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RURAL ELECTRIC COOPERATIVES

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RURAL ELECTRIFIC COOPERATIVES IN COUNTRY DEVELOPMENT

INTRODUCTION

Throughout the world, countries are reappraising plans, strategies and time-tables to speed up the development of their rural areas.

A number of problems prompt this increased focus on the rural sector. Many countries are finding it difficult to increase food production fast enough to feed their rapidly expanding populations. With a drabness of life, and lack of opportunity in the villages, millions are fleeing to an equally bleak future with the masses of jobless huddled in the slums around the cities. Following the first blush of enthusiasm to industrialize, many countries now are facing up to the need to develop for a mass market (which includes the 80 or 90 percent of the populations in the rural areas) to sustain present and future industries. One internationally-known authority epitomized the problem in this way:

"... the central strategy... in the next decade, and perhaps generation, of development is the problem of integrating societies in the widest sense ... which are now rather dramatically split between modern cities and relatively traditional under-developed, unmodernized rural life."

Capping the social-economic problem is the steadily heightening political tensions. A president-elect in Latin America said his first problem and challenge would be the low standard of living in rural areas. A business leader in another Latin American country said that unless ways are found to meet the growing demands for services and goods, "our political problems become unsupportable."

This, then, is framework against which to consider rural electrification in developing countries.

I ROLE OF RURAL ELECTRIFICATION

Many are inclined to think of rural electrification as a luxury beyond the means of most developing countries today. Actually, it is now beginning to be regarded as an important foundation stone in development.

UN Report on Africa

The Economic Commission for Africa made a study, "Activity of the United Nations in the Field of Rural Electrification,"

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dated September 10, 1963. The report states that:

"It is clear... that the introduction of electricity to rural areas brings with it an appreciable improvement in the level of agricultural life and contributes considerably to increasing farm production. By using electric power it is also possible to improve the quality of farm, vegetable and animal products; and the better regulated output thus achieved enable better prices to be obtained. Moreover, the social significance of rural electrification is stressed by several countries as a means of improving the living and the working conditions of rural populations, and also of slowing down the drift from the countryside to towns."

Assuming appropriate provisions for training, finance and other requisites, some now regard rural electric service as a catalyst to trigger expanded economic-social development.

In the United States, the REA-sponsored rural electric cooperative programs-- and the Tennessee Valley program-- demonstrated that reasonably-priced power substantially increases the number of small rural industries especially the processing of agricultural, forestry, and mineral products. Such sound developments are a key to greater rural prosperity. They increase the efficiency of agriculture, notably in preserving, processing, the transportation. They provide employment for surplus labor which otherwise might migrate to city slums. They also provide part-time, farm rural industrial employment to help stabilize income, maintain a higher living standard, and promote rural security.

The Need to Speed Expansion

The human pressures in the rural areas described earlier reflect the need to find practical ways to involve beneficially the 80 or 90 percent of populations characteristically by-passed in many country development programs to date. This urgency is partially expressed in a report by a U.S. rural electrification advisor in Costa Rica:

"With Costa Rica's population pressures, economic needs -- accentuated by loss of land due to the Irazy Volcano -- it cannot afford the slow approach to rural electrification as followed in the United States. Under present plans, rural electrification will require at least 20 years. Actually, Costa Rica should figure a comprehensive, well-planned

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program to complete the job in 5-10 years. The problems are huge; but the possibilities immense."

II APPROACH TO RURAL ELECTRIFICATION

As a generalization, the approach -- the initial emphasis -- in rural electrification in most developing countries will differ from that in the United States.

Emphasis on Productive Uses

The UN study team put high priority on use of electric power for productive purposes in agriculture and industry; this means a secondary rather than primary attention to provide electricity for domestic use (lights, ventilation, cooking, etc.) As one rural electrification specialist put it: "A plan which simply puts a light bulb or so (often at exorbitant rates) in homes in place of candles or kerosene actually may be a drain on the home owners' finance, without giving much in return." Instead of this type of "limited" electrification, the plan should provide for 'productive' electrification designed to increase living standards, develop new industries, create new jobs, raise wages.

The First Target: The Villages

In many developing countries, most farm families are grouped in villages. Unlike most small towns and villages in the United States, the villages have not had electricity; or, at least, have had highly inadequate systems. Initially, rural electrification in these countries is directed primarily toward the villages. From there, service is extended as feasible to small settlements and individual farms outside the villages. At this stage, however, rural electric systems in developing countries do not serve the large numbers of individual, scattered farmers as do U.S. systems.

