Electricidade de Moçambique – EDM
Sida

Rural Electrification Project

Ribáuè/Iapala
Nampula
Mozambique

Study on the impact of rural electrification
In the Ribáuè, Namiginha and Iapala áreas
Ribáuè district

Gunilla Akesson
Virgulino Nhate

February, 2002

INTRODUCTION

This report presents a study on the impact of rural electrification in the Ribáuè, Namigonha and Iapala areas of Ribáuè district, in Nampula province, Mozambique. The main purpose of the report is to illustrate and analyse the role of electrification in the development of Ribáuè district.

First it presents the background to the electrification project and the impact study. This is followed by a summary of the project's effects and impact, and then a more detailed description of how the expectations expressed by the population and economic actors during the project's planning phase have been met. Finally, there are some observations and conclusions on this rural electrification experience.

A socio-economic study was carried out in Ribáuè district in 1997 to serve as the baseline for this impact study[1]. The 1997 study report described the various sectors and social and economic activities in the district. This report on the 2001 impact study describes the same sectors and activities and the achievement of expectations, in order to analyse more directly the importance of electrification for their respective actors.

The Ribáuè-Iapala Rural Electrification Project

Since June 2000 Ribáuè district has been receiving electricity from HCB, transformed in the Nampula substation. This rural electrification project was implemented by Electricidade de Moçambique (EDM) with technical assistance from Swedpower. The company Transelectric was contracted to participate in the construction work. The project was financed by the Swedish Agency for International development Cooperation (Sida) and Mozambique.

Rural electrification in Ribáuè district is part of a national programme to expand the supply of electricity to rural areas. The safe supply of electricity has an important role in the progress of economic and social activities in the country. Investment in electrification is considered an important condition for stimulating economic and social development.

The main component of the Ribáuè project was the construction of a 33 kV transmission line from the Nampula substation to Iapala in Ribáuè district (see map). It also included the construction of distribution lines and transformers, as well as preparations for connections and fitting metres in the premises of consumers.

It was intended that the current phase of the project, considered the first phase, should provide electricity to some 1,000 domestic and 25 industrial consumers, 20 of which classified as small companies and five as medium companies, as well as other public services and commercial consumers such as hospitals, schools and traders.

[1] Electrificação Rural Ribáuè/Iapala, Nampula, Moçambique: Estudo sobre aspectos socio-económicos e de género. Gunilla Akesson, ICS collaborators: Mário Simoque, João Missão. December 1997, EDM-SIDA.

It is expected that electrification will stimulate the expansion of economic and social activities in agriculture, commerce, industry, health and education by improving the population's standard of living. The expected results of the project specifically mention equity and gender aspects. This means there is an expectation that the project will also benefit the poorest strata and that women will benefit as much as men.

The impact study

In order to permit a future evaluation of the rural electrification project in Ribáuè district, a socio-economic and gender study was carried out in 1997. The study report presented in December 1997, describes mainly:

- the main economic, social and cultural aspects of the district and the various energy sources used at that time;
- the opinions, expectations and predictions of respondents as to the importance of the electrification for the district and its population;
- some reflections and comments on the ways in which electrification could play a role in the development process.

The information presented in the 1997 report will not be repeated here. It will, however, be referred to when making comparisons between the previous situation in the district and the situation today.

The current impact study was carried out at the end of November 2001, about a year and a half after the district started to receive electricity. The methods used were the same as those applied in the 1997 study. It concentrates on Ribáuè district, more specifically the areas of the Ribáuè capital, Iapala and Namigonha that were covered by the project. We gathered information on the situation in the various sectors in the districts.

In both this and the 1997 study we interviewed people who were representative of the various economic, social and administrative activities. We interviewed economic agents, district and local leaders in the various areas, institutions and organisations, the private sector, workers, civil servants and peasant families. We asked each person about the future and current importance of electrification for that person, his/her family, economic activity, institution, community and for the district. We discussed the gender aspects of expectations about electrification and its benefits.

The study was requested by Sida and EDM and the research was carried out by the consultants Gunilla Akesson and Virgulino Nhate. We would like to thank all the informants in Ribáuè district, the local leaders and the technicians in the provincial directorates and EDM Nampula and Maputo, Transelectric and Sida for their support during the study.

Introductory summary

We find that electricity is already stimulating the expansion of economic and social activities in the district. We shall summarise here some of the most welcome aspects of the progress made, as well as some of the problems that are inevitably linked to a rural electrification process.

- Following the more reliable supply of electricity, the cotton gin in the district capital has increased its productivity and output by about 30%, which has in turn led to:
  - the more rapid transfer of cotton;
  - greater demand for cotton;
  - stricter requirements with regard to quantity and quality in cotton production. If these requirements are met the income of family cotton farmers will rise.

- As electric mills operate more effectively and regularly than diesel mills, one effect has been a fall in the price charged for milling maize in the district capital from 1,000 Mt to 750 or 500 Mt a kg.

- The more reliable supply of electricity means that access to fresh produce such as meat and fish has improved in the district.

- Electrification has improved the quality of the services provided in the rural hospital and health centres, from surgical operations to caring for patients. It facilitates emergency assistance at night and has improved assistance to deliveries in maternity units.

- The district capital now provides night classes in the second level of primary education (EP2) and in secondary education (ES). Women comprise 29% of pupils in the EP2 and 19% in the secondary level night classes. This means a comparatively high level of women at these education levels. The pass rate of pupils in the agricultural school rose from 71% to 82.3% in the last school year. According to the school's pedagogical director, the main factor is access to electricity.

- Public lighting is praised by everyone, especially women.

- Even though the marketing of crops other than cotton and tobacco is still considered weak in the district, electrification has had a positive influence in this field. Access to electricity has stimulated commercial activities; by enabling some traders to accumulate funds more people are now getting involved in agricultural marketing.

- A comparison of traffic in 1997 and 2001 shows a substantial rise in, revealing greater interest in the district than before.

The main aspect relating to the effects on families who have started to receive electricity in their homes is that there fewer domestic consumers than anticipated, and that on the whole they use little electricity.

This is due to two factors. On the one hand, the envisaged consumers do not have the financial capacity, or do not want to make investments in electrification, before verifying in practice the presence of electricity supplies in the district. Secondly, it is also related to the fact that after the project ended EDM did not have materials to extend the line (twisted cable and posts) or to make new connections (concentric cable). No domestic consumer lives solely from agriculture; they are families that also have other incomes to supplement the family economy.

Problems

In addition to the positive effects for the district a number of situations warrant consideration.

- Some of the connections are unsafe, apparently because they were made with inappropriate material after the project ended. The posts do not always seem appropriate and wires have an irregular pattern, crossing over each other and placed too close to the roofs of houses. This makes people feel uneasy and somewhat fearful.

- The fact that there are only 600 consumers instead of the 1,100 foreseen, and that low tariff consumers are using very little electricity means a low utilisation rate for the installations as a whole. Rural development, which is in turn dependent on electricity supplies, will determine whether there is interest and economic capacity to create growing demand. If this happens, a key question will be how EDM will be able to guarantee the material needed to constantly take on more and more clients.

- The number of consumers who have been disconnected for non-payment of their bills is quite high. Over the January - September 2001 period, 271 clients were cut off for non-payment. There was no information as to how many consumers had been re-connected after settling their accounts. This problem reflects on the one hand, an over-estimate of the domestic economy of many families and on the other hand, the absence of a habit of paying for this kind of service, which some people thought was a public service paid for by the government.

- There are also some administrative problems linked to the fact that Ribáuè was the first rural electrification project. This made new demands of EDM, a company whose activities were more geared to urban areas. The company's administrative structure must now be adapted to also cope with the specific demands of rural areas.

In short, we find that electricity is already playing an important role in the district. It is, however, a slow and long-term process. When the people interviewed in 1997 spoke about the possible benefits of electrification, they noted in order to be used to the full electricity

would have to be accompanied by other investments. They said that electrification cannot be seen in isolation and that other investments would needed to create conditions for the proper utilisation of electricity supplies. A more profound analysis of the impact of rural electrification can only be made when the district has had electricity for some years, although some of the project's expected results have already been partially achieved.

EFFECTS AND IMPACT

The Project

The transmission line

The 33 kV transmission line provided by the Nampula substation passes through Rapale, Mutivasse, Namina, Namigonha and Ribáuè district capital and ends in Iapala. The line has 600 consumers, divided among the various localities as follows.

Vila/Locality	Natiquiri	Rapale	Namina	Namigonha	Ribáuè	Iapala	Total
Consumers	5	38	92	63	279	124	601

Source: EDM, 011022

Natiquiri and Rapale are in Nampula district, while Namina is in Mecubúri district, and Namigonha, Ribáuè and Iapala are in Ribáuè district. Distribution to Namina, Namigonha, Ribáuè and Iapala is organised through the Ribáuè distribution area. Natiquiri is a suburb of Nampula city, where five large low-tension consumers (more power) have been connected for industrial and commercial activities.

The distribution of electricity to Natiquiri and Rapale is organised administratively through the Nampula distribution area. Electricity for Namina, Namigonha, Ribáuè and Iapala is organised through the Ribáuè distribution area.

As can be seen in the Annex, the project originally envisaged supplying electricity to the Mutivasse settlement located along the line. However as the number of interested clients was less than expected it was decided not to establish a T-off in this locality.

This impact study focuses on the situation in Ribáuè district and in particular the electrified locations of Namigonha, Ribáuè district capital and Iapala. Namigonha lies 10 kilometres to the south of Ribáuè town and Iapala is 40 kilometres west of Ribáuè. They have a total of 466 consumers.

