in electrification fit into a broader mission strategy to build a cooperative movement in other areas, including agriculture and credit unions.
- 8/ Capital Assistance Paper, Loan 035, p. 52.
- 9/ Title IX (a precursor of the "New Directions" legislation of 1974) was introduced into the law by Section 106 of the Foreign Assistance Act of 1966. It encouraged the agency to maximize, in its programs, the strengthening of democratic private and local government institutions.
- 10/ Socioeconomic indicators for each of the areas visited are contained in Tables 2-6 of Annex 7.
- 11/ As indicated below (See p. 12) a number of these plants could have operated profitably by investing in their own private diesel plants. Cost savings resulting from access to the coop system, however, is substantial.

- 12/ Employment of women as maids and in other service capacities may not seem to be much of an achievement in terms of development strategy. Such employment has, however, made a major contribution to individual and family welfare in an otherwise barren zone.
- 13/ See Annex 4, pp. 2-3.
- 14/ Chapter 7, Section 7.5.5, 1979 Rural Electrification Pre-Feasibility Study (Ecuador) Inter-American Development Bank.
- 15/ See Annex 3.

ANNEX 1 METHODOLOGY

The evaluation team consisted of three members, two economists and an attorney. Team members were chosen in addition to their professional qualifications on the basis of extensive field experience and fluency in Spanish. The team was supplemented by an Ecuadorian sociologist/regional planner who conducted an intensive survey involving over 600 Ecuadorian households in the Santo Domingo area, in support of the team's own work.

Upon arrival in Quito, the team spent several days refining the preliminary evaluation design prepared in Washington, identifying and interviewing officials of key government agencies (USAID/Quito had made extensive preliminary contacts and appointments), and working with the Ecuadorian social scientist on the survey and questionnaire design. Locations originally identified for site visits by the team were also modified.

The three A.I.D. rural electrification loans originally proposed to assist eleven institutions - five existing or proposed rural electric cooperatives and six electric companies, in addition to the Ecuadorian National Electricity Company. Two of these, the cooperative at Santo Domingo and the company at Santa Elena had been the object of early and intensive A.I.D. attention, beginning in 1964, and were therefore logical choices. They also presented widely varying topographies and productive and demographic characteristics. In addition, they represented an opportunity to examine possible contrasts, between the cooperative and company forms of organization as these might affect issues such as participation and character of population served. From among the remaining A.I.D.-assisted local-level institutions we chose Daule - the site of the only other rural electric cooperative which had operated for any significant time. The Daule cooperative had, however, been taken over in early 1976 by INECEL and merged into the operations of the regional company serving the area around the major port city of Guayaquil, located just 45 km. away. The reasons for the failure of the Daule cooperative, as well as any significant changes in service to the community or attitudes toward the serving institution, appeared likely to shed light on broad issues of interest to the team.

All of these areas, Santo Domingo, Daule and Santa Elena are located in the lowland coastal area of Ecuador which contains almost half of the country's population. Finally, the team chose to visit the Ambato Electric Company - an institution which had not received A.I.D. support. The city of Ambato is located in the mountainous area (Sierra) of central Ecuador which contains almost all of the remaining population (the Oriente, which we did not visit, is an extended geographic area which contains only about 3% of the population). Ambato is the center of a major agricultural area characterized by tiny farms, averaging between 1.5 and 2 hectares ^{1/}, which contrast sharply with the larger plots found in Santo Domingo, averaging about 30 hectares.

At each site we attempted to contact individuals who had played a significant historical role in the development of the local electric enterprise, representatives of local branches of government institutions such as the National Development Bank

^{1/} 1 hectare equals approximately 2.5 acres.

(agricultural credit), Ministry of Agriculture, local health and social security organizations as well as residential, commercial and industrial users and non-users of electricity from the public system. Electric enterprise data on production and distribution, numbers of users by category (residential, commercial, industrial) were obtained in each location.

The team determined that it was not feasible to attempt an intensive house-to-house survey in more than one of the four areas chosen within the time frame of the visit. The Santo Domingo area was chosen for an in-depth survey because of:

1. A.I.D.'s extended involvement there;
2. the area's burgeoning growth, both in terms of population (due in part to colonization efforts) and production; and
3. the availability of relatively good baseline data.

A 38-question, mainly closed answer questionnaire was developed in cooperation with Lic. Nelson Romero Simancas (see Annex 8), who has lived in and studied the Santo Domingo area for 14 years. The questionnaire, which was administered to over 600 households and businesses involving some 3200 persons, was directed, among other things, at identifying productive uses of electricity, impact on family and community life, income levels of users and non-users, family outlays for all forms of energy, participation in community groups, and aspirations for family and community improvement.

While Santo Domingo is not representative of the rural areas of Ecuador for a variety of reasons, the team concluded that the combined characteristics of the region, including large non-electrified areas side-by-side with electrified ones, would provide a wealth of useful data, both for this study and for broader use. The survey has been used as a significant empirical reference point for the necessarily more subjective judgments and conclusions of the team.

The last four days of the team's stay in Ecuador was spent in Quito collecting further back-up materials and writing a preliminary draft of the evaluation report.

ANNEX 2
THE ECUADOREAN ELECTRIFICATION INSTITUTE (INECEL)
AND RURAL ELECTRIFICATION

The relationships between INECEL, the companies and political leaders are determinants of how well the rural electrical part of the total system has fared in the past and will fare in the future. In addition, technical and financial matters will set the backdrop against which decisions are made.

INECEL is the key and its role in relation to regional power companies is a complex one. It is required by law to supervise the technical, accounting and financial performance of the 17 regional companies. In addition, INECEL owns over 80% of their stock. It has the power to approve the manager of each regional company, its rate schedule and its investment plans, so that in theory it has overwhelming power to determine the course of the regional companies' affairs. In practice, however, the regional companies have much more power than their position would indicate because of Ecuador's political structure. Central governments, whether military or elected, have traditionally been weak, while many of the major municipal political forces have been strong. More recently, Regional Development Authorities have also held significant power. A former high official and Director of INECEL told us that what happens in practice is that the municipios deal directly with the President of the Republic, who in turn advises the Minister to which INECEL reports that he does not want trouble with the municipios. INECEL's power is thereby seriously diluted and its ability to appoint a particular company manager or get a company to accept a particular national policy is often questionable.

Nevertheless, INECEL is the conduit for the central government investment financing that the regional companies need. These funds, coming from external borrowing, a tax on electricity sold to large commercial and industrial users, and most importantly a share of the government's oil revenues, are substantial. The last two alone provide about \$120 million per year. In addition, INECEL produces and sells bulk electricity to several regional companies that are already connected to the national grid. Such electricity is often priced below what the companies could produce it for. Thus, the regional companies need to have working relationships with INECEL.

Rural electrification is a national policy and has been for several years. It is part of INECEL's mandate. The National Development Plan for 1980-84 includes a \$67 million rural electrification program (see Annex 3) that would more than double the percentage of rural residents served by electricity (no new generation capacity would be financed in that program). The rural electrification program has the following programmatic and policy objectives:

- a. Improve living conditions of the rural population and help stem urban migration;
- b. Help increase productivity in the agriculture sector and stimulate agro-industrial activities; and
- c. Support the substitution of electric power for some traditional rural energy resources.

The team believes that these are both serious and generally accepted goals at the national level and, to a lesser extent, at the company level. Even at the company

level, however, acceptance beyond the philosophical or emotional level is hard because rural electrification is often seen as a social service at best and, at worst, a potential drain on the financial resources of the company for a very long time. Certainly, even in the Ambato company, which was the company most vocal in its commitment to rural electrification and in the Santo Domingo Cooperative, this was the case. Problems of raising utility rates to more realistic levels, discussed in the body of the report, place further constraints on the ability of INECEL and the government to marshal additional resources for the rural areas.

When seen against this background, the future course of rural electrification is not all that sure. Present progress is significant but potential major increases in petroleum and power costs could have negative or positive results for the rural poor. On the one hand it could place vast new resources at the disposal of the government which could redound to the benefit of the rural areas. On the other, more realistic electricity costs could drastically limit demand generally as well as reduce such incentives as may exist for the companies to increase the coverage of the system. Some hope exists for the future when major hydroelectric generating investments are finished and put into use. Accomplishment of the Plan's objectives for hydroelectric power would save 5.9 million barrels of petroleum per year, valued at \$200 million (at \$35 per barrel), and would ameliorate the economic and financial costs of expanding electricity services.