Priority Services

A "package" or "productive" rural electrification system in developing countries is justified on all, or some combination of, factors such as:

- 1.- Health and Sanitation-- with electricity providing safe drinking water, better handling of sewage, aiding clinics and hospitals, etc.
- 2.- Education -- with lights and teaching aids for not only youth education and related activities; but also night-time adult education; and schools of mechanic arts and equipment and machinery repairs.

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- 3.- Food -- with freezer and cold storage plants to store fish, meat, fruits and vegetables, and other local or "imported" foods.
- 4.- Economic Enterprises --including wide range of activities: home crafts, pumping for irrigation, local agricultural and forest product processing, small manufacture, other.
- 5.- Municipal Lighting and Communications--including "Security lights".
- 6.- Home Conveniences--with these often of relatively minor importance in the earlier phases of electrification.

PLANNING FOR RURAL ELECTRIFICATION

In planning a rural electric system, it is important to try to anticipate future expansion in the market for electricity.

While other developing countries may or may not increase electricity consumption as fast as the United States, the U.S. experience at least emphasizes the need to look ahead. During the relatively depressed period of the 1930's, the newly-formed rural electric co-operatives averaged about 60 to 90 kilowatt hours per consumer a month; many families used no more than 25 to 40. Through the large unforeseen demand for electricity to take the place of farm labor -- and the greater prosperity-- consumption has mounted to an average of more than 400 kilowatt hours a month. In fact rural electricity use has doubled every 7 and 8 years as against the U.S. normal of every 10 years.

In the northern parts of Alaska, where the population is largely Indian and Eskimo, demand for electricity is increasing rapidly. Some of the villages would use double the amount of current available. Electricity has made it possible to start small industries and foster trade with other areas to improve the communities' economy.

The Tennessee Valley Authority had the authority and funds for a systematic approach to rural electrification. It aided with:

...Studies of the area: its potential, the kinds of things for which electricity could be used profitably in the years ahead.

...Programs with manufacturers to devise practical, low-cost equipment.

..../...

...Educational programs through the agricultural extension services to acquaint farmers with use of electricity.

Some Guides on Planning Ahead

Having looked ahead, a country still has to reckon with its ~~own~~ economics. Just as with many areas of the United States which did anticipate correctly big increase in demand, a country may have to start with what it can afford. But it can think out plans for such expansion to minimize cost.

Others may find it necessary to use diesel generators to meet their needs. These should be units of a common manufacture to keep repair parts inventory low. A spare unit should be available for emergency needs. Ultimate objective should be a connection to a central transmission grid. A system of construction using diesels to help build the bad until connection to a transmission grid as feasible would be an economic method of procedure in a developing country.

As indicated in the reference to the TVA experience in the United States, planning included trying to anticipate population and industrial growth, and other factors in future use of electricity.

Rural electrification advisers discussed in Section III are prepared to aid with the economic appraisals, along with the technical aspects of planning and installing a rural electrification system.

III RURAL ELECTRIFICATION POLICY -- AND SUPPORT

With rural electrification a basic element in country development programs, some general guides are offered as to AID policy and support:

Factors to consider in Rural Electrification Plans

It is proposed that consideration be given to rural electrification components in plans for activities such as:

1.- General Electrification Projects -- Whenever loans or grants are made for electric generation and distribution systems, it should be a general policy to consider beginning electrification in rural areas at the same time as in the urban areas. In fact, for expanding systems, there should be a firm agreement for increased percentages of succeeding loans and/or grants to be used to serve

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farms. As indicated previously, there are political and economic, as well as social, reasons for such a policy.

2.- Rural Development Programs -- What sequences of light and power in rural development programs?

3.- Industrial Development -- What plans for small, local industries in light of considerations posed in the foregoing section II?

4.- Evaluating Rural Electrification Potential -- **Factors to be considered:**

...Attitude of people. Do they want electrification? Will they work for it?

...Residential density.

...Food and feed potential of area (including consideration of soil fertility, and availability of water).

...Potential for development and expansion of agricultural industry.

...Potential for additional land, population growth, and other factors for expansion

...Natural resources other than agriculture.

...Market potential -- transportation.

...Water, health facilities, education, radio TV.

...Feasibility, in light of foregoing and other factors, for loan repayment.