The total load of the 33 kV transmission line from Nampula to Iapala is 16 MVA. Forecasts on the annual growth in the use of the total load over the 2000-2006 period are attached. Under the EDM plan the prognosis on the load in the first year of electricity supply was 2.5 MVA. It was estimated that demand for electricity would rise by about 3-4% a year, reaching a total load of about 3.3 MVA in 2006. The installed load permits not only the growth of existing activities but also the supply of electricity for various new activities.

However, in November 2001, the peak power (maximum demand) was 0.675 MVA or about 27% of the amount forecast for that year. The difference between the forecast and the real situation is due mainly to the estimates of energy consumption. It was assumed that on average each domestic client would consume about 2,000 kWh a year. In fact, 70% of these clients are consuming less than 500 kWh a year – reflecting the limited economic capacity of families living in rural areas. An urban family with access to electricity probably consumes much more than a rural family.

However, one of the main objectives of rural electrification is to stimulate economic development and it is hoped that this will also strengthen the family economy, making it possible not only to increase the number of consumers but also to make better use of energy supplies.

We shall now look at who the consumers are and the sources of income that finance their energy consumption.

Groups of electricity consumers

EDM statistical data classify consumers into three groups: large consumers, general tariff consumers and domestic tariff consumers. The so-called social tariff is not applied in the Ribáuè distribution area. This classification is based on the type of connection and the envisaged consumption.

At the end of 2001, EDM records show that Ribáuè district had four large consumers. These were the cotton company, CANAM, the secondary school, and two mills - one in Namigonha and one in Iapala. There are also 70 general tariff and 363 domestic tariff consumers.

About 60% of the general tariff consumers are in the private sector, undertaking commercial or semi-industrial activities. The other consumers in this group belong to the public sector or civil society. The domestic tariff group is almost entirely composed of families that, in addition to their income from agriculture, have a supplementary income from wage work or permanent self-employment activities. It is predominantly these families who can afford the electrical installations and the costs linked to electricity consumption.

The 1997 report looked at various aspects of electrification relating to:

- economic activities and the opinions expressed by economic stakeholders;
- the expectations of leaders and other people about social activities, mainly in the education and health fields;
- the family's socio-economic situation and the hope of being able to improve it;
- general expectations

Our presentation of the project's effects after one and a half years of operation divides consumers by activity: economic activities, public sector and private families. We shall then look at each of these three consumer groups, their condition and the effects of

electrification. We shall present the expectations expressed in 1997 and opinions and findings on the current situation.

Economic activities

Large and general tariff consumers

In addition to the four large consumers (cotton factory, a second school and two mills) the area covered by the study also has 70 general tariff consumers.

In the following table they are distributed by economic activity. About 60% of all consumers operate in the commercial and semi-industrial areas. Others belong to the public sector, such as health units and schools with electricity, and civil society such as NGOs and churches.

Number and percentage of general tariff consumers, by activity, Ribáuè district.

Activity	Ribáuè town		Namigonha		Iapala		District Total	
Market/stall	11	31%	8	57%	8	40%	27	39%
Bar/Restaurant	2	5%	-	-	-	-	2	3%
Shop	1	3%	2	14%	2	10%	5	7%
Mill	1	3%	-	-	-	-	1	1%
Workshop	1	3%	-	-	-	-	1	1%
CFM	-	-	1	7%	1	5%	2	3%
Video/discotheque	-	-	1	7%	1	5%	2	3%
Public sector*	8	22%	1	7%	4	20%	13	19%
Agricultural school	5	14%	-	-	-	-	5	7%
NGO	2	5%	-	-	-	-	2	3%
Church	1	3%	-	-	2	10%	3	4%
Catholic mission	2	5%	-	-	1	5%	3	4%
Other	2	5%	1	7%	1	5%	4	6%
Total	36	100%	14	100%	20	100%	70	100%
Women	3	8%	1	7%	1	5%	5	7%

*Public sector,: Administration, District Directorates, the police, health units and schools.

Five women have general tariff contracts: three are street sellers, one is a trader and one owns a restaurant that opened recently in Ribáuè town.

Economic agents

Not all the economic agents in the district have installed electricity. In some cases, they cannot afford the necessary investment. Others are not yet convinced that an investment of this kind is profitable, because electrification is considered a major undertaking. Before making such an investment the various economic agents try to assess their future market prospects and the demand for their products.

Public sector

Public sector institutions and directorates have a budget for energy consumption that satisfies their needs. The budget planning process was started in advance and functioned satisfactorily. Institutions such as health units and schools received their budget allocations in due time to pay for their electrical installations and connections.

The monthly consumption levels and costs of the 70 general tariff clients in the district are distributed as follows.

Ribáuè District Consumption levels and general tariff consumer costs. September 2001

Consumption kWh/month	Number of clients	% clients	Monthly costs (Mt)
0-85	38	54%	51,288 – 146,998
86 – 165	15	21%	228,878 – 392,013
166 – 330	13	19%	452,676 – 849,228
496 – 990	3	4%	1,376,104 – 2,695,578
1,981 – 2,475	1*	1%	5,810,055 – 7,246,113
Total	**70**	**100%**	

* the rural hospital in Ribáuè town.

Cotton production

In anticipation of reliable access to electricity the CANAM cotton factory planned to make more investments to increase its production capacity and improve its operation. This has been done.

The cotton factory has made new investments in its internal electrical installations, electrical engines and other equipment and machinery. Other investments such as the construction of the distribution line and transformer were financed by EDM and the project. The investments have increased the factory's productivity and output. Whereas it used to work with two shifts, it now has three shifts, each with 40 workers. Output per shift has risen from 40 to 50 bales of cotton fibre and the total amount of cotton processed in the factory has risen by 300 tons a month – an increase of 30%.

According to the agricultural engineer in charge of the factory, its energy costs are not lower than before, when it used a diesel generator, but supplies are now more reliable and ensure that the factory works better. There are fewer interruptions, production stoppages due to breakdowns and other problems are less frequent, and production is more effective than before. The current energy supply thus brings economic advantages for the company.

The factory has an installed load of 250 kW (corresponding to a charge of 315 kVA) and during the six month period May - October 2001 its invoiced consumption averaged about 30,000 kWh a month. According to the factory manager, there are no serious problems with energy supplies, indeed the system is working very well. When there is a small problem, for example with the transformer, the EDM technicians resolve it immediately.

The only problem is the high fixed energy fee. Other than that, electricity has brought nothing but benefits because without it development is limited.

It is hoped that the improved operation of the factory and increased cotton production will create more job opportunities. At the moment, in addition to its network of extensionists who work directly with peasants, the cotton factory employs 54 permanent workers and officers and 120 temporary workers. The temporary workers are employed during the July to December cotton ginning period.

Our conclusion on the cotton factory's use of electricity supplies is that the investment has had positive effects for the rural population, even families living far from the district capital in areas not covered by electrification.

Indirect effects for peasants

All the cotton bought by the company is produced by the family sector. According to the company the number of producers is rising again after a negative trend at the end of the nineties. The fall in the number of cotton producers was due to the fall in the price of cotton on the international market. In 1996, the peasants receive 3,900 Mt/kg. for first-class cotton, but then the price started to fall. In 1997 they received 3,200 Mt/kg and in 1999 2,300 Mt. In 2001 the price rose to 2,700 Mt/kg, but in Ribáuè CANAM paid the peasants 2,850 Mt/kg. Almost all the cotton produced in the Ribáuè area is first-class cotton.

CANAM also suffered the effects of the falling international cotton price. It used to receive 18,000-20,000 Mt/kg for cotton ginned and cleaned in the factory but in 2001 it only received 10,000 Mt/kg. The company is thus faced with a more demanding situation and must increase the efficiency of its factory.

According to the District Directorate of Agriculture and Rural Development in recent years cotton production in Ribáuè district has evolved as follows.

Evolution of cotton production, Ribáuè district

Season	Area planted (ha)	Productivity/ha (average ton)	Production (ton)
1996/97	3,430	0.45	1,540
1999/2000	2,286	0.45	1,030
2000/2001	2,650	0.45	1,200

In the current 2001/2002 season the number of peasants who have planted cotton has risen. In addition, the average area cultivated by each producer is also tending to rise, from 0.5 hectares to 0.75 hectares.

CANAM not only markets cotton in Ribáuè but also in neighbouring districts. The company organises cotton promotion through some 120 overseers and agents spread throughout the villages. They provide technical assistance to producers and distribute the

necessary seeds and chemical products. The company is divided into markets or production areas, each one covering about 10 localities.

The need to improve the efficiency of production and the profitability of the factory has led the company to introduce new ways of working with the family producer. One of the important changes has been to provide better technical assistance for the peasant. The company has hired an additional six agricultural technicians trained in the Ribáuè agricultural school. This in itself benefits the district, on the one hand because it creates job opportunities for students from the agricultural school and on the other hand, because they are local technicians who know the reality of agriculture in the district. The company intends to improve the quality of its technical assistance to producers, which will in turn have positive effects on the quality and quantity of cotton produced.

Another decisive factor in the company's ability to respond to the new demands by helping producers to organise themselves in groups. This enables its technical assistance to cover more peasants, as it is organised through groups rather than being provided individually to scattered peasants.

At the end of 2001, about 90% of the district's family cotton producers were organised in about 300 groups. Although they are still not considered as such, the groups are in the process of transforming themselves into associations, with the help of the non-governmental organisation CLUSA that has provided training in organisation, administration and economics and how to negotiate prices and contracts with economic agents.