ANNEX 3

ELECTRICITY IN THE NATIONAL DEVELOPMENT PLAN FOR 1980-84

The National Development Plan, promulgated by the Roldos government earlier this year, lays out an ambitious investment program involving 145.4 billion sucres (\$5.39 billion at the current exchange rate) over the five year period. By way for comparison, the 1980 public sector budget called for expenditures of 28.1 billion sucres (\$1.05 billion) for the same items, but this figure includes both current and investment expenditures. The 1980 budget itself was about 15 percent above the 1979 budget in constant value terms. The investments called for in the Plan are thus significantly higher than investment budgets in the recent past.

The Plan gives high priority to expanding programs that meet the basic human needs of the 60 percent of the Ecuadorean population that is poor and that has been essentially left out of sharing in the country's economic growth process. Accomplishment of the Plan is intended to be the Government's major way of fulfilling its campaign platform of social and economic reforms.

The Plan calls for about 15 percent of total investment to go to electricity, or approximately S/.830 million. It is the single largest line item after hydrocarbon exploration, production and refining.

The electrification portion of the plan was drawn up against the following background:

1. Only 1 percent of the country's potential hydroelectric resources are being used at present.
2. Installed electric generating capacity grew by 25 percent from 1973 to 1978, from 306 Mw to 932 Mw.
3. Installed thermal generating capacity grew faster than hydroelectric capacity (28% versus 18%) because of the urgency to provide electric power and because of the availability of petroleum-based fuels.
4. About 40 percent of the population was served by electricity at the end of 1978.
5. Electricity use in 1978 was divided as follows:

Residential	39%
Commercial	15%
Industrial	33%
Other	13%
6. About 64 percent of all electricity was used in Quito and Guayaquil, including 76 percent of all industrial uses of electricity.
7. Existing tariff structures generally provide inadequate returns on investments and encourage inefficient use.

The major objectives of the electricity portion of the Plan are:

1. Rationalize and optimize the generation, transmission, distribution and use of electricity through the interconnection of generating plants and through revised tariff schedules.

2. Speed up the construction of hydroelectric plans and reduce the importance of thermal generating plants. Of the 1102 Mw of new generating capacity to be installed by the end of the period, 683 Mw will be hydroelectric. This would save 5.9 million barrels of oil per year (valued at over \$200 million at \$35 per barrel), or one-eighth of projected 1980 petroleum exports. Watershed protection and reforestation activities will be included under this portion of the Plan.

3. Extend electric service to the 700,000 rural residents now without electricity, such that 55 percent of the entire population of the country has electrical service, including all persons living in populated centers of 500 inhabitants or more. Minihydroelectric plants are contemplated in some areas, as are other non-conventional energy sources.

Investments in electricity, according to the Plan, are given in the attached Table.

These data do not include the cost of two large multiple purpose projects that will also lead to increased generating and distribution capacity, and not all of the projects here funded will be completed by the end of the period.

Electricity Investments 1980-84
(Billions of 1979 Sucres)

I.	National Interconnected System		18.9
	A. Studies and designs	1.2	
	B. Generation	14.1	
	1. Quito Gas (60 Mw)	0.3	
	2. Estero Saldo Steam (73 Mw)	0.4	
	3. Esmeraldas Steam (125 Mw)	1.3	
	4. Toachi Hydro (300 Mw)	0.4	
	5. Paute Hydro Phases A+B (500 Mw)	6.5	
	6. Agoyan Hydro (150 Mw)	3.8	
	7. Paute Hydro-Phase C (500 Mw)	0.6	
	8. Paute-Mazar	0.4	
	9. Mini-Hydro and Non-Conventional	0.5	
	C. National Transmission System	3.6	
II.	Regional Systems		1.8
III.	Rural Electrification		1.8
IV.	TOTAL		22.5

ANNEX 4

ECUADORIAN POLITICS AND U.S. - ECUADORIAN RELATIONS

Ecuador's political history has been marked by more or less chronic instability and weak central governments. After seceding from Simon Bolivar's union as part of Greater Colombia in 1830, Ecuador was governed by a rapid succession of Presidents, dictators and juntas - 40 in all during its first 95 years as an independent republic. From 1925 to 1948, Ecuador went through an even more troubled political period. No President was able to complete his term of office; there was a total of 22 Presidents or Chiefs of State. Galo Plaza Lasso (former Secretary General of the Organization of American States), elected in 1948, was the first President since 1924 to complete his constitutional 4 year term, followed by Velasco Ibarra (1952-56) and Camilo Ponce (1956-60).

Though Velasco Ibarra was again elected by a large plurality in 1960, Ecuadorian politics in the past twenty years have returned to a period of turbulence resulting, in part, from a very adverse economic situation in the early sixties. Since then, Ecuador has lived under military rule from 1963 to 1966 and again from 1972 to last year when a new constitutional President, Jaime Roldos, was elected and installed.^{1/}

The unstable nature of national politics reflects, in part, the very traditional nature of large and powerful segments of Ecuadorian society which have been resistant to change. Income distribution is highly skewed with the share of national income received by top 20% of the population ranking highest among 66 countries included in a recent World Bank compilation. In addition, the 1974 agricultural census indicated that 67% of farm families have less than 6 hectares of land - or a total of 7% of land in farms. At the other extreme, the 6.5% of farm families with 50 hectares or more controlled 66% of the land in farms. Traditional patron-peon relationships in rural areas and similar paternalistic attitudes permeate rich-poor relations in other areas, while racial and social prejudices against Indians and Blacks bar these groups from easy mobility. It must be said, however, that while this description accurately describes important elements of Ecuadorean society, there are a wide variety of other groups of a more modernizing character, many of whom are close to the present government. The very important economic benefits which have accrued to Ecuador since major oil production began in 1972 should also favor the accelerated integration of marginal groups.

In addition to the problems posed by a tradition of military intervention and pressures from traditional social and political groups, another important characteristic of Ecuadorian politics has been the relative weakness of the central government -whether or not constitutionally chosen - and the relative strength of city (Municipio) political organizations and several Regional Development Authorities. As might be expected, power relationships among these institutions and groups have played a significant role in the shaping of Ecuador's electrification plans. These influences are described in the main text of the evaluation report.

It is also important to mention the course of U.S. Ecuadorian relations in recent years because of its effects on AID's efforts in rural electrification. The principal issue between the two nations arose in 1953 when Ecuador, together with a number

^{1/} In addition Velasco Ibarra governed from 1970-72, having suspended the Constitution, with the Support of the Armed Forces.

of other countries, began to defend its claim to a 200-mile territorial sea by imposing license fees and fines on foreign fishing vessels - most of them tuna boats flying the U.S. flag. In the first years of the dispute, seizures of U.S. tuna boats were infrequent, but between 1971 and February 1975, Ecuador seized approximately 100 boats and collected fines and fees totalling over \$6 million. Since 1975, most boat owners have purchased Ecuadorean licenses, and seizures have ceased.

Major differences remain, however, between the U.S. position claiming protective jurisdiction of fishery resources up to 200 miles (excluding however, highly migratory species such as tuna) and the Ecuadorean position which makes no such exception. Progress toward a negotiated solution has been slow and broke down completely in 1971 when Foreign Military Sales and Credits to Ecuador were suspended. They were resumed in 1974.

During the critical confrontation period, however, nationalistic feelings in Ecuador ran high and close association of Ecuadoreans with U.S. programs, including those of A.I.D., was not looked on with favor. As indicated in the text, the signing of loan 035 was held up for almost two years during this period. It also appears that during this period some Ecuadoreans closely associated with the AID-initiated cooperative movement in rural electrification may have been seriously undercut by their close association with us.

The AID Mission in Ecuador apparently undertook a very strong initiative in the coop area in the sixties generally for reasons which also were related to larger international issues. Rightly or wrongly, the United States during that period feared the extension of Fidel Castro's influence to other countries in the hemisphere and especially saw Ecuador in grave danger of a marxist revolution. As part of our response, we put forward grass-roots local organizations, and especially cooperatives as a constructive alternative to traditional models of local organization. Our conversations with Mission personnel from that period indicate that a portion of the Mission was zealously, perhaps over zealously, attempting to implant cooperative organizations. This posture appears to have engendered resistance and certainly the Mission's strong belief in cooperatives was never shared by INECEL. This situation might not have had serious consequences had not INECEL been the principal implementing agency chosen by the Mission for rural electrification programs. It was, however, and the failure of the rural electric cooperative movement in Ecuador, with the sole exception of the Santo Domingo coop, resulted in part from this situation.