Sponsoring Organization

It is desirable to plan for supervision of a national system of rural electric cooperatives, reflecting principles of the U.S. Rural Electrification Administration. It may not be wise, however, to insist upon a single supervisory agency of the REA type as pre-condition for a loan or other help.

Financing the Cooperative

Cooperatives often are able to mobilize a surprising amount of local capital to finance a rural electric system. In one Latin American country, the public oversubscribed the amount of stock earmarked for the public for a distribution covering two

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towns. In another country, a group of local citizens pooled their organizational efforts and contributed \$5.00 a month; and were able to finance a new automatic dial telephone system. They explained that in the past, when government agencies were entrusted with funds for community improvement work, too often they absconded with the funds. In the telephone cooperative, all the funds were placed in the bank; they could not be touched except for authorized expenditures.

As to government loans, it is recommended that these be on liberal terms because of the potential of rural electrification to stimulate country development.

Orientation Policy Officials-Leaders

Who are the policy officials, and other leaders, who are concerned with rural electrification, and have the authority and influence in its development? What plans to involve and orient them on rural electrification? Some suggested steps include:

...A study-visit to potential areas in the country for rural electrification.

... A study-seminar on materials on rural electrification in other countries, Taiwan, Japan, Puerto-Rico, Alaska etc.

...A study-trip outside the country to the foregoing and other points to study rural electrification in action.

The U.S. rural electrification program provides for 35-year loans at 2 percent interest with a moratorium of 5 years on principal payment to allow a system to get a good start. Arrangements are also made for loans to members to make it possible for them to wire their farms and homes as to take immediate advantage of the cooperative. Loans are for a long period and interest rates are low to keep power rates at a level that **minimizes** the use of electricity and compounds the social and economic effects on the community. When determining interest rates lower than the normal cost of money in developing power needs, the community must be looked as a whole. The total economic impact and improvement in a community can justify a low interest rate. The return from the community to the total economic well being of the country will be considerably greater than the loss attributed to a lower than normal interest rate. In short, the loan policy is intended to help insure that the community makes maximum use of the potential of the cooperative, to be sure that the cooperative gets off to

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a good start and the community maximize its contribution to the total economic needs of the country.

NRECA Consultative and Technical Help

Through the contract with AID, the National Rural Electric Cooperative Association offers comprehensive organizational, managerial and technical help in the establishment and early operation of rural electrification systems;

1) Training; -- NRECA offers a wide variety of helps in training rural electrification personnel. For example:

International training courses in the United States.

Regional training programs in strategic locations throughout the world.

On-the-job training during the establishment of a pilot project in a participating country.

Orientation and training for AID personnel going to countries interested in establishing rural electric cooperatives.

2) Consultation -- NRECA provides consultant services in three broad categories:

- a) to solve specialized problems in construction of facilities or efficient operation of the business;
- b) to make an independent appraisal of some phase of the business;
- c) to make a complete business analysis.

Such consultants cover the range of technical competence required in rural electric systems: attorneys, engineers, management specialists, etc. Management services include training programs for all levels of cooperative management, consulting in individual systems, and a quarterly management publication to keep cooperatives abreast of the latest in management ideas and techniques.

In the United States there are almost 1000 rural electric cooperatives from which administrative, managerial and technical talent can be drawn. In addition to the National Rural Electric Cooperative Association and its membership, talent can also be drawn from the Rural Electrification Administration and other division of the U.S. Department of Agriculture.

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U.S. Voluntary Help on Materials and Equipment

NRECA will be able to help supply a certain amount of materials and equipment for demonstration rural electric projects. Today, rural electric cooperatives supply an average of about 400 KWH per consumer per month as against 60 to 90 KWH some years ago when the lines were built. As a result, power distributors are "heavying-up" their lines and substations. Materials and equipment such as conductor wire, transformers, meters, etc., have been -- and are being -- out-grown by the U.S. rural electric cooperatives. Many of the systems have established a stockpile of good, serviceable equipment which might help meet some of the current needs of participating countries.

The attached Appendix A on the Santo Domingo Rural Electric Cooperative in Ecuador offers an example of extensive help by Kentucky Rural Electric Cooperatives to a "sister" cooperative abroad. The National Rural Electric Cooperative Association has expressed interest in facilitating contacts with potential "sponsors" for demonstration cooperatives.

Another area of voluntary help to explore is one or more of the 1,500 voluntary organizations of various types which may be operating in a particular country.