In order to stimulate associations, producers organised in groups have received better prices for their cotton: 3,100 Mt/kg instead of 2,850 Mt/kg. Clearly, having producers organised in groups is more profitable for the company and facilitates its work in a number of ways. This is one reason why the company pays a better price to organised producers. For example, the group must assume responsibility for receiving and distributing inputs and organise the peasants to receive technical assistance and other information provided by the company's technicians and agents. This means that the group must also learn how to run and maintain an organisation, including learning the rules governing the selection of its legitimate representatives.

The main factors of production provided to the peasants are seeds, sprayers and chemical products to treat the cotton plants. The seeds are free, the sprayers are loaned and the chemical products provided on credit that is paid back when the cotton is marketed. The inputs are delivered to the structure responsible for the group, which must keep records and distribute them to the producers. An overseer or technician helps the producer to treat the plants. Few peasants know about spraying techniques, while others are afraid to work with chemicals.

When the time comes to sell the cotton, the farmers' groups organise the delivery of cotton to the sales posts. When the company buys the cotton, it makes the payment to the group after deducting the cost of the inputs provided.

According to calculations by the agronomist, one treatment costing 75,000 Mt/ha increases cotton productivity by about 200 kg a hectare. Although at least three applications are recommended the peasants only do two because they think the treatment is expensive. Peasants in the Ribáuè area average about 2.5 applications. The company is trying to convince them to treat the cotton at least three times, but considers that four would be even better.

The technicians and overseers have to explain the importance and value of the treatments to the peasants. Although the peasants think they are expensive, they do not realise that each application costing 75,000 Mt/ha. means a rise in productivity of 200 kg., worth 620,000 Mt., depending on the purchase price paid. However not all the overseers know this or are able to explain it to the peasant.

If the factory is to increase the quantity and quality of its output, the company must take these factors into account, which indeed it is doing by improving the assistance provided to the peasants. But it is not just the company that benefits from these investments and improvements. The peasant does too, and not only due to better productivity in cotton but also because the cultivation techniques taught by the technicians are also partially applicable to other crops. In addition, the peasant's improved knowledge will be reflected in other productive activities. By organising themselves in groups, future associations, the peasants are already obtaining benefits. This not only facilitates access to technical assistance but has also strengthened the peasants' position. The company pays 2,850 Mt/kg instead of the official price of 2,700 Mt/kg because the peasants are organized. When the official cotton price was published the peasants started to complain and demanded a better price, threatening to stop growing cotton if they did not receive more. This was the first step in defending their rights. Later, those who were organised managed to obtain an even better price of 3,100 Mt/kg. This latest price increase is calculated on the basis of the company's marginal gain from the synergetic effects of organised producers.

The cotton company has an important role because cotton growing is economically very important for peasants in the family sector. Many peasants struggle to grow a cash crop because it usually guarantees a better income than just maize and bean surpluses.

In addition to cotton, in 2001 CANAM started to introduce sesame in Ribáuè district. Although still on a small scale, in 2002 it intends to distribute sesame seeds to 4,000 peasants covering a total cultivated area of 1,000 hectares. Each peasant will start growing sesame on a quarter of a hectare. If the planned and partially introduced sesame scheme proves to be economically sound, peasants in associations will also benefit from this cash crop. CANAM is already marketing sesame. It has a factory to produce cooking oil and has started exporting the product to India.

Both men and women try to supplement their food production with cash crops and other economic activities. Some women work in the cotton factory while others grow cotton in their family fields. However, even though women work alongside their husbands in the family's cotton fields, it is often considered a man's crop. It is predominantly men who are involved in selling cotton, although it is not only the man who decides how the money should be used. Although in some instances the husband does not consult his wife, it is more common for the couple to decide together how to use the money. In many cases the man prefers to give the money to his wife for safekeeping. A woman is considered a better money manager than a man, even though she cannot decide on her own about how the money should be used.

The income from cash crops improves the family economy and raises the living standards of peasant families. But some families are unable to take advantage of the cash crop opportunities. Once such group comprises families headed by a woman. It is much less common for a female-headed household to have a cash crop income because a woman on her own does not have access to sufficient labour for both food and cash crop production. Although the situation of female-headed households varies, few are in a position to hire somebody to help with the work in the fields.

There is some concern that the rise in cotton cultivation will prejudice the production of food crops. It was not possible to gather figures during the study in order to verify if this has occurred or not. We were told that it has not yet happened.

Nevertheless, one effect of increased cotton cultivation has been environmental change in the form of more cotton pests. According to the agricultural engineer the rise in pests is due to the more frequent application of chemicals to the cotton. This has created an imbalance because the chemicals are also eliminating the insects that are the natural enemies of pests. Nevertheless, in order to control and increase cotton productivity chemicals continue to be used to treat plants.

Small industry

Mills

Diesel mills often stop working due to breakdowns and difficulty in obtaining fuel. After gaining access to electricity, some owners have installed electric mills. At the end of 2001 Ribáuè district had 4 electric mills, one in the district capital, one in Namigonha, one in Iapala and a small one in the area of the old Iapala mission. The mills have been working more regularly and effectively than the previous diesel ones.

In conversations with women, they said that when there is an electric mill they do not have to wait a long time, as they did with the other mills. When they go to the electric mill they always know they will be able to mill their maize, but when they go to the others even after waiting for a long time they might have to return home without doing so. This means that a woman wastes a lot of time. On the one hand because she spends a long time waiting and on the other hand because even so when she gets home she must pound her maize and this

delays her other work. Access to a mill is a great help to a woman but access to a mill that guarantees effective service is even better.

More owners intend to install electricity and electric engines in their mills.

The following example describes the situation of a couple who settled in Ribáuè and have invested in an electric mill.

It was the electrification of the area that encouraged the couple to come to Ribáuè town in October 2000 to set up their own business. Their first investment was to build a house, do the electrical installation and buy an electric mill. The house has two rooms, one serves as living quarters and the other contains the electric mill. The couple obtained a loan of 42 million Mt from an NGO in Nampula to finance the construction of the house.

The cost of the electrical installation comprised mainly the necessary materials and expenditure related to the contract with EDM. The husband, who trained as an electrician in the Nampula industrial school, did all the electrical installation work. They spent about 16 million Mt. on installation materials.

Other expenses related to the EDM contract total the 4,755,000 Mt., distributed as follows:

- guarantee deposit	4,387,500
- inspection	58,500
- connection	292,500
- other expenses	16,500
Total in Mt	4,755,000

The mill and the electric engine cost 145 million Mt. The couple paid for the entire investment in the electrical installation and the mill with their own funds.

The mill started working in March 2001. Revenue varies according to the time of the year. They have more clients when there is a lot of maize and less in the months when there are shortages. In addition to the population, their clients also include the hospital, the agricultural school and the secondary school. During their first months, the secondary school brought 4-5 tons of maize a month to be milled and the agricultural school one ton. From 2002 the agricultural school will no longer be a client because it has just installed its own mill. Up to June, the daily income from the mill was about 350,000 Mt, equivalent to some 9-10 million Mt/month. At that time they charged 750 Mt for milling 1 kilo of maize. After June the daily number of clients started to fall so the owner lowered the price to 500 Mt/kg but only for the population. Other clients still had to pay 750 Mt. In November the mill was virtually at the standstill, with only 2-3 clients a day, so the owner again started to charge a single price of 750 Mt.

Consequently, their expenditure on electricity also varies. When there are many clients, the mill must work constantly and thus uses more electricity. In the months when there is a lot

of work they paid 2.8 to 3 million Mt. for electricity. In other months they paid less, for example the October 2001 bill was 690,000 Mt and the following month it was 494,762 Mt.

At the time of this study the mill had only been working for eight months and was a new economic activity for the couple. It is thus difficult to assess whether the mill is profitable or not. They had some initial financial problems when they started their economic activities in Ribáuè. They were unable to repay the NGO loan within one year and still owe about 24 million Mt. In November 2001 they were forced to increase the price to 750 Mt/kg because the number of clients fell drastically, resulting in little revenue. The same month they also decided to reduce the wages of the mill's two permanent workers, from 450,000 Mt to 250,000 Mt a month.

However, they also have income from other activities. They have a small workshop in Nampula town where the husband has been repairing electrical appliances for a long time. Before moving to Ribáuè, the couple lived in Nampula town for 33 years and have a house there. Five of their nine children live with their grandmother in the town and are continuing their studies there. The husband usually goes and works in his Nampula workshop for two weeks each month. During these periods his wife directs the work in the mill in Ribáuè.

The couple plan to develop more economic activities in the district. In addition to the mill investment, they are building a guesthouse out of local materials at the entrance to Ribáuè town, with five rooms and a bar. They also plan to set up a small sawmill.

Small workshops

At the time of the study there was still no workshop using electricity. One owner in Iapala has mounted a small metal workshop. Another three, in Ribáuè town, Namigonha and Iapala had concluded the necessary electrical installations but had still not started to use them. Other owners of small embryonic workshops have invested in electric dynamos for soldering and started to provide this service locally.

Sawmill

A sawmill in Iapala town is using electricity. Although it has not started sawing timber, it is cutting logs to facilitate their transport.

A person working in forest exploitation is setting up a sawmill in the district capital. The workers will be recruited locally. Work will be organised in shifts in order to use the installations to the maximum.

The original intention was to locate the sawmill some distance away but the site finally chosen is very close to the town so it can take advantage of the existing transformer. Owing to his limited financial resources the owner cannot afford to pay for the T-off on the distribution line and the installation of his own transformer in the other location. He can only afford the investment in the sawmill.

As a transformer has a very limited radius, people operating far from electrification do not have access to electricity. They must establish distribution line T-off to these areas and the client himself must pay the extra cost of installing the transformer.