ANNEX 5
A.I.D. FINANCIAL ASSISTANCE FOR
RURAL ELECTRIFICATION IN ECUADOR

Between 1964 and 1972, A.I.D. extended three loans,* totalling \$5.8 million, to the Government of Ecuador to assist in financing and implementing rural electrification projects in selected parts of the country. Of this total amount, \$4.53 million was utilized and the rest deobligated. In addition to these three loans, \$873,000 of an earlier 1962, feasibility study loan ** totalling \$2.0 million was used to finance two hydroelectric studies by U.S. consultants; these formed the technical and financial basis for projects which were subsequently funded by the Inter-American Development Bank. Over a thirteen year period from 1962 to 1976, when the third rural electrification loan (035) was fully disbursed, A.I.D. loan financing of rural electrification activities in Ecuador amounted to \$5,626,000.

I. Loan 518-L-023, Rural Electric Cooperatives

This loan, amounting to \$650,000, was signed by INECCEL in August, 1964, "for the (i) construction of electric power generation, transmission and distribution facilities; (ii) the procurement of technical assistance, engineering services, materials and equipment and (iii) the extension of consumer credit for the development of the Santo Domingo Rural Electric Cooperative."

The Santo Domingo Electric Cooperative was organized with National Rural Electric Cooperative Association (NRECA) assistance prior to the 1964 A.I.D. loan. It was the outgrowth of a savings and loan cooperative which had been established by several local businessmen who were unable to secure commercial loans from the local banking community. Their initial interest in forming an electric cooperative was stimulated by activities of some 50 agricultural cooperatives which had been formed in the area as a result of GOE Agrarian Reform efforts. USAID engaged the services of an NRECA specialist in 1963 who recommended the development of an electric cooperative. In early 1964 the cooperative obtained ownership of the existing municipal electric system and began expanded operations with materials donated by U.S. rural electric cooperatives.

Proceeds from Loan 023 were used in the purchase of local and imported materials for the construction of the electric power system in the town of Santo Domingo. Work was divided into three phases. Phase "A", completed in 1967, consisted of the construction of a 1,380 kw generating plant, installation of a distribution substation and the construction of distribution networks for the urban areas of Santo Domingo. Phase "B" consisted of the construction of transmission and distribution lines along the four main approaches to Santo Domingo (from Quito, Quevedo, Chone and Quinde), thus making electric power available to rural areas adjacent to the four roads. Distribution networks in the town of Santo Domingo were also expanded under this phase of project activities. Phase "C" of the loan provided for financing to enlarge the powerhouse and provide additional distribution facilities.

* Loans 518-L-023, Rural Electric Cooperatives; Loan 518-H-025, Electric Power; Loan 518-L-035, Rural Electrification.

** Loan 518-L-017, Feasibility Studies

Complementing the loan was a \$128,000 grant which financed technical assistance from NRECA and the rehabilitation, inspection and shipping of three 450 kw generating units which had been donated from U.S. Government excess property.

Standard REA construction and engineering design was provided, assuming the establishment of centralized grid systems and accompanying distribution lines. Engineering services were performed by INECEL, and contractors were to provide labor and equipment. An NRECA specialist was assigned to the cooperative for the purpose of training and supervising management personnel, assisting the cooperative in signing up new members and coordinating engineering and construction activities.

2. Loan 518-H-025, Electric Power

In August, 1964, a \$1.6 million loan was signed with INECEL "for the expansion of generation, transmission and distribution facilities of electric power companies in Cuenca and the Santa Elena Peninsula" and for "improving the borrower's (INECEL's) capacity to plan and implement the development of the electric power systems in Ecuador". In December, 1965, AID deobligated \$900,000 of the loan, destined for the Cuenca system, in view of the low rate structure of the Cuenca Power Company which was inadequate to cover operating costs, including depreciation and debt servicing. Of the remaining \$700,000, approximately half went for improvement of the Santa Elena Power Company and the other half to INECEL.

Prior to the 1964 AID loan, each small town in the area had a thermal plant, supplying power, at night if it were operational and if fuel were available. Many residences, hotels and businesses had their own generating units.

The loan provided \$335,000 to the Santa Elena Power Company to purchase materials for the installation of four generating units, purchased through an EXIMBANK loan, with a total capacity of 3,600 kw. In addition, the loan financed a total of 20 km. of subtransmission lines from La Libertad to Salinas and the tourist resort of Punta Carnero. The installation of a 5,000-KVA substation and construction of distribution lines in the towns of La Libertad, Salinas, Santa Elena and Ballenita were also financed, as was the installation of 400 kw station and distribution network in Playas and surrounding villages.

The remaining \$365,000 was used by INECEL in support of projects such as procurement of technical assistance and purchase of construction and communication equipment and office machines.

3. Loan 518-L-035, Rural Electrification

The third AID loan in the area of rural electrification was authorized in June, 1970, after a favorable evaluation of the two previous loans. It was not signed with the GOE until May, 1972, however, after two years' delay as a result of political problems between the two governments. Disbursements began in 1975. The loan, for \$3.55 million, contemplated the "planned expansion of two existing electric cooperatives (Santo Domingo and Daule), six electric companies (Santa Elena, Esmeraldas, Cuenca, El Oro, Los Rios and Milagro) and the organization and development of three new electric cooperatives (Quinde, Tena and Macas)." In addition to the construction of electric generation, transmission and distribution facilities, technical assistance was to be provided to INECEL in organizing and operating a rural electric cooperative department.

Of the anticipated eleven sub-projects, the loan actually assisted eight, six on the coast and two in the oriente. The two existing cooperatives received financial assistance to increase their transmission and distribution facilities (Santo Domingo and Daule), but in 1976 INECEL took over the Daule cooperative; it is now subsumed under INECEL-Guyas operations headquartered in Guayaquil. No new cooperatives were actually formed, the proposed Tena and Macas cooperatives having been financed as companies. Of the then existing companies, only Santa Elena, Esmeraldas, Los Rios and Milagro were assisted under the loan.

The loan basically financed the import of commodities, including the following; (i) power transformers for 19 substations with a total capacity of 75.3 MVS; (ii) 278 km. of 69 KV transmission line; (iii) 1,058 km. of 13.8 KV transmission line; (iv) distribution systems with a capacity of approximately 34,000 new user connections; (v) 7 construction and maintenance vehicles and (vi) 22 lineman tool kits. In addition, the loan financed NRECA assistance to INECEL, providing for advisory services in the organization of electric utilities.

ANNEX 6

POLICY OVERVIEW OF AID INVOLVEMENT IN RURAL ELECTRIFICATION

1. Purposes and Goals of A.I.D. Assistance in Rural Electrification

A.I.D.'s involvement in rural electrification in Ecuador was conceived and largely implemented in the pre "New Directions" era. A.I.D. personnel of the 1980's, reading the Project Papers (CAPs) developed during the early to late 1960's, will be immediately struck by the overwhelmingly technical approach taken by the project development teams, with relatively little attention given to examining the socioeconomic characteristics of the population to be benefitted or the intended linkages between the institutional development of INECEL and the development of areas predominated by the rural poor. Indeed, the terms "rural poor" and "target group" - standard terminology in the 1980 A.I.D. lexicon - do not appear in any project documentation reviewed by the evaluation team.*

The overall goal, stated simply, was to electrify - both rural areas and their adjacent urban and semi-urban populations. The linkages between such electrification and improved economic conditions, increased agricultural production and improved general welfare, etc. were not examined with any degree of detail or precision; they were, rather, implicitly-assumed. In short, the A.I.D. projects were designed in an era when one of the Agency's major emphases was in developing infrastructure, and rural electrification was seen as one more input into providing a minimally acceptable level of rural infrastructure which would lead to an improved level of general welfare.

How all of this was to be accomplished (i.e., the projects' purposes) is even less evident from reviewing relevant documentation. For example, the strengthening of recipient electric companies and cooperatives, as well as providing assistance to INECEL, was an obvious implicit purpose of the A.I.D. rural electrification package, yet the overwhelming bulk of project inputs was measured in tangibles such as kilometers of transmission lines, numbers of distribution systems, and other commodities.