APPENDIX A

An Example

A RURAL ELECTRIC COOPERATIVE IN ECUADOR

The first Rural Electric Cooperative in Ecuador was set up at Santo Domingo March 18, 1964 on the basis of a survey by a representative of the U.S. National Rural Electric Cooperative Association in 1963. It was based on a small, ineffective municipal system.

Background on Santo Domingo Cooperative

Santo Domingo is a town of 7-10,000. It is part of the Municipio of Quito but is located 75 miles from Quito.

Quito had been furnishing Santo Domingo electric service on a part-time basis. It had been losing money on the service. Moreover, supervision of the Santo Domingo plant from Quito was unwieldy. So Quito agreed to transfer the system to a cooperative for a token charge.

At the time of the transfer, the system included two 150 KW Caterpillar diesel electric generators; a primary network with two transformers; services and secondary services to 374 customers; and property worth \$50,000. In the transfer, the cooperative agreed to furnish up to 50,000 KWH a year for 5 years to Santo Domingo for street lights and public buildings. The municipality also received 10 shares worth \$50.00 with one vote.

Plan for Expanded Service

Along with the service within the town of Santo Domingo, the Cooperative surveyed an un electrified area in the town and along the four main highways for about 35 kms. This survey revealed about 800 additional prospective customers in the town, and about 1,100 along the rural highways.

Financing the Cooperative

AID approved a loan for \$650,000 to finance the cooperative and its plans for extended service.

Through an AID contract with the Credit Union National Association (CUNA), Santo Domingo had established a successful credit union. The credit union provided the fledgling electric cooperative with a locale, volunteered organizing help with their CUNA-trained personnel, and lent membership and other funds to the new members of the rural electric cooperative.

Kentucky Cooperatives Help

As a result of interest generated through an NRECA survey in Ecuador by a manager of the Warren Rural Electric Cooperative Corporation in Kentucky, the Kentucky Rural Electric Cooperative Association cooperating with the national organization (NRECA) surveyed its membership about possible help to Santo Domingo cooperative. The Kentucky cooperative provided, initially, 200 meters and sockets, 59 transformers, 40,000 feet of service wire, primary line conductor, and a complete assortment of enough other equipment at wholesale cost to extend the system to serve at least 200 new members. About \$10,000 worth of equipment was donated by 24 Kentucky cooperatives. The Kentucky RECC trucks transported the equipment to Gulfport, Mississippi; a fruit company hauled the equipment free on an empty banana boat. The banana company trucks hauled the equipment 100 miles inland to Santo Domingo. At last reports, the Kentucky RECC was building up another shipment in its Louisville warehouse.

A local industrialist in Santo Domingo donated land to the cooperative.

Improved Service

When the cooperative was formed March 24, 1964 it had two engines which provided light from 6:00 p.m. to 6:00 a.m. Through repair of existing equipment, and the donations by the Kentucky electric cooperatives, the cooperative was able to initiate 24-hour service; and extend its service. Contrary to the original estimate that the cooperative would operate in the "red" for the first 10-12 months, it got in the black during its second month of operation.

General Progress

A progress report of October 14, 1964 -- about a year and a half after the cooperative was formed -- shows:

	<u>Before Co-op</u>	<u>After Co-op</u>
1. Percentage electric bills paid:	60 percent	97 percent
2. Volume electricity sold per month:	25, 040 KWH	63,248 KWH
3. Number of customers:	374	549
4. Monthly revenues:	\$ 955	\$ 2,165
5. Miscellaneous social-economic improvements:		

...Town assuming more modern appearance socially, and economically.

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...Families acquiring radios, electric stoves, television sets, and refrigerators in homes.

...Electric water pumps, grain mills, silage cutters, saw mills, etc., replacing manually-operated tools.

...Well-lighted playgrounds, community reading rooms, and recreation centers are now gathering places, especially for youth.

...Cooperative has built 59 spans of primary line to improve voltage.

...Dependable service provided for new radio station, ice-manufacturing plant, soft-drink bottling plant, new garage, spaghetti factory.

...Many new jobs created.

...As a result of Sante Domingo project, town of Daule currently organizing for a second cooperative in Ecuador.