Vegetable oil factory

This is the case of a private farmer in Ribáuè who plans to install a factory for extracting vegetable oil. His farm is 2.5 km. from the district capital where he already has a machine for producing sunflower oil. As he does not have access to electricity he is going to operate the machine with a diesel engine. He said it would be much better if he were linked to the Ribáuè electricity grid, as he would also use electricity for irrigation systems on his farm.

In order to get access to electricity he contacted EDM and requested information about the cost of a T-off line and the installation of a transformer. EDM gave him a budget of USD 38,000, which he felt was too expensive. He cannot afford it.

The farmer has a certificate for producing seeds, and grows sunflower, groundnuts, maize and bean seeds. The vegetable oil factory is part of sunflower promotion in the family sector. There are plans to distribute sunflower seeds to about 2,000 peasants in 2002. The seeds are provided on credit, which is repaid when the sunflower is bought from the peasant.

It is expected that electrification will stimulate rural economic development through the appearance of small industries for transforming agricultural crops. The vegetable oil factory is one such industry that can stimulate peasant production through sunflower marketing.

Other economic activities

Restaurants

The growing interest in the district is also demonstrated by the appearance of new restaurants, bars and boarding houses in the district capital. There is more demand for meals and accommodation because the district is now receiving more visits than before. It not only has more commercial contacts but visits by public sector provincial directorates are also more frequent. In addition, the improved conditions in the district have resulted in seminars being organised there, attended by people from other districts in the province.

All this requires conditions for serving meals and providing accommodation. The bar in the capital's sporting club has been rehabilitated and serves meals every day. There are several small bars in the market, one of which also serves meals. The largest investment in this field has been by a lady who recently opened a new restaurant in Ribáuè town.

She came to Ribáuè from Nampula, where she also has a small restaurant in the market, in April 2001. It was electrification and the fact that there was no restaurant in Ribáuè town that encouraged her to invest in the district. At the time of this study, the restaurant had already opened even though the premises were still not ready. The restaurant comprises two

open shelters, but the owner also intends to build a meeting room, a bar and a place for a discotheque. She has had electricity since 9 November 2001, using it mainly for lighting and the sound system. Locally bought charcoal and firewood are used to prepare meals but she wants to install electric stoves, an oven for making bread and an ice-cream machine. She has a freezer in her house that is also used to keep the food and fresh produce used in preparing meals for the restaurant.

All the material for the electrical installations in the restaurant was obtained locally. The electrical accessories cost 1,775,000 Mt. The installation work was done by an electrician in the district who charged 350,000 Mt. When she signed the general tariff contract she paid EDM 345,000 Mt but was told that she would probably have to pay more depending on the tariff to be established. The tariff payable depends on the contracted load and the energy used.

The investments in the restaurant were financed from income obtained from her spirit factory. She has been operating a semi-industrial spirit factory for some years, producing about 800 litres a month. The factory used to be located in Nampula town but she has now transferred it to Ribáuè. Production is regularly controlled by the health authorities through laboratory tests. It is bottled and sold in Nampula town and other districts in the region.

As the restaurant only opened recently it is difficult to calculate its eventual income. However, when we spoke to the owner, even though the restaurant had only been open for a short time she had already served daily meals for the participants in two seminars. One seminar with for some years lasted two days and the other had 38 participants and lasted four weeks. In November 2001 the simplest meals cost: breakfast -25,000 Mt; lunch - 50,000 Mt; and dinner 50,000 Mt.

By the end of 2001 the investments in the restaurant and the spirit factory had created ten jobs. The three women working the kitchen receive 500,000 Mt a month, the two guards receive the same and the four male factory workers receive 750,000 Mt. The man who cleans the yard receives 250,000 Mt a month.

Bars

In 1997 the district had four small bars, all of which were operating badly. Now various bars have appeared in the markets in Ribáuè town, Namigonha and Iapala. Some form part of the soft drink distribution and sales network of the Coca-Cola company. After signing a contract with this company, small traders are provided with a fridge on loan and are regularly supplied with soft drinks delivered by the company's lorries.

Boarding houses

In the past it was difficult to obtain accommodation in Ribáuè district. Now there is a new boarding house in the capital and the NGO Salama has installations with some guest rooms. The guesthouse of the administration in Ribáuè capital has been rehabilitated and has

electricity, which has improved conditions in the house. The owners of a mill are building a guesthouse out of local materials close to the town.

A complex containing a conference room, bedrooms and a bar is being built out of conventional materials in Iapala. Another person is building a small boarding house out of local materials.

Video film shows

Some people are showing video films on a commercial basis. In some cases the films are shown in a bar or a shop, in other cases in private houses. When organised on a daily basis, this can be quite a profitable activity.

Video film shows or discotheques are organised almost every weekend in the former sporting cloud in Ribáuè district capital. The same events are organised by an owner in Iapala who has rehabilitated an old building to function as a recreation centre.

Traffic

The amount of traffic provides an indication of interest in the district. A comparison between the 1997 and 2001 records shows that the number of vehicles circulating in the district has risen as shown in the following table.

Vehicle	**Number – entering the town***		**Number – leaving the town***	
	Friday 17.10.97	**Friday 16.11.01**	**Friday 17.10.97**	**Friday 16.11.01**
Lorries	6	12	10	16
Cars/Trucks	30	33	22	57
Tractors	2	1	1	2
Motorcycle	5	10	7	15
TPN bus	0	2	0	1
Bicycles	67	125	70	101

* record of vehicles travelling on road number 8 from Nampula that runs through Ribáuè district.

More transport companies are providing services in the district and access to collective transport has improved. The company *Transport Público de Nampula* (TPN) has started a daily bus service between Nampula and Ribáuè town and to Lalaua, the neighbouring district. Every day a TPN bus passes through Ribáuè and another one every two days when it makes the Iapala run. In addition, there are the so-called "chapas" (taxis), the open trucks that carry passengers and circulate daily in the district. One owner of an open lorry that has been adapted to carry passengers makes daily trips from Ribáuè town to the railway station in Namigonha, where passengers can get the daily train. A TPN bus ticket from Ribáuè to Nampula costs 25,000 Mt. The train journey from Namigonha to Nampula costs 20,000 Mt.

The commercial network and marketing

There are companies marketing cotton and tobacco and both the production and marketing of these crops is increasing, as well as sesame and sunflower. The existence of marketing companies for these cash crops is the peasant's best guarantee of a cash income because the marketing of other agricultural surpluses such as maize, beans, cassava etc. is still weak in the district.

There is, however, a tendency for new marketing actors to appear following electrification. They operate in the informal sector, small travelling salesmen and the owners of small embryonic shops, stalls and bars in the local market who are developing new activities. This trend is visible in Ribáuè capital, Namigonha and Iapala, where there has been a substantial rise in informal traders after they started receiving electricity. Access to electricity, providing light at night and the installation of freezers, has had a positive influence on their activities, in particular by resulting in more clients. Some of these economic agents have started to get involved in marketing, using the capital obtained from their other economic activities to buy crops from the peasants. Although still a small-scale activity, it is nevertheless important for the peasants. The crops bought are sold to marketing people who come from Nampula or neighbouring countries.

The formal commercial network of old shops in the districts continues to be weak. The capital only has one functioning shop and another that re opened recently on the outskirts of the town. In Namigonha and Iapala only one of the old commercial establishments has been rehabilitated. A small general store with a bar opened recently in Iapala. Another two shops in Namigonha and Iapala are operating but in a bad condition. One or two of the shop owners do some crop marketing but only of a very limited kind. The district has other shops but they are all closed.

Many traders continue decapitalised, unable to rehabilitate their shops, without the capital to invest in their own vehicle and they also complain about the lack of capital to buy crops from peasants. Another factor influencing the weak involvement of shop owners in marketing is the very high cost involved. They say they risk having their capital tied up for a long time because they cannot always find a market for the crops they have bought. They also said that it is difficult to obtain credit for commercial activities and when they do get loans they are not very useful because they are short term and have very high interest rates.

In 2001 one of the Ribáuè traders got finance from FARE to rehabilitate his shop and do some marketing. He used the money to buy 60 tons of maize from peasants in the district that he then sold to traders in Nampula who had come from Maputo.

The Mozambique Cereals Institute (ICM) that is now working with a South African company V&M continues to be the most active entity in the district. ICM bought 87 tons of maize in 2000 and 468 tons in 2001. It buys mainly maize and beans.

For a long time now the company's headquarters have been in Iapala, an area that has always had a co-ordinating role in marketing in the region. The company is going through a process of revitalisation and recently improved its installations by building two new warehouses in Iapala town.

ICM does its marketing by a hiring small local actors to organise sales posts where they buy surpluses from peasants. They work with ICM capital but it is ICM that transports the crops purchased out of the district. For his work in organising sales posts, a trader receives 150 Mt per kg. of maize delivered to ICM.

As there was a shortage of maize in 2001, the price paid to the peasants rose. Even so, ICM was only able to buy a little over are half of what it bought in 2000. At the beginning of the 2001 season, peasants in Iapala and Lalaua received 1,750 Mt/kg. for maize but later, when it started to get scarce in October - November, they received up to 3,500 Mt/kg. Most of the maize was bought at the beginning of the season. ICM paid 1,500 Mt/kg. for beans, but at the end of the season the price rose to 2,500 Mt.

In other areas where there were only informal itinerant traders the peasants received a lower price of 900-1,200 Mt./kg., with some not reaching 900 Mt/kg. because they live in the more isolated areas far from the district capital and have no alternative but to accept the price offered by the only buyer who appears there.

Terms of trade

A comparison of the prices paid in 1997 and 2001 shows that they have improved. The first table shows the prices of certain essential items in shops and markets in Ribáuè town in October 1997 and November 2000.