Under the first loan, 023, which strengthened the Santo Domingo Rural Electric Cooperative, the National Rural Electric Cooperatives Association (NRECA) was contracted to provide technical assistance, but neither the purpose nor the eventual outcome of the contract is evident. In the second loan, 025, which assisted the Santa Elena Electric Company, a total of \$365,000 was made available to INECEL for the purpose of "procurement or technical assistance and purchase of construction and communication equipment and office machines." The actual "technical assistance" portion amounted to contracting the Middle West Service Company to assist INECEL personnel in the United States. The majority of these funds, however, went into the purchase of line construction equipment, communications and office equipment and maintenance, transportation and construction equipment.

* The third project in the series, 035, went the farthest in trying to spell out the linkages between rural electrification, institutional development and social change. The arguments, however, were primarily directed towards fomenting the increased use of cooperatives - which A.I.D. strongly favored in Ecuador - as a vehicle of rural electrification.

The final loan, 035, which was designed to assist a total of eleven electric cooperatives and companies went the farthest in trying to articulate a rationale which linked both social and political objectives with the project's activities.

Two sections of the CAP, "Electric Power and Social Change" and "Social Development Implications of Cooperative Electrification," while they would not meet the requirements of a "Social Soundness" analysis in a "New Directions" Project Paper, attempt to deal in a qualitative manner with the developmental aspects of rural electrification. In the former section, the CAP notes:

"Access to electric power in rural areas contributes in many ways to accelerate the process of social change and modernization.... Several areas of human activity can be identified as most susceptible to these influences."

The section goes on to enumerate these areas, including: (a) eliminating some of the most obvious disadvantages of country living; (b) providing constructive alternatives and opportunities in the areas of cultural development and education; (c) increasing aspirations and consumption levels; and (d) bringing professional services to the rural areas."

In the CAP section on "Social Development Implications of Cooperative Electrification" a number of reasons are cited for opting for the cooperative model, including management concerns, and the unique contribution which cooperatives have had in the formation of other types of community action programs. The final paragraph of the section, however, probably gets the closest to articulating one of the major purposes behind A.I.D.'s rural electrification efforts in Ecuador, a purpose which linked development, institutional and political goals:

"The provision of electric power brings to a rural area a resource unique in its potential for changing community life. When power is provided through a proven social institution - the cooperative - this potential for change has the best chance to contribute to the formation of an increasingly responsive and responsible democratic society."

2. Strategy of A.I.D. Rural Electrification Programs

A.I.D.'s rural electrification strategy in Ecuador may best be seen in the perspective of its overall programming strategy throughout the 1960's. In Judith Tendler's study "A.I.D. and Small Farmer Organizations: Lessons of the Ecuadorean Experience" (LA/DP:1976), it is noted that during the 60's, A.I.D., almost exclusively, limited its assistance to Ecuador to support cooperative forms of organizations. The study provides an exhaustive summary of A.I.D. involvement with Ecuadorean agriculture and credit cooperatives during the 1960's, culminating in two loans of \$1.2 million each (in 1965 and 1969) to set up and financed an Ecuadorean cooperative bank. In 1965, A.I.D. contracted with the Cooperative League of the U.S.A. (CLUSA) to develop an agricultural cooperative program, and was also instrumental in the development of a rice growers federation.

Tendler points out that A.I.D. almost exclusively focused upon cooperatives as a way to work on political development as well as economic development, through promotion of grass roots decision-making. This decision was largely based on the successes of the U.S. cooperative movement. As a result, notes Tendler, "the A.I.D. decision to start working with small farmers through United States type cooperatives and credit unions was more a result of happenings in the United States than of thinking about agricultural development in Latin America."

While A.I.D.'s assistance in the field of rural electrification was not limited to cooperatives, the implicit strategy was to assist the GOF in an eventual cooperativization of rural electric endeavors. The first two loans, supporting the Santo Domingo Rural Electric Cooperative and the Santa Elena Electric Company, respectively, were probably equally successful in terms of meeting the specified technical objectives. The third loan, which originally was to assist eleven electric entities, was almost equally divided between cooperatives and companies (five and six, respectively). A careful reading of the 035 CAP, however, reveals a strong bias towards the cooperative route as a viable vehicles for rural electriciation programs. The purpose reads:

"The purpose of the project is to give an impulse to the development of Ecuador through rural electrification and to expand and strengthen the cooperative movement, thus achieving an economic development effect as well as social development implicit in the cooperative movement."

Somewhat later, the CAP goes on to cite that:

"The specific objectives will be to provide a strong and expanded rural electrification program by financing generating and distribution equipment and providing technical assistance especially in the formation and development of electric cooperatives...

"...in social development terms, the value of cooperatives as a vehicles for social development does not require elaboration nor does the impact of the availability of electricity on the lives of rural dwellers require emphasis."

The loan's projects \$121,700 technical assistance program consisted of "advice to INECEL in the formation of its electric cooperative section and assistance in the organization and early development phases of the new cooperatives."

ANNEX 7
STATISTICAL ANNEX

Table /

IMPACT OF RURAL ELECTRIFICATION IN FOUR AREAS OF ECUADOR

AREAS:	IMPACT ON INCOME LEVELS OF RURAL INHABITANTS:			IMPACT ON PROVISION OF SOCIAL SERVICES TO RURAL AREAS:		ABILITY TO MOBILIZE LOCAL RESOURCES	BUILDING OF PARTICIPATORY INSTITUTIONS:
	Agriculture	Commerce	Industry	Health	Education		
Santo Domingo	N	M	H	L	M	H	M
Cauce	N	M	M	L	L	M	L+
Santa Elena	N	H	M	L	L	L	N
Ambato	L	L	H	H	H	M	N/O

AREAS:	ABILITY TO LOBBY EFFECTIVELY WITH CENTRAL GOVERNMENT	IMPACT ON RURAL WOMEN:		AVAILABILITY AND COST OF ENERGY:	DEVELOPMENT OF GROWTH POLES:	IMPACT ON NATIONAL ECONOMY:
		Income	Freeing Time			
Santo Domingo	M	L	M	H	H	H
Cauce	N/O	L	L	M	N	M
Santa Elena	N/O	M	L	M+	L	M
Ambato	Neg.	H	M	M	H	H

Key: H - High Impact Neg. - Negative Impact
M - Medium Impact N/O - Not Observed
L - Low Impact
N - Neutral

Explanation: The categories established in the key and used in the table represent a very approximate attempt to quantify and display in comparative form the impact of electrification by area and subject matter. Because of the variety of subject matter dealt with in the table, it is not useful to attempt to define each letter category. H, M and L obviously indicate positive impacts on a descending scale. N indicates no impact while Neg. indicates an unfavorable or weakening effect of electrification. For statements describing the specific results leading to the letter ratings see the main text of the report.

AREAS OF SANTO DOMINGO, DAULE, SANTA ELENA, AND AMBATO

Eight Rural Level of Living Indicators, by Cantón, 1974

- (1) Annual Cash Income Per Capita (sucres)
 (2) Farm Units with Less than 1 Hectare (percent)
 (3) General Mortality Rate (deaths per 1000 population)
 (4) Infant Mortality Rate (deaths per 1000 live births)
 (5) Housing Units without Piped Water (percent)
 (6) Housing Units without Electricity (percent)
 (7) Illiteracy, Persons 10 Years of Age and Over (percent)
 (8) Persons 6-12 Years Old Not Attending School (percent)

PROVINCE AND CANTON	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PICHINCHA								
Santo Domingo	6,059	31.5	8.1	72.4	76.4	66.1	22.4	27.7
TUNGURAHUA								
Ambato	3,885	57.5	14.9	121.1	88.1	72.7	35.7	27.0
Baños	2,956	28.6	14.7	96.5	34.2	48.5	17.2	16.7
Patate	24,670	33.6	17.7	63.3	67.2	81.8	32.7	20.2
Pelileo	3,178	59.2	15.8	72.9	55.5	75.5	29.7	23.5
Píllaro	17,205	55.8	26.0	127.0	66.1	83.0	33.0	24.3
GUAYAS								
Daule	4,601	34.1	7.9	73.5	97.8	84.9	41.1	41.8
Salinas	2,270	94.1	10.6	130.4	91.8	29.1	12.6	18.0
Santa Elena	5,665	25.2	9.8	75.9	92.9	66.5	18.6	19.6

SOURCE: Luzuriaga and Zuvekas, "Income Distribution and Poverty in Rural Ecuador: A Survey of the Literature, 1950-1979", prepared for Rural Development Division, Bureau for Latin America and the Caribbean, AID.