APPENDIX B

RATIONALES FOR RURAL ELECTRIFICATION
IN THE U.S. AND ABROAD

Both the United States and the developing countries have the same end objectives in rural electrification -- a prosperous rural economy. But immediate rationales and justifications tend to vary greatly. A failure to recognize these differences tends to confuse the role of rural electrification in country development. Comparisons on certain basic factors include:

<u>Factors</u>	<u>United States</u>	<u>Developing Countries</u>
<u>Income Levels</u>	Some systems serve mainly low-income families; but these have relatively far higher incomes and living standards than in developing countries.	Large sectors may earn under \$100.00 per family a year; with barest minimum of food, clothes, and other essentials
<u>Electric Systems</u>	Serve scattered individual farms -- averaging 3 to a mile.	Serve villages as a nucleus for rural development
<u>Primary Uses</u>	Initially in U.S. individual homes and farms for radio, refrigerators and other home conveniences and to expand dairying, irrigation, home water supply, etc.	Initially for community services and to increase income (Irrigation, health, school lighting, food storage, local industries, etc.)
<u>Labor Factor</u>	Important impetus to electrification during war and otherwise for labor-saving (feed grinders, milking machines, etc.)	Important function to develop local small industries; etc., to absorb surplus labor; and to limit migration and slum build-up in cities

*home craft

APPENDIX C

UNITED STATES EXPERIENCE WITH RURAL
ELECTRIFICATION

II NATION-WIDE -- VIA REA

J.B. McCurley and D.H. Cooper of the Rural Electrification Administration trace the stimulus to rural electrification in the United States through the Rural Electric Administration aided program.

Progress -- 98 Percent of Farms Electrified

These Officials explain that:

"Thirty years ago, only one-tenth of the farms in the United States had the benefit of electricity generated at central stations. By 1962, however, almost all farms (98 percent) were electrified."

They point out that advance was due to a combination of REA-financed cooperatives which served 54 percent of the farms and the competition they stimulated among private power companies.

U.S. Pattern of Distribution

Unlike the prevailing patterns in most developing countries, these officials explain that:

"The average system (in the United States) serves 5,000 consumers with 1,500 miles of distribution lines ... In a representative situation, about three farms are served by each mile of distribution line..."

Cooperatives also serve small rural villages and towns in their areas.

The Keystone--Cooperatives

Mr McCurley and Mr. Cooper discuss key points in the success of rural electrification in the U.S.:

"Use of member-owned cooperatives to provide non-profit service in thinly populated and poor areas is a principal factor in the success of that part of rural electrification with which REA is associated. Other important features are the concept of

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area coverage, reduction of construction costs for rural lines, the availability of technical and other assistance, Government financing, and intensive education and promotion of consumers' use of power.

A further factor in success of rural electric cooperatives in the United States is their cooperation through state federations, and the National Association of Rural Electric Cooperatives on legislative matters, management training, insurance, information, and related matters.

A Principle -- Area Coverage

Commenting further on a fundamental feature of rural electrification in the United States, Mr. McCureley and Mr. Cooper explain:

"In developing full area coverage, REA borrowers build a 'backbone' distribution system adequate for provision of service to every one in the area who might eventually want service ... Individual consumers do not pay construction costs of individual line extensions."

Liberal Loan Policies

"The Rural Electrification Act of 1936 empowered REA to make self-liquidating loans to companies, cooperatives, municipalities and public power districts to finance the construction and operation of generating plants, transmission and distribution lines and related facilities ... to furnish electric service to unserved persons in rural areas.... REA loans are made for a maximum period of 35 years and bear 2 percent interest. They are 100 percent loans secured generally by first mortgages on the electric systems."

Self-Help -- to Cut Costs

"Another plan involved the application of the 'self-help' principle to reduce the cost of line construction in low-income areas. Under this plan members of the electric cooperatives were employed as unskilled and semi-skilled laborers for work such as right-of-way clearing and hole digging. The success of endeavors such as those just described required use of practical enforceable standards

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for equipment, materials and workers' performance. If standards can be maintained and if construction time schedules are not critical, there is a good possibility of success in using local unskilled and semi-skilled workers."

Electric Equipment "Packages"

"A number of manufacturers cooperated with REA in offering for sale a lighting 'package' which contained fixtures for an average-size farm house at about half the then prevailing price. Similar mass-purchase plans were applied to electric running-water systems and basic appliances. These plans helped the farmers and helped the new cooperatives. At the same time they opened up a vast new market for electric wiring appliances, and equipment."

Local Manufacture of Electrical Equipment

" The possibility of developing local industries for the manufacture, fabrication, assembly, and processing of materials and equipment used in distribution line construction merits serious consideration"

Miscellaneous Economies

The various articles in Volume I of "Science, Technology, and Development" include a wide variety of economies in developing rural electric systems which have come out of U.S. experience.