Item	Price in 1997	Price in 2001
Salt	3 000 Mt/kg	3 000 Mt/kg
Sugar	10 000 Mt/kg	15 000 Mt/kg
Bar of soap	10 000 Mt	10 000 Mt
Box of matches	500 Mt	1 000 Mt
Battery	2 500 Mt	3 000 Mt
Exercise book	3 000 Mt	3 000 Mt
Normal hoe	30 000 Mt	40 000 Mt
Normal cloth	25 000 Mt	32 000 Mt
Blanket	150 000 Mt	100 000 Mt
Bicycle	1 350 000 Mt	1 100 000 Mt

The next table compares the amount of maize that has to be sold in order to buy these goods in 1997 and 2001. The calculations are based on prices in the shops and markets in Ribáuè town. The comparison uses maize prices of 700 Mt. paid in 1997 and for 2001 the minimum price of 900 Mt and the average price of 1,500 Mt.

Item	1997 (700 Mt)	2001 (900 Mt)	2001 (1,500 Mt)
Salt	4.3 kg	3.3 kg	2.0 kg
Sugar	14.3 kg	16.7 kg	10.0 kg
Bar of soap	14.3 kg	11.1 kg	6.7 kg
Box of matches	0.7 kg	1.1 kg	0,7 kg
Battery	3.6 kg	3.3 kg	2.0 kg
Exercise book	4.3 kg	3.3 kg	2.0 kg
Normal hoe	43 kg	44.4 kg	26.6 kg
Normal cloth	35.7 kg	35.5 kg	21.3 kg
Blanket	214.0 kg	111.0 kg	66.7 kg
Bicycle	1 928.0 kg	1 222.0 kg	733.0 kg

Other Planned activities

Agriculture and livestock in the private sector

Agriculture and livestock still use little electricity. Some private farmers in Iapala have electricity in their homes but do not use it for their agricultural activities. Some small vegetable farmers in Namigonha have irrigation systems and vegetable production is increasing. Given the improved access to the district, they can sell more vegetables to Nampula town and other local places. However, to date no farmer has installed an electrical pump for irrigation except for one in Ribáuè town.

Cattle, goats and small animals are increasing in the district but the activity is still dominated by small-scale animal keeping. Cattle and goat herds are still small and there is no commercial livestock producer. Some farmers intend to open butcheries to slaughter animals and sell the meat but this is still in the planning stage. One of the district traders has invested in a large freezer to conserve meat that he buys in Malawi, in other parts of the province and from local farmers and then sells locally.

Fuel pumps

The planned petrol pump has not yet been installed. The district capital used to have petrol pumps. A person who was interested in opening a petrol station in the district did some research on the state of the old underground tanks but has still not gone ahead with other works or the construction of the petrol station, although he has started to sell fuel in Ribáuè town using a temporary tank. Other people sell fuel that they bring from Nampula in jerry cans. The price is higher in the district than in Nampula town. In November 2001, diesel in Nampula cost 9,767 Mt/litre but in the district the price varied and even reached 12,500 Mt/litre.

Mineral water factory

Some research has been done on the installation of a facility to exploit the mineral waters in Ribáuè Mountain but the project is still in a preparatory phase.

Carpentry workshop

One carpentry workshop belonging to one of the commercial establishments in Iapala town uses electricity. Others elsewhere in the district continue to work without electrical machinery. In some cases they have access to electricity but only for lighting.

Telecommunications

The Mozambique Telecommunications (TDM) has installed a new telephone booth in the district capital with the intention of setting up a satellite telephone in 2002. Since November 2001, the service provided by telecommunications has also operated at night.

Mozambique Television (TVM), community radio

At the end of 2001 TVM started work on installing an antenna in Ribáuè capital and the installation of a community radio station.

Observations on economic activities

Even though there has been substantial progress, electrification cannot be considered in isolation. Many investments are needed in order to create the conditions that make use of electricity supplies. In the 1997 study many of the district's economic agents explained that they did not have access to capital for the necessary investments in electrical machinery and installations. If these activities are to be profitable, they must be expanded. They need to rebuild and rehabilitate damaged infrastructure such as shops, warehouses and other buildings. Many activities depend on access to vehicles and at that time very few economic agents owned vehicles.

Economic agents who used to operate stopped working for a long time or only worked on a very limited scale, so they have not been able to accumulate sufficient capital for large investments or to start new activities. They complained about the difficulty in obtaining loans. The situation in terms of access to capital has remained almost the same. Few economic agents have been able to access credit. Most work with the money they have accumulated from their own economic activity, making new investments little by little to develop their activities.

One example is a person who has a workshop and a mill in the district capital and is also a small-scale forest operator and does some farming. First he invested 17 million Mt. in cables and posts to extend the distribution line from the transformer to his area. Even though his workshop and installations are not very far from the transformer, only about 400 metres, the area was not covered by the distribution lines installed under the project. Then he had to pay for a tri-phase installation for future industrial use, costing 750,000 Mt, and other expenses linked to the EDM electricity supply contracts costing 1,850,000 Mt.

He did all this from his own income from these activities. Although he has had electricity since June 2000 at the end of 2001 he was only using it for lighting in the workshop and

mill because he did not have sufficient capital to buy an electric engine and other necessary equipment. He has managed to buy an old electric water pump to irrigate his vegetable crop. As soon as he has sufficient funds, he will also buy an electric engine for the mill and an electrical dynamo for soldering.

Public Activities

Education

Only six schools in the district have access to electricity:

- the agriculture school that trains basic technicians, about 8 km from Ribáuè town;
- the secondary school, about 3 km from Ribáuè town;
- the EP2 school in the old Iapala mission, about 2 km from Iapala town;
- the EP2 school in Ribáuè town
- an EP1 school in Ribáuè town
- an EP1 school in Iapala town

Electrification has had a number of positive effects on education, such as improving pedagogical performance, the organisation of night classes for adults and better conditions in hostels. Lighting in schools, hostels and teachers' homes means that both pupils and teachers can prepare their lessons better and do revision. In addition, children and adults in families with access to electricity are able to do their homework. We even found a house with electricity where a blackboard had been set up in the yard so that the children of this family and their friends could organise a school in their free time a night. The father had hung a strong light bulb to illuminate the yard.

All the buildings of the agricultural school, including its electrical installations, were rehabilitated recently. The school has a piped water system that operates with an electric pump. It also has a small metal workshop with an electrical dynamo that does minor repair work in the school. A new electric mill has been installed and access to a freezer makes it possible to store fresh produce. The school also has some electrical equipment, such as a photocopying machine.

Access to electricity has enabled the school to improve the quality of its teaching and has also improved conditions for the pupils. After one year with electricity, the promotion rate rose from 71% to 82.3%. According to the pedagogical director, the main reason for this positive result was the electrification of the school. Now pupils are able to prepare properly and do revision. Better conditions in the boarding facility and the rehabilitation of the female hostel have resulted in more girl students. Now 29% of first year students are women, with 15% in the second year and 9% in the third year whereas in 1997 the respective figures were 9%, 4% and 2%.

We also found that the teachers' houses around the school had electricity. This has had a positive influence not only on the private lives of teachers, but also their work. Today it is rare for a teacher not to turn up to give lessons, whereas before they were often going off to

Ribáuè town or other places due to their isolation and the lack of entertainment in the school area. Now they all have light at home and many have videos, music equipment, a freezer and a fan.

There are plans to rehabilitate the secondary school or to build a new one. In the meantime, it still functions in the old installations. All the buildings have electrical installations but electrification is not used to the full due to the precarious state of the fittings in the school. For example, there have been no investments in new electrical equipment and new material for the laboratories. This will only take place after the school has been rehabilitated. The only new equipment is a back projector.

Nevertheless, access to electricity has been important for teaching and for the organisation of the school. According to the director, lighting is the most important aspect of electrification. The school has introduced night studies to help the pupils prepare better. The director is convinced that school performance will be positive at the end of the year. Compared to 1997, the number of girl students in the first year of secondary education has risen a little from 19% to 22%. The school has a hostel for girls although some girls prefer to live in the hostel run by Catholic nuns in Ribáuè town. Many of them attended the EP2 school in the old Iapala mission.

Electrification has also had a positive impact on EP1 and EP2 school performance, girls in particular.The pass rate in the EP1 school in the district capital has improved as follows.

1st semester 2000		**1st semester 2001**	
Total	Girls	Total	Girls
68,8%	63,2%	72,4%	79%

In 2001 there were more schools and more pupils than in 1997. The following table shows that the percentage of girl pupils has risen.

	Male	**Female**	**MF**	**% Female**	**Schools**
EP1					
1997	9 552	5 588	15 140	37%	64
2001	13 727	10 745	26 472	41%	79
EP2					
1997	629	141	770	18%	2
2001	1 457	476	1 933	25%	5
Secondary					
1997	521	112	633	18%	1
2001	913	211	1 124	19%	1
Agricultural					
1997	248	15	263	6%	1
2001	190	42	232	18%	1

One factor that could hamper the positive trend towards more girls in school is the rise in school fees – registration, enrolment and boarding fees - approved by the Nampula Provincial Government. For example, the EP2 fee has risen from 4,000 Mt to 50,000 Mt and the annual boarding fee has risen from 200,000 Mt to 900,000 Mt. payable in three instalments. Nevertheless, the education authorities in Ribáuè district have introduced a programme to promote the education of girls. All girls who enter grade 1 in EP1, grade 6 in EP2 and grade 8 in secondary education do not pay enrolment fees. This programme will continue despite the introduction of the new fees.