Cantón of Santo Domingo
Province of Pichincha

	1975		1980		Change 1975-80	
	No.	%	No.	%	No.	%
1. <u>Population</u>						
a. Total	111,808	100.0	160,374	100.0	48,566	43.0
b. Urban	34,728	31.1	51,377	32.0	16,649	47.9
c. Rural	77,080	68.9	108,997	68.0	31,917	41.4

2. Age Structure of Population, (1974) Urban and Rural

Age Group	Urban		Rural		Total	
	No.	%	No.	%	No.	%
a. 0-4	5,098	16.7	13,341	18.4	18,439	17.9
b. 5-14	8,800	28.8	20,907	28.8	29,707	28.8
c. 15-19	3,388	11.1	7,730	10.6	11,118	10.8
d. 20-49	11,046	36.2	25,596	35.2	36,642	35.4
e. 50+	2,191	7.2	5,118	7.0	7,309	7.1
f. Total	30,523	100.0	72,692	100.0	103,215	100.0

3. Population 6 yrs. and over, (1974) by Highest Education Level, Urban and Rural

	Urban		Rural		Total	
	No.	%	No.	%	No.	%
a. Partial Primary	8,705	35.6	23,314	41.1	32,019	39.5
b. Full Primary*	9,839	40.2	13,937	24.6	23,776	29.3
c. Full Secondary	1,216	5.0	625	1.1	1,841	2.3
d. Superior	283	1.2	215	0.4	498	0.6
e. No education or not declared	4,407	18.0	18,591	32.8	22,998	28.3
f. Total	24,450	100.0	56,682	100.0	81,132	100.0

* "Full Primary" includes pop. with some, but not all, secondary

4. Economically Active Population, 12 yrs. and over, (1974), Urban and Rural

	Urban		Rural		Total	
	No.	%	No.	%	No.	%
a. Agriculture, Mining	1,408	16.0	19,802	83.8	21,210	65.3
b. Industry, Const.	1,822	20.6	1,758	7.4	3,580	11.0
c. Commerce, Transport	2,610	29.6	847	3.6	3,457	10.6
d. Finance, Services	2,240	25.4	822	3.5	3,062	9.4
e. Others	745	8.4	410	1.7	1,155	3.7
f. Total	8,827	100.0	23,639	100.0	32,466	100.0

5. Agriculture Land Tenancy and Average Size, (1974)

	No. Units	%	No. Has.	%	Average Size Has.
a. Owner	6,014	77.4	245,107	83.3	40.7
b. Rented	220	2.8	4,981	1.7	22.6
c. Occupied w/o title	1,083	13.9	28,382	9.6	26.2
d. Other	454	5.9	15,754	5.4	45.7
e. Total	7,771	100.0	294,224	100.0	37.8

TABLE 4
Canton of Daule
Province of Guayas

	1975		1980		Change: 1975-80	
	No.	%	No.	%	No.	%
1. Population						
a. Total	124,901	100.0	144,571	100.0	19,670	15.7
b. Urban	14,454	11.5	18,154	12.5	3,700	25.5
c. Rural	110,447	88.5	126,417	87.5	15,970	14.4
2. Age Structure of Population (1974) Urban and Rural						
Age Group:	Urban		Rural		Total	
	No.	%	No.	%	No.	%
a. 0-4	2,000	15.1	18,613	16.8	20,613	16.6
b. 5-14	3,889	29.5	33,617	30.3	37,506	30.2
c. 15-19	1,499	11.3	11,902	10.8	13,401	10.8
d. 20-49	4,503	34.1	36,487	32.8	40,990	33.1
e. 50+	1,279	10.0	10,301	9.3	11,580	9.3
f. Total	13,170	100.0	110,920	100.0	124,090	100.0
3. Population 6 yrs. and over (1974) by Highest Education Level, Urban and Rural						
	Urban		Rural		Total	
	No.	%	No.	%	No.	%
a. Partial Primary	3,907	36.2	29,899	33.8	33,806	34.1
b. Full Primary*	4,015	37.3	15,076	17.0	19,091	19.2
c. Full Secondary	494	4.6	506	.6	1,000	1.0
d. Superior	167	1.5	151	.2	318	.3
e. No education or not declared	2,195	20.4	42,807	48.4	45,002	45.4
f. Total	10,778	100.0	88,439	100.0	99,217	100.0
* "Full Primary" includes pop. with some, but not all, secondary						
4. Economically Active Population, 12 yrs. and over (1974) Urban and Rural						
	Urban		Rural		Total	
	No.	%	No.	%	No.	%
a. Agriculture, Mining	1,094	33.0	27,583	85.9	28,677	80.9
b. Industry, Construction	499	15.0	894	2.8	1,393	3.9
c. Commerce, Transport	875	26.4	1,461	4.5	2,336	6.6
d. Finance, Service	520	15.7	655	2.0	1,175	3.3
e. Others	330	9.9	1,528	4.8	1,858	5.3
f. Total	3,318	100.0	32,121	100.0	35,439	100.0
5. Agriculture Land Tenancy and Average Size (1974)						
	No. Units		No. Has.		Average Size Has.	
		%		%		
a. Owner	5,637	54.2	93,192	81.3	16.5	
b. Rented	3,297	31.7	5,814	5.1	1.8	
c. Occupied w/o title	745	7.2	5,308	4.6	7.1	
d. Other	712	6.9	10,282	9.0	14.4	
e. Total	10,391	100.0	114,596	100.0	11.0	

TABLE 5

Cantons of Santa Elena and Salinas (continued)Province of Guayas

	1975				1980				Change:	
	1975		1980		1975-80					
	No.	%	No.	%	No.	%	No.	%	No.	%
1. <u>Population</u>										
a. Total	129,335	100.0	155,554	100.0	26,219	20.3				
b. Urban	22,178	17.1	29,176	18.8	6,998	31.6				
c. Rural	107,157	82.9	126,378	81.2	19,221	68.4				
2. <u>Age Structure of Population (1974), Urban and Rural</u>										
Age Group:	Urban		Rural		Total					
	No.	%	No.	%	No.	%	No.	%	No.	%
a. 0-4	3,252	16.3	14,883	16.4	18,135	16.3				
b. 5-14	5,578	27.9	24,951	27.4	30,529	27.5				
c. 15-19	2,320	11.6	9,509	10.4	11,829	10.7				
d. 20-49	7,176	36.0	32,250	35.4	39,426	35.5				
e. 50+	1,633	8.2	9,424	10.4	11,057	10.0				
f. Total	19,960	100.0	91,016	100.0	110,976	100.0				
3. <u>Population 6 yrs. and over (1974) by Highest Education Level, Urban and Rural</u>										
	Urban		Rural		Total					
	No.	%	No.	%	No.	%	No.	%	No.	%
a. Partial Primary	5,958	36.9	29,900	43.9	35,858	42.5				
b. Full Primary*	6,406	39.7	22,006	32.3	28,412	33.7				
c. Full Secondary	1,255	7.8	1,964	2.9	3,219	3.8				
d. Superior	303	1.9	587	.8	890	1.0				
e. No education or not declared	2,200	13.7	13,685	20.0	15,885	19.0				
f. Total	16,122	100.0	68,142	100.0	84,264	100.0				
• "Full Primary" includes pop. with some, but not all, secondary										
4. <u>Economically Active Population, 12 yrs. and over, (1974) Urban and Rural</u>										
	Urban		Rural		Total					
	No.	%	No.	%	No.	%	No.	%	No.	%
a. Agriculture, Mining	768	13.8	9,601	41.6	10,369	36.2				
b. Industry, Const.	1,629	29.3	4,284	18.6	5,913	20.6				
c. Commerce, Transport	755	13.6	3,583	15.5	4,338	15.1				
d. Finance, Services	1,705	30.6	2,705	11.7	4,410	15.4				
e. Others	704	12.7	2,902	12.6	3,606	12.7				
f. Total	5,561	100.0	23,075	100.0	28,636	100.0				
5. <u>Agriculture Land Tenancy and Average Size (1974)</u>										
	No. Units	%	No. Has.	%	Average Size Has.					
a. Owner	3,118	65.9	40,008	78.6	12.8					
b. Rented	41	.8	232	.4	.2					
c. Occupied w/o title	1,146	24.2	4,483	8.8	3.9					
d. Other	423	9.1	6,173	12.2	14.6					
e. Total	4,728	100.0	50,896	100.0	10.8					

TABLE 6

Province of Tungurahua (Ambato)

	1975		1980		Change: 1975-80	
	No.	%	No.	%	No.	%
1. Population						
a. Total	297,108	100.0	329,630	100.0	32,522	10.9
b. Urban	100,799	33.9	119,243	36.2	18,444	18.3
c. Rural	196,309	66.1	210,387	63.8	14,078	7.2
2. Age Structure of Population (1974), Urban and Rural						
Age Group:	Urban		Rural		Total	
	No.	%	No.	%	No.	%
a. 0-4	12,732	13.6	28,670	15.4	41,402	14.8
b. 5-14	25,622	27.4	48,719	26.2	74,341	26.6
c. 15-19	10,978	11.7	16,984	9.1	27,962	9.4
d. 20-49	32,381	34.6	62,610	33.6	94,991	33.9
e. 50+	11,955	12.7	29,269	15.7	41,224	15.3
f. Total	93,668	100.0	186,252	100.0	279,920	100.0
3. Population 6 yrs. and over (1974) by Highest Education Level, Urban and Rural						
	Urban		Rural		Total	
	No.	%	No.	%	No.	%
a. Partial Primary	23,918	30.6	50,510	33.4	74,428	32.4
b. Full Primary	32,06	41.0	39,115	25.9	71,184	31.0
c. Full Secondary	7,71	9.9	1,432	0.9	9,147	3.9
d. Superior	3,0'6	3.9	541	.4	3,597	1.5
e. No education or not declared	11,325	14.6	59,787	39.4	71,112	31.2
f. Total	78,190	100.0	151,278	100.0	229,468	100.0
4. Economically Active Population, 12 yrs. and over (1974), Urban and Rural						
	Urban		Rural		Total	
	No.	%	No.	%	No.	%
a. Agriculture, Mining	1,941	6.8	41,572	72.8	43,513	51.2
b. Industry, Construction	7,649	26.6	7,025	12.9	14,674	16.9
c. Commerce, Transport	6,482	22.6	2,253	3.9	8,735	10.1
d. Finance, Services	10,342	36.0	4,312	7.5	14,654	16.9
e. Others	2,315	8.0	1,725	2.9	4,040	4.9
f. Total	28,729	100.0	57,887	100.0	86,616	100.0

ANNEX 8
SURVEY RESULTS

SOCIOECONOMIC INVESTIGATION TO DETECT THE IMPACT OF THE RURAL ELECTRIFICATION IN THE AREA OF SANTO DOMINGO

	I N V E S T I G A T I O N		A R E A S		Urban area %	Totals	%
	#1: STO. DOMINGO	QUINIMBO	#2: STO. DOMINGO	QUEVEDO			
Table No. 1							
SEX							
1. Men	640	838	350	814	318	1,310	52.6
2. Women	520	465	335	464	237	1,315	52.1
Sub Total	1,160	1,303	685	1,278	555	2,623	100.0
Table No. 2							
Age							
4: 6 or less	182	140	115	125	105	499	45.4
5: 6 - 12	218	190	122	177	112	610	48.8
6: 13 - 18	135	118	123	145	108	476	44.2
7: 19 - 24	122	107	84	115	85	382	36.2
8: 25 - 34	195	110	91	135	70	391	44.8
9: 35 - 44	180	140	97	141	101	349	43.8
10: 45 +	131	116	70	113	85	269	31.6
Sub Total	1,180	1,066	687	1,000	607	2,295	100.0
Table No. 3							
Place of Birth							
1: CACHA	4	14	6	6	0	26	1.1
2: INABURRA	0	8	6	9	0	23	0.9
3: PICHINCHA	102	381	128	265	11	526	20.0
4: COTACACHI	16	82	83	83	8	252	9.7
5: TUNABURRA	18	24	6	8	6	52	2.0
6: BOLIVAR	1	21	6	2	6	36	1.4
7: CHIGORAZO	3	14	13	12	7	49	1.9
8: CARRIZO	0	0	1	1	1	6	0.2
9: SANTA	40	41	23	38	5	147	5.6
10: SORIANO	5	19	50	53	3	127	4.9
11: TUPACATSI	25	40	5	41	0	111	4.3
12: MARIPE	114	302	136	183	0	635	24.2
13: SAN CARLOS	11	21	52	46	3	133	5.1
14: EL OCHO	4	15	1	17	4	37	1.4
15: Others	14	15	20	31	4	84	3.2
Sub Total	400	1,490	480	1,066	104	2,046	100.0

Total	%
10	1.2
30	1.1
1,310	50.0
1,315	50.0
2,625	100.0
227	8.6
59	2.2
4	0.1
30	1.1
114	4.3
31	1.1
163	6.2
408	15.5
11	0.4
62	2.3
68	2.6
3,245	100.0

	Nº1 STO DOMINGO - QUINISE	Nº2 STO DOMINGO - CUEVEDO	Nº3 STO DOMINGO - ALLRUCQUI	Nº4 STO DOMINGO -	Urban Area	TOTALES	%
the zone	824	824	314	187	300	1,252	38.4
	16.5	33.0	38.1		33.0	1,036	31.6
	387	293	245	201	230	534	17.4
	147	157	137	59	8.0	248	7.6
	65	50	64	30	5.0	115	3.5
	6	39	36	9	1.5	22	0.8
	5	10	2	1	0.2	9	0.3
	4	1	3				
	1,140	687	824	607	100.0	3,255	100.0
years or more							
uction	97	50	120	7	11.5	270	10.0
	314	160	243	131	23.0	683	30.1
	380	241	262	122	21.5	1,067	36.0
	401	96	62	122	21.2	381	13.6
	52	40	37	47	8.6	142	6.1
	16	5	6	21	2.1	38	1.4
	2	1	1			5	0.3
	988	594	732	502	100.0	2,786	100.0
during the last 6 months							
	119	77	26	18	5.0	137	8.2
	9	15	34	20	3.0	70	3.2
Job	209	198	224	127	45.0	518	26.2
	116	87	90	59	22.5	382	16.2
	291	157	157	84	21.5	673	32.2
	143	472	531	390	100.0	2,136	100.0
ation	124	65	122	30	5.0	336	15.7
	52	16	64	8	2.0	140	7.0
	17	41	28	13	3.0	99	4.6
	99	55	44	40	15.0	238	10.2
	33	39	33	23	45.0	202	9.5
	14	6	6	11	2.0	66	3.0
	389	217	234	105	53.0	1,075	50.0
	383	313	333	250	100.0	1,356	100.0