Night classes have been introduced in Ribáuè in EP2 and secondary education with the assistance of teachers from the secondary school who go to the district capital to give classes at night. The EP2 school is used for this purpose. There are 117 pupils in grades 6 and 7, 29% of whom are women. There are 111 pupils in 8^{th} grade and 31 in 9^{th} grade, with women comprising 15% and 19% respectively. 10th grade will be introduced in 2002.

No night literacy courses have yet been organised. At the moment they only exist during the day. Many women attend adult education courses. Of the 2,339 pupils in the first to third years of literacy, 1,364 or 58% are women.

The complete EP1 and EP2 schools in Namigonha and Iapala still do not have electricity. However, according to the educational authorities this is planned for the first semester in 2002. These schools will also organise night courses for adults

Health

The health network comprises Ribáuè district hospital, three health centres and five health posts. The hospital and the centres also have maternity units. The following health units have electricity:

- Ribáuè rural hospital;
- Iapala health centre
- the health centre in the old Iapala mission;
- the health post in the agricultural school.

Many people said that the health units with access to electricity are able to provide better assistance to the population. Electrification has improved the quality of the services provided in the rural hospital and the health centres, from operations to the care of patients and ensures that the laboratories function better. It has also facilitated emergency treatment at night. Working conditions are a little better and this helps the staff to provide good service.

Women praise the improvements in assistance during deliveries during the night in the maternity unit. The number of pregnant women assisted in maternity units has increased, although many women still do not have access to this service. Most women are assisted by a traditional birth attendant in the community. Some of them are trained and supervised by

the District Directorate of Health. However, the women said that when the birth is complicated the only solution is to resort to the hospital or the health centre.

With access to electricity, health units are able to improve the conservation of vaccines. They used to use paraffin generators but this did not always work satisfactorily.

Not all health units have satisfactory water supplies. The hospital and the health centre in the old Iapala mission have piped water systems, the Iapala health centre has a borehole but the other health units get their water directly from the river.

The financial situation of the District Administration

As regards local public revenue, the financial situation of the district administration has improved. The main sources of local revenue are the following fees and licences:

- annual fee, itinerant trader	107,000 Mt
- monthly fee, stall	107,000 Mt
- annual marketing fee	250,000 Mt
- daily market fee	3,000 Mt
- bicycle licence, annual	41,000 Mt
- bicycle registration license	54,000 Mt
- bicycle riding license	40,000 Mt
- legalisation of land for construction,	
- plot by square metre	4,000 Mt
- 25% of the National Reconstruction Tax	10,000 Mt

In 2000 the total revenue collected was about 35 million Mt a month, which rose to about 40 million/month in 2001. In addition to this income, the district also receives funds from the general state budget and the District Development Fund.

New and rehabilitated infrastructure

A number of buildings have been rehabilitated in the district capital including the Agricultural School and some of the District Administration buildings. The District Directorate of Education, the rural hospital and the central markets were rehabilitated in 1997. In the district capital there has been additional construction work on the two EP1 and EP2 buildings concluded in 1997 with various classrooms.

There are a number of new buildings in the district capital and the surrounding area. In the surrounding neighbourhoods they are mainly houses built out of local materials. A number of cement residences, an yet un-opened shop, some small shops or stalls of conventional materials in the central market, a building for showing video films, the EDM house, a new TDM phone both, a new boarding house, premises for the SALAMA organisation, new installations for the Catholic mission used by nuns and the girls' hostel, 2 new churches for

the Baptist church and the Adventist Church have been built in the district capital. The Catholic Church is being rehabilitated and expanded.

In Iapala the health centre and maternity unit have been rehabilitated and an additional 2 classrooms have been built in the EP1 school. There are also a number of new cement houses and small shops or stalls. ICM has built two large warehouses close to its former installations.

In the headquarters of Namigonha locality a health post has been built and the EP1 school has been rehabilitated. There are plans to build a new market and the number of sellers and stalls in the market is increasing.

In the three areas that have been electrified it is clear that people with new houses built out of local materials are making a great effort to have a somewhat better house than the others in their neighbourhoods, in other words a house that has been improved. They are investing in zinc sheets for the roofs in order to have a safer electrical installation. This was confirmed by the manager of the shop in the district capital who said that he is now selling more zinc sheets. Before Ribáuè had electricity, his shop did not sell either cement or zinc sheets but now it is selling a lot and also electrical materials.

Roads

The following stretches on the districts main roads have been rehabilitated:

- Road no. 8 that runs from Nampula, through Ribáuè district to Malema the town of Cuamba in Niassa province.
- Road no. 512 that goes from the Ribáuè district capital to the neighbouring district of Lalaua to the north.
- Road no. 104 from Iapala to Alto Molocue district in Zambézia province. The five-kilometre stretch to the Iapala capital has also been rehabilitated.
- The feeder road connecting road no. 8 to Iapala town.
- The unclassified 50 km road from Namigonha to Murrupula district.

The water situation

The three district centres covered by electrification have water off-take systems. All the systems are old and in a bad state due to lack of maintenance and repair over many years.

The piped water system in Ribáuè town was partially rehabilitated last year. At the end of 2001 work also started on restoring and cleaning the dam. The water that supplies the system comes from the mountain and is collected in a small damn from where it is distributed by gravity to the various sources in the town. Although the water from the mountain is of good quality it is not always potable when supplied through the piped system because the dam has not been cleaned for many years. The towns of Iapala and Namigonha have piped water from the CFM water off-take system. But neither system is working.

Some neighbourhoods have boreholes or wells but many of the wells have been dug by hand. Many of the district's inhabitants continue to use water taken directly from the river. It has 33 water sources, boreholes and wells in its various neighbourhoods and settlements. Some are not working because the pumps have broken down and others because they have no water during the dry season.

Other effects of electrification

Many people - women children and children - mentioned public lighting as a major benefit of electrification. The district's isolation is coming to an end due to better access to transport and communication. Electrification has made it possible to conserve and sell fresh produce in the district's towns.

Overall, lighting has also had a positive impact on the commercial activities of shops. One owner explained this as follows: People here start to do their shopping after 17h00 because they go to their fields during the day and when the we only have candle light they cannot see much. Guards can watch over the premises better at night when it is not dark.

The better living and working conditions created by electricity have meant that better educated people, for example graduate teachers and technicians, are more willing to live and work in the district. Some institutions and organisation now have photocopying machines and computers in their offices. In 1997 the people said that they would return to their neighbourhoods and villages if they had electricity, and this is precisely what is happening. There is clearly an influx of people to settlements covered by electrification. In particular, families that had decided to remain close to their fields in areas far from their neighbourhoods, are returning. There are many new houses, or houses under construction, in the area around the district capital.

It was expected that access to electricity would have a positive environmental effect in that it would reduce consumption of firewood. It is still not possible to see this impact of electrification. On the contrary, there is indeed the risk that electrification could have a negative environmental effects, at least in areas around the electrified places, because they are attracting people from other areas and biomass is still the main energy source for preparing meals, even in restaurants, bakeries and hostels. We were told that new families who have decided to move to the towns with electricity still keep their fields in the areas where they used to live. So there are as yet no negative environmental effects from the opening of new fields close to the electrified towns. The main problem is forest exploitation for firewood.

The situation of families

Domestic tariff consumers

The examples gathered during the 1997 study indicated that it would be families who not only had an income from agriculture but also an additional income from wage work or self-

employment activities who would be able to afford the installation of electricity and the consumption costs.

The socio-economic analysis in 2001 shows that the domestic tariff consumer group comprises families with an income from wage employment or self-employment. In addition, all these families also practice agriculture. In order to analyse the sources of income of consumers with domestic connections, a sample was selected comprising all 98 consumers in Muhiliale neighbourhood in Ribáuè town and all those in Namigonha and Iapala - 45 and 100 respectively. The 243 consumers in the sample comprise 67% of all domestic tariff consumers (363) in Ribáuè district.

The following table shows the distribution of domestic tariff consumers by source of income.

Number and percentage of domestic tariff consumers by source of income, from a sample of 243 consumers (67%) of the total in Ribáuè district.

Source of income	Ribáuè town		Namigonha		Iapala		Total	
Market seller	20	20%	23	51%	19	19%	62	26%
Cotton factory worker	23	23%	-	-	-	-	49	20%
CFM worker or official	-	-	3	7%	5	5%		
Private sector worker	7	7%	1	2%	10	10%		
Self-employed*	8	8%	6	13%	5	5%	19	8%
Peasant	1	1%	-	-	-	-	1	0,5%
Trader	2	2%	-	-	1	1%	3	1%
Private farmer	-	-	-	-	9	9%	9	4%
Mill owner	3	3%	-	-	-	-	3	1%
Adm/Dist. Directorate worker	15	15%	1	2%	4	4%	20	8%
Teacher	12	12%	6	13%	28	28%	46	19%
Health technician	1	1%	3	7%	6	6%	10	4%
Police	3	3%	-	-	12	12%	15	6%
NGO	1	1%	2	4%	1	1%	4	2%
Other	2	2%	-	-	-	-	2	1%
Total	98	100%	45	100%	100	100%	243	100%
Women	7	7%	0	0%	3	3%	10	4%

* carpenter, stonemason, tailor, electrician, photographer, showing video films, local manufacturer of drinks, traditional doctor.

There are 10 domestic tariff contracts with women (4%). One is an itinerant trader, three are teachers, one is a nurse and one is a civil servant. The other three, all of whom have their own house, receive financial support from their husbands, two of whom have jobs and the other is a travelling salesman. Muhalile has the most consumers. The other electrified suburbs in Ribáuè town - Mulipiha, Murrapania and the cement neighbourhoods have 65, 29 and 14 domestic tariff consumers respectively. The others are teachers and officials living near the agricultural school.

Consumption level and costs - domestic tariff

The electrical current is used primarily for lighting and supplying a few appliances, mainly the radio and in some cases also a freezer and an iron. Firewood continues to be the main source of energy for cooking. Even so, expenditure on energy for the domestic tariff consumers is higher than when they used only firewood, paraffin and batteries. This is due in part to the initial cost of gaining access to the electrical current, but mainly because the amount of energy consumed rises when other energy sources are replaced by electricity. Nevertheless, the consumers feel that even though they have to pay more for electricity than they did for other kinds of energy, this is outweighed by the advantages of electricity.

The vast majority of domestic tariff consumers have an installed load of 1.1 kVa and their consumption is in the 0-85 kWh/month range.

Consumption by domestic tariff consumers in Ribáuè district, September 2001

Consumption range	**Ribáuè town**	**Namigonha**	**Iapala**
0-85 kWh	83% (181)	98% (44)	86% (86)
86-165 kWh	15% (33)	0%	12% (12)
>166 kWh	4% (4)	2% (1)	2% (2)
Total consumers	100% (218)	100% (45)	100% (100)

The following table shows the domestic tariff consumers in Ribáuè town in the 0-85kWh range, by consumption and the costs at each level, based on the consumption recorded by EDM. Costs are based on the tariff changes introduced in November 2001, the price for the 0-85kWh range being 866 Mt per kWh consumed and the fixed monthly tariff 51,288 Mt.

Ribáuè District. Consumption levels and monthly costs for domestic tariff consumers in the 0-85kWh/month range.

Consumption kWh	**Ribáuè-town**		**Namigonha**		**Iapala**		**Monthly costs Mt**
	Number	**%**	**Number**	**%**	**Number**	**%**	
0	16	9%	6	14%	2	2%	51 288
1 – 10	12	7%	6	14%	5	6%	52 154 – 59 948
11 – 20	18	10%	4	9%	14	16%	60 814 – 68 608
21 – 30	42	23%	10	23%	16	19%	69 474 – 77 268
31 – 40	33	18%	5	11%	13	15%	78 134 – 85 928
41 – 50	19	10%	4	9%	19	22%	86 794 – 94 588
51 – 60	21	12%	4	9%	6	7%	95 454 – 103 248
61 – 70	9	5%	0	0	6	7%	104 114 – 111 908
71 – 80	8	4%	3	7%	3	3%	112 774 – 120 568
81 – 85	3	2%	2	4%	2	2%	121 434 – 124 898
Total	**181**	**100%**	**44**	**100%**	**86**	**100%**	

According to this ranking of consumers, 70% consumed less than 40kWh a month, implying that electricity is used mainly for lighting and a radio. For example, if the family has three 60W bulbs that are used six hours a day for 30 days, total monthly consumption for lighting alone will be 32.4 kWh.

We have already mentioned that families with electricity are predominantly families with income from wage work or self-employment. They usually have double incomes, one in cash and another from their agricultural activities. There is no one who does not have a field where he produces his own basic food, even workers and civil servants with a permanent job. Nevertheless, even for someone with a job electricity consumption can become too expensive because wages are low. Most local workers receive 400,000 - 6000,000 Mt/month; civil servants usually receive more but even so they are not well paid. Those with higher incomes are engaged in different kinds of commercial activities, such as shop keepers and itinerant traders, people with stalls or bars in the market, mill owners and people who show video films and have a discotheque.

It is virtually impossible for a peasant family to have electricity at home. In most cases a peasant's only available cash comes from selling his surpluses. Agricultural marketing is still weak and there are also few surpluses. Peasants who produce cotton or tobacco have a more stable economic situation, and some are in a position to invest in the electrification of their houses. But they have difficulty in paying for the electricity because they do not have a regular income.

For a peasant family to pay for 40 kWh/month, corresponding to 86,000 Mt. it would have to sell 684 kg. of maize a year or 57 kg. a month just to pay for the electricity. This is based on an average farmgate price of 1,500 Mt/kg. in the Ribáuè area. However, the maize prize fluctuates throughout the year. Immediately after the harvest it was 800-900 Mt/kg. but during the period of shortage in November it reached 3,000 Mt/kg.

The family usually grows between 1 and 1.5 hectares of maize, producing 600-800 kg. per hectare. If an average household of five members is able to produce a ton of maize about 800 kg. must be kept to feed the family. A maximum of 200 kg. can be considered the surplus available for sale. Under such circumstances, the family will not be able to afford electricity. Moreover, they also have other needs that must be met and cannot spend all their income on energy alone.

Even if the family grows cotton it will be difficult to pay the monthly cost of electricity consumption. Most peasants grow an average of 0.5 hectares producing about 200 kg. Productivity averages 400-450 kg/hectare if they apply at least two spraying treatments. Subtracting the cost of the chemicals, the price they get for the crop is equivalent to 2,900 Mt/kg. so they must sell 30 kg. of cotton in order to pay for 40 kWh of electricity in a month. Another problem is that few families are able to plan their economy so that their income from the sale of crops is available throughout the year.

Tobacco is another important source of income in Ribáuè district. Tobacco production is increasing and since 2001 the district has had two tobacco promoters, the company João Fereira dos Santos and the company, SONIL. We were told that the arrival of SONIL has resulted in competition that has in turn increased the price paid to the tobacco growers. However, as tobacco is a very demanding crop that is sensitive to climatic factors it is a somewhat risky undertaking. Nevertheless, the number of peasants who have decided to grow tobacco is increasing. According to reports by the District Directorate of Agriculture and Rural Development, the tobacco promoters assisted 12,110 peasants in the 2000/2001 season. They planted 2,523 ha., averaging 0.2 ha. Each. According to measurements by extension workers productivity per hectare is 600 kg. We can thus conclude that each farmer is able to produce an average of 120 kg of tobacco. When the tobacco is sold it is classified by the promotion company into six different quality classes, and the price paid depends on quality. In 2001, the most common price paid to the peasants was 14,000-16,000 Mt/kg. equivalent to 3rd class quality.

There are about 25,000-30,000 families active in family sector agriculture in the district. Of these, about 5,000 grow cotton and about 12,000 grow tobacco.

Socio-economic situation and gender aspects

All the people interviewed in 1997 hoped that electrification would bring improvements and benefits for the population. The opinions of the various population groups and also of women and men differ somewhat, and were also influenced by factors related to gender. Sometimes men and women had the same expectations, other times not. We found that people's visions were frequently dependent on and influenced by their living conditions. Consequently, to a large extent the division of labour between men and women, social norms and positions determine expectations.

Access to the benefits of electricity is determined by the socio-economic situation of society and in particular the socio-economic situation of each family. Moreover, we find that socio-economic status and gender aspects are inter-dependent. Under these circumstances, families headed by a single woman are more vulnerable. Many face economic difficulties and have a much harder time than other families. Their difficult living conditions are not only reflected in the family economy but also in the woman's opportunities to do anything other than working. They have to work more and more and this gives them very little chance to participate in educational or community activities.

Despite all the initiatives by families to improve their economic situation, there is a tendency for socio-economic differences to increase and many families are in a very difficult situation. Socio- economic differentiation in society leads to an economic imbalance and also social and cultural inequalities. The poorer groups do not have the same access to education and health services as those in more stable conditions. To a large extent the standard of housing defines access to economic and social services. It is very clear that families living in rural areas far from the district capital not only have smaller financial resources but also have less access to economic and social services. Consequently, their

situation is defined by two factors, poverty and distance. When these factors operate together there is a serious risk that these families will become more vulnerable and this accelerates the process of social differentiation in society.

One of the problems faced by families is the weak monetarisationof the family economy. While the needs that can only be satisfied by cash are growing, peasant families have few activities that generate cash. For this reason the peasants, and men in particular, expressed the hope that electrification would bring more job opportunities. Although it is still early to measure this kind of influence of electrification, we did find that it has brought some more employment opportunities. However, in order to promote a positive cycle productive activities must be stimulated and facilitated. The peasants feel that the most important aspect is access to means of production and the ability to sell their surpluses at an acceptable price. Agriculture is the main basis for the establishment of a stable life in the rural environment. Health and education services must all also be available to help the peasant family create and maintain stability in their lives.

We can already see some signs of developments that are in accordance with the hopes expressed by peasant families in remote areas. The production and marketing of some cash crop such as cotton, tobacco and sesame is increasing. There are more schools and they are able to cover more and more areas of the district. Although the health network is not very extensive, the service provided in the existing health units is improving. The challenge is to create conditions that can produce benefits for everyone. This is not just an economic issue, but also an organisational, social and cultural one.

We asked whether women had the same access to electricity as men or if electrification had a special importance for women. The most frequent response was that women have the same access but also that it has special importance for them.

Now some of the mills run on electricity. The improved operation of mills is frequently mentioned because it permits a better use of a person's time. When a woman goes to the mill she does not have to spend a long time waiting. Public lighting means that a woman feels more at ease and safer when she has to go somewhere far from home at night.

Many women mentioned the importance of improvements in the health service and assistance in maternity units. Not only are these institutions better equipped now but the existence of lighting is also a major step forward. In the past, when a woman went to the maternity unit she had to take her own candle or paraffin lamp. Women had to remain in the dark if they had no money to buy paraffin.

Electrification is creating more opportunities for women to study. Quite a large number of women are attending night classes. In addition, the percentage of girls in both primary and secondary education is gradually rising. And there has been a substantial rise in the number of female students in the agricultural school. This is extremely important for rural extension and agricultural assistance activities, given that half the peasants in the family sector are women.

There has been a noticeable rise in the number of women operating as small economic agents in the markets in Ribáuè, Namigonha and Iapala.

When we visited the district in 1997, some people explained that women would benefit more from electrification than men because electricity would be used mainly for domestic work. Men in particular felt that a woman's workload would fall with access to electricity. At that time we ourselves envisaged that the opposite might happen, and indeed it has. This is because when a woman has light at home she can do more domestic work at night and spend more time on other work during the day. A woman spends most of her time working in agriculture, even women whose husbands have wage a job. Some women have small businesses. In addition to this they must also do their housework and take care are of their children. As families are using electricity mainly for lighting a woman still has to go and get firewood to prepare meals. The potable water supply system will improve in Ribáuè town but women living elsewhere still have to travel long distances to get water.

On various occasions it was mentioned that nowadays families have more problems than they used to. Some people hoped that electrification would create better conditions for families and thus help to eliminate some problems. Few people thought otherwise. One of the problems frequently mentioned was the excessive consumption of alcohol. It is mainly men who frequent bars and stalls, and drink beer and other forms of alcohol. Business in these bars is profitable and they now have more clients than before electrification. We asked if this has created social problems, with the excessive consumption of alcohol causing problems in the home.
Some respondents felt that easy access to cold beer and other alcoholic drinks was causing problems. They said that family problems and disagreements are often due to drunkenness. One public worker in the social action field explained that it is quite common for both women and men to abandon their homes. In his opinion this is due to the family's poverty but also to the alcoholism of some men. Other respondents also thought that the main problem is poverty, which is sometimes the main factor underlying alcoholism. Local representatives of the Muslim congregation also defended this position. They said that it was not so much a problem of easy access to alcohol but rather the difficult situation the man faced because he was unable to support his family.

REFLECTIONS, CONSIDERATIONS AND CONCLUSIONS

During the planning phase of the electrification project it was assumed that rural electrification could make an important contribution to the districts reconstruction and development process. This position considers that the electrification project addresses the economic and social needs of society and of the various economic stakeholders. To a large extent it corresponds to the prospects and plans expressed for the future. Nevertheless, in the planning stage we also found a need to reflect on the possibility of society and its members being able to taken advantage of the electricity supply.

During the 1997 study we established three sets of conditions for defining the utility of electrification:

- In technical terms level of use and advantages are determined by the cost of obtaining an electrical installation and connection, the tariffs charged for electricity consumption and confidence in the system supplying the electrical current.

- General economic development expressed by the financial capacity of economic actors, the current running cost budget of public institutions and citizens in general, access to capital and the market, income levels, purchasing power, housing standard etc.

- The socio-economic stratification of society will be a determining factor because it shows how the resources of society are distributed among the population. In a society with strong social differentiation, many families run the risk of being increasingly marginalised. They will possibly thus obtain less benefits from future improvements in the economic and social services of society arising from electrification.

Before the rural electrification project began, it was also found that:

Rural electrification is one of the important conditions for the development process, but full development potential is not created by electrification alone. This process depends on a number of other factors. In order to promote improvements in economic and productive activities, health and education services and create administrative and political stability, conditions must be created that permit the implementation of various different activities in a way that promotes good results. Consequently, electrification in itself cannot guarantee that development will follow the desired path. This must also be borne in mind in the future when assessing the effects of rural electrification.

Energy supply and maintenance

In the first place we found great confidence in the system supplying the electrical current. As they said in Ribáuè "the current is safe". They feel that the line was well built and is of good quality. The only problem raised is that the transformers have a number of technical problems. We were told that this is due the to their poor quality. One of the problems mentioned was an excessive discharge of all oil. The on the job training of personnel during project implementation is also considered good.

There is a permanent maintenance system for the transmission line, including continuous maintenance by the team of electricians placed in Ribáuè district. Twice a year weeds are removed from around the posts and the strip is cleared by people recruited locally and supervised by the maintenance team.

A certain times of the year, mainly November and December, there is general maintenance covering the whole area supplied with energy from Nampula. On these occasions energy supplies are interrupted for a few hours on Sundays. The power cuts are always announced in advance on the radio.

Expenditure linked to electrification

Installation and connection

Many of the houses with electricity connections are built of local materials. Before the electrification project started it was said that the installation cables in houses built with local materials and covered with grass would have to be protected with tubing. This security requirement was considered necessary in order to protect the users of electricity. This kind of installation is a little more expensive than a normal one, and not all of them have respected this requirement. However, the majority of the interior installations have been done with protected wiring to guarantee the safety of the installation. Before the connection is made, the installation is inspected by an EDM electrician.

During project implementation, the installation work was done also by EDM electricians. At that time Ribáuè district only had one qualified electrician, employed in the cotton factory. But since the electrification project started electricians from other areas have begun to show interest in the district. The EDM electricians say that they are no longer allowed to do household installations. Nevertheless, we understood that in fact the EDM electrician often assists other local electricians in order to ensure that the installation is done properly. This assistance seems to be necessary, because many of the so-called local electricians have no training as such, and even less a license for this kind of work. Their knowledge has been gained by learning through doing.

It is mainly the domestic tariff consumers who ask local electricians to do the electrical installation work. And installation by a local electrician is cheaper than hiring a trained electrician from a company. According to information obtained in the district, a local electrician charges 150,000 - 250,000 Mt for a simple installation in a house built of local materials. Others said that electricians charge 200,000 Mt - 350,000 Mt. The charge for labour varies from one electrician to another. The cost of other installations in houses or other kinds of buildings varies depending on the kind of installation and the size of the house.

Electrical accessories are now being sold not only in Nampula town but also locally in one of the shops and in the central market. The shop also has some electrical appliances such as fans and freezers. We were told that the price of almost all the electrical accessories and appliances has risen over the last two years. Many people with a connection bought the installation material in the local market. (See a comparison of the 1997 and 2001 prices in the Annex).

In addition to the outlays up to the moment when the installation can be physically used, there are a further three costs:

- the inspection cost: 58,500 Mt
- the connection fee that is determined by the installed load;
- the guarantee deposit, also determined by the installed load.

The connection fee for consumers with the smallest installed load is 16,380 Mt and the guarantee deposit is 163,800 Mt. (The various EDM fees and tariffs are listed in the table in the Annex).

Tariffs

In order to show the evolution of charges for electricity we can compare EDM rates in 1997 and those applied today.

The system used in the 1997 tariff table was different to that used in 2001. In 1997 the load fee was paid according to the installed load and a fixed price per kWh - 468 Mt for the domestic tariff. The fee for a 1.1 kVA load was 24,090 Mt. per month.

Under the current system, there is a fixed monthly fee that in November 2001 was increased to 51,288 Mt, and a tariff that varies according to the installed load and consumption. The lowest tariff is 866 Mt/kWh, applied to consumption in the 0-85 kWh per month range.

Consequently, the cost per kWh in November 2001 was 85% higher than in 1997. This refers to clients with the low energy consumption domestic tariff . The price increase for those consuming over 85 kWh has been more than 85%. Value added tax (VAT) is not included in the tariff paid by the consumer.

Problems

Payment

According to EDM Nampula statistics, at the beginning and in some subsequent periods the payment rate in the Ribáuè distribution area was low. The records of payments presented in the following table include general tariff and domestic tariff clients in the Ribáuè distribution area (Namina, Namigonha, Ribáuè town and Iapala).

Payment rates in January - September 2000, in the Ribáuè distribution area

Month	Janeiro	February	March	April	May	June	July	August	September	Total
Clients	482	499	509	517	521	528	531	542	558	
Rate	16%	40%	26%	92%	39%	35%	98%	64%	86%	
Cuts	2	8	1	157	0	0	89	10	7	274

The low payment rate is mainly related to five factors:

- The consumer’s weak economic capacity;
- consumers without a regular monthly income;
- high energy consumption due to ignorance or not being careful about consumption;
- an incorrect attitude to payment demands;
- management difficulties before EDM placed permanent staff in the various locations in the distribution area.

Clients who were unable to pay their bills were cut off. Some of these consumers were unable to restore the connection because they could not afford it. Others who could afford it were unable to pay because they do not have a regular income throughout the year. Others used the energy in an uncontrolled way, resulting in large bills from EDM that exceeded their economic capacity. In some cases the client thought he did not have to pay for energy because the government would provide support and assume responsibility for the accumulated EDM debts. The payment rate was also influenced by the fact that EDM did not have permanent administrative staff in the Ribáuè distribution area.

An electrician was placed in each sub area of the Ribáuè distribution area, but management of the collection of payments was based on a mobile team that had to make weekly trips of some 400 km. to supervise and do various kinds of work. As sometimes they were unable to appear on the day agreed, clients waited in vain and were unable to pay their bills. This has created yet another problem. On various occasions a client has been fined for late payments, when it was not the client's fault but was due to the defective administrative system. In November 2001, the Ribáuè distribution area received permanent staff and a vehicle for collecting payments. It is thus hoped that the collection of payments will become more effective.

As can be seen from the above table, the payment rate in recent months has been higher and more stable than at the beginning of the year. At the same time, despite the cuts the number of consumers is rising.

EDM Officials explained that supplies had to be cut off in order to create a payment habit. And the expected results have been achieved. After their electricity was cut off, many clients paid their bills.

It is also clear that consumers are being increasingly careful about saving energy. In the beginning, not all consumers had sufficient knowledge or experience to calculate or anticipate their energy consumption. During the first months, many clients were amazed by the large bills they received from EDM, and attributed this to their metres being read incorrectly, not to their real consumption of electricity. Little by little consumers have realised the importance of saving energy.

Limited distribution

The supply of energy still covers only a limited geographic area. On the one hand, because the construction of