Table No. 8 Type of work		Mts STO DOMINGO - DOMINICA		Mts STO DOMINGO - QUEVEDO		Mts STO DOMINGO - BARRIAQUIN		Urban area		TOTALS	
	%		%		%		%		%		%
1. owner	49	49	6.5	33	6.0	25	6.0	44	8.9	44	2.0
2. own account	170	170	20.7	140	26.0	107	27.0	157	31.4	157	7.0
3. salaried	103	103	14.4	66	14.0	54	14.0	65	13.2	65	3.0
4. unpaid	414	414	55.7	309	67.4	147	38.0	181	36.4	181	8.0
5. other	5	5	0.8	3	0.7	1	0.3	1	0.2	1	0.0
sub total		413	100.0	413	100.0	390	100.0	390	100.0	413	100.0
Table No. 9		sub total		sub total		sub total		sub total		sub total	
Hours worked per day		1.1 or 0		1.1 or 0		1.1 or 0		1.1 or 0		1.1 or 0	
1.1	44	44	10.7	31	7.5	18	4.6	2	0.4	49	1.0
1.4	14	14	3.4	16	3.9	16	4.1	3	0.6	66	1.6
1.5	456	456	110.5	405	98.1	413	105.9	403	103.1	454	10.9
1.6	30	30	7.3	20	4.8	27	6.9	41	10.5	38	0.9
1.7	40	40	9.7	32	7.8	15	3.8	5	1.3	65	1.6
1.8	37	37	9.0	32	7.8	13	3.3	4	1.0	140	3.4
1.9	17	17	4.1	10	2.4	3	0.8	4	1.0	44	1.1
2.0	147	147	35.6	154	37.3	137	35.1	137	35.1	147	3.6
2.1	136	136	32.9	129	31.2	84	21.5	127	32.6	136	3.3
sub total		413	100.0	413	100.0	390	100.0	390	100.0	413	100.0
Table No. 10		sub total		sub total		sub total		sub total		sub total	
Activities at 6PM		1. Rest		1. Rest		1. Rest		1. Rest		1. Rest	
1. Rest	446	446	108.0	303	73.4	329	84.4	426	109.2	446	108.0
2. Listen the radio	33	33	8.0	50	12.1	66	16.9	25	6.4	41	10.0
3. Watch TV	133	133	32.2	54	13.1	38	9.7	208	52.9	151	36.6
4. Work in house	39	39	9.4	41	10.0	30	7.7	45	11.5	45	11.0
5. Work outside house	2	2	0.5	41	10.0	8	2.1	18	4.6	44	10.7
sub total		413	100.0	413	100.0	390	100.0	390	100.0	413	100.0
Table No. 11		sub total		sub total		sub total		sub total		sub total	
Monthly income (Sucre)		1. 500 or less		1. 500 or less		1. 500 or less		1. 500 or less		1. 500 or less	
1. 500 or less	3	3	0.7	1	0.2	2	0.5	1	0.3	3	0.7
2. 500 - 1000	10	10	2.4	1	0.2	6	1.5	4	1.0	18	4.4
3. 1000 - 1500	26	26	6.3	10	2.4	8	2.1	4	1.0	39	9.4
4. 1500 - 2000	44	44	10.7	10	2.4	18	4.6	9	2.3	51	12.4
5. 2000 - 3000	16	16	3.9	34	8.2	10	2.6	12	3.1	28	6.8
6. 3000 - 4000	53	53	12.8	23	5.6	30	7.7	32	8.2	65	15.7
7. 4000 - 5000	14	14	3.4	12	2.9	4	1.0	4	1.0	18	4.4
8. 5000 - 6000	14	14	3.4	12	2.9	4	1.0	4	1.0	18	4.4
9. 6000 - 7000	14	14	3.4	12	2.9	4	1.0	4	1.0	18	4.4
10. 7000 - 8000	14	14	3.4	12	2.9	4	1.0	4	1.0	18	4.4
11. 8000 - 9000	14	14	3.4	12	2.9	4	1.0	4	1.0	18	4.4
12. 9000 - 10000	14	14	3.4	12	2.9	4	1.0	4	1.0	18	4.4
13. 10000 or more	14	14	3.4	12	2.9	4	1.0	4	1.0	18	4.4
sub total		413	100.0	413	100.0	390	100.0	390	100.0	413	100.0
Table No. 12		sub total		sub total		sub total		sub total		sub total	
Percentage of population		1. 100%		1. 100%		1. 100%		1. 100%		1. 100%	
1. 100%	14	14	3.4	12	2.9	4	1.0	4	1.0	18	4.4
2. 90%	14	14	3.4	12	2.9	4	1.0	4	1.0	18	4.4
3. 80%	14	14	3.4	12	2.9	4	1.0	4	1.0	18	4.4
4. 70%	14	14	3.4	12	2.9	4	1.0	4	1.0	18	4.4
5. 60%	14	14	3.4	12	2.9	4	1.0	4	1.0	18	4.4
6. 50%	14	14	3.4	12	2.9	4	1.0	4	1.0	18	4.4
7. 40%	14	14	3.4	12	2.9	4	1.0	4	1.0	18	4.4
8. 30%	14	14	3.4	12	2.9	4	1.0	4	1.0	18	4.4
9. 20%	14	14	3.4	12	2.9	4	1.0	4	1.0	18	4.4
10. 10%	14	14	3.4	12	2.9	4	1.0	4	1.0	18	4.4
sub total		413	100.0	413	100.0	390	100.0	390	100.0	413	100.0

	NS4	STO DOMINGO	CAJINDE	NS2	STO DOMINGO	CAJUEVO	NS3	STO DOMINGO	ALLIQUIN	NS4	STO DOMINGO	Urban	TOTALES	%
			%			%			%			%		%
Table No. 23														
Monthly payment														
1. 0 - 20		3	4.9		4	4.5		2			2	2.0	5	1.2
2. 20 - 50		10	15		5	5.3		7	11.9		7	6.9	23	5.7
3. 50 - 75		8	12		5	5.2		7	11.9		6	5.9	31	7.5
4. 75 - 99		4	6		5	5.2		7	11.9		4	3.6	21	5.2
5. 100 - 200		23	35.6		31	33.2		20	31.0		38	35.2	105	26.3
6. 201 - 500		44	68.4		50	54.2		16	24.3		3	2.8	121	30.0
7. 501 - 1000		6	9.2		7	7.5		0			3	2.8	10	2.5
8. 1000 + MS.		2	3		6	6.8		0			2	1.8	8	2.0
Sub Total		110	100.0		68	100.0		54	100.0		101	100.0	403	100.0
Table No. 24														
When did you receive electricity														
1. 1955 or before														
2. 1956 - 1958														
3. 1959 - 1960														
4. 1961 - 1965														
5. 1966 - 1970														
6. 1971 - 1975														
7. 1976 - 1980														
Sub Total		110	100.0		68	100.0		54	100.0		101	100.0	403	100.0
Table No. 25														
Do you belong to any association														
1. yes		51	46.4		25	36.8		61	58.8		34	32.4	138	34.2
2. no		59	53.6		43	63.2		93	81.2		67	63.6	265	65.8
Sub Total		110	100.0		68	100.0		154	100.0		101	100.0	403	100.0
Table No. 26														
What kind of organization														
1. AG coop.		5	4.5		3	4.4		3	4.4		3	2.9	11	2.7
2. elect. coop.		1	0.9		3	4.4		0			4	3.8	14	3.5
3. housing coop.		10	9.1		3	4.4		18	13.6		10	9.4	38	9.4
4. workers union		0			1	1.5		3	2.2		3	2.9	11	2.7
5. livestock assoc.		3	2.7		6	8.8		4	3.0		4	3.8	15	3.7
6. small industry groups		0			1	1.5		3	2.2		3	2.9	11	2.7
7. Other		31	28.2		4	5.9		1	0.7		4	3.8	15	3.7
Sub Total		110	100.0		68	100.0		64	47.4		34	31.7	138	34.2

FUENTE: INSTITUCION BANCARIA EN EL NOROCCIDENTE DE GUATEMALA, S.A.

	Nº 4 STO DORINGO	QUINDE	Nº 2 STO DOMINGO	QUEVEDO	Nº 3 STO DOMINGO	ILLUZIONIN	Nº 4 STO DOMINGO	Urban area	TOTALES	%
Table No. 27										
Principal problems of the community										
1. water	327	37.4	109	37.1	149	38.7	32	22.8	537	29.7
2. sewerage	344	29.4	73	21.2	40	12.0	58	47.5	412	22.8
3. electricity	323	14.9	46	13.9	40	32.5	37	41.3	318	17.4
4. employment	64	6.5	23	6.6	58	16.8	34	40.8	181	10.0
5. health	113	44.3	45	13.6	-	-	62	49.3	235	12.5
6. education	49	5.8	30	9.1	-	-	51	46.2	224	6.9
7. others	4	0.5	5	1.5	-	-	4	1.3	13	0.7
SUB TOTAL	841	100.0	330	100.0	333	100.0	315	100.0	1301	100.0
Table No. 28										
Principal family problems										
1. work	150	23.6	66	20.5	84	19.8	68	23.5	364	21.8
2. housing	94	14.6	51	16.8	33	7.8	47	16.4	235	13.6
3. health	44	25.7	84	27.3	145	33.3	34	25.6	439	26.5
4. electricity	101	15.7	32	10.6	91	21.6	16	5.5	240	14.5
5. education	144	20.0	88	25.5	91	21.1	83	29.3	391	22.4
6. others	5	0.8	1	0.3	8	1.9	1	0.2	20	1.2
SUB TOTAL	645	100.0	303	100.0	422	100.0	289	100.0	1659	100.0
Table No. 29										
Which 3 items should be attended										
1. water	241	21.1	119	33.1	134	27.8	91	26.6	576	28.6
2. sewerage	144	14.5	73	21.4	39	8.3	46	13.5	272	14.0
3. electricity	121	10.1	55	15.5	102	21.1	22	6.4	304	15.0
4. education	87	10.1	44	12.9	49	10.4	62	18.2	239	11.9
5. health	124	14.5	33	9.6	77	16.4	34	11.1	268	15.4
6. work	144	16.7	26	7.6	52	11.0	36	10.5	258	12.8
7. transportation	41	4.2	3	0.9	20	4.5	11	3.2	75	3.7
SUB TOTAL	858	100.0	342	100.0	470	100.0	348	100.0	2012	100.0
Table No. 30										
Would you pay for electric services better electric										
1. yes	116	70.1	75	66.4	133	80.3	92	81.4	440	71.2
2. no	4	2.5	8	3.1	10	6.4	4	3.5	26	4.1
3. has to think	49	19.5	11	3.7	40	6.4	7	6.3	77	12.1
4. no answer	22	8.8	14	16.8	10	6.4	10	8.8	61	9.6
SUB TOTAL	251	100.0	113	100.0	153	100.0	115	100.0	634	100.0

ANNEX 9
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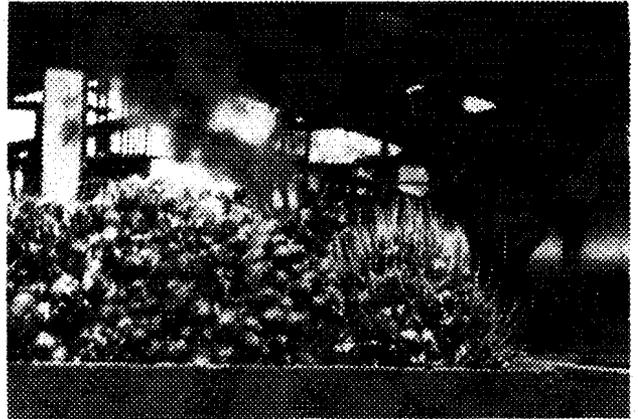
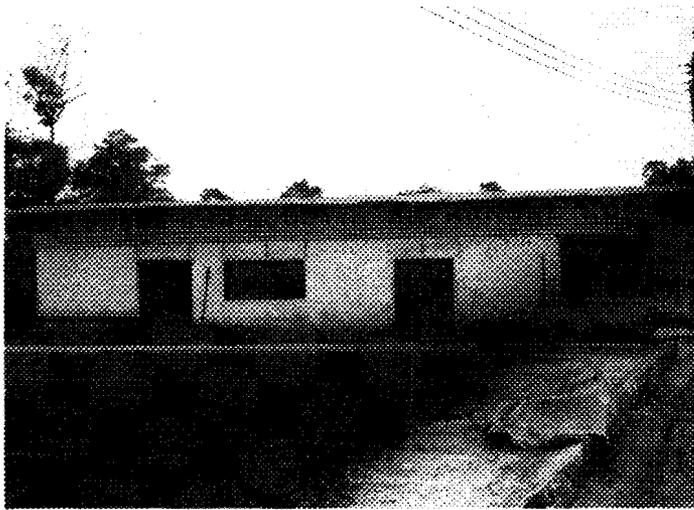
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PHOTOGRAPHIC ANNEX



Santo Domingo de los Colorados, Ecuador: The town pedestrian mall, brightly lit and full of shoppers most evenings, stands as a symbol of the regional market town and service center Santo Domingo has become.



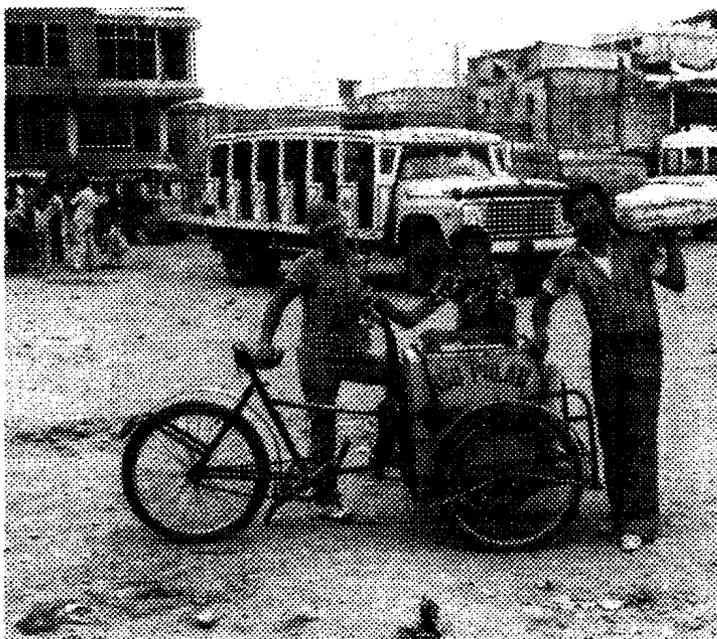
Sixty-seven industrial users of coop power, mainly agroindustrial, create jobs, markets for products, and more local value added.

Demand for new connections has often outrun generating capacity.

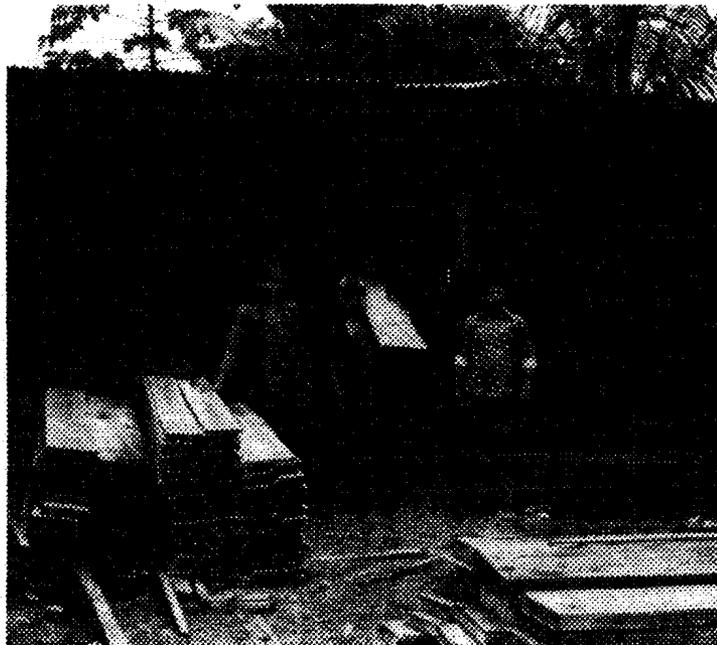
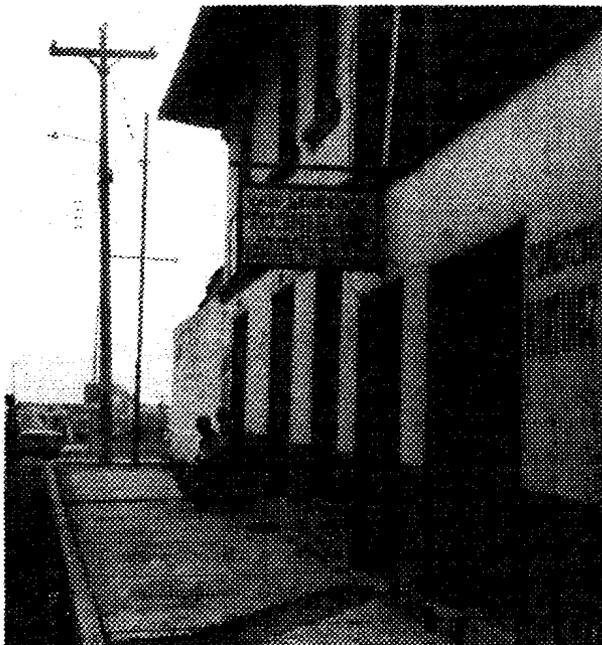


Members of the "Cristobal Colon" housing coop-pressuring for electric service 15 km from the main trunk road.





Small electricity-based industries perform a wide range of manufacturing and service tasks for a vast surrounding area. Here the product of a local ice cream factory is sold at the busy bus depot; refrigerator and other electric appliance repairs are performed in numerous small workshops; finally, wood-working with electric tools provides employment in many small workshops.





*Be they ever so humble . . .
The antennas were everywhere.*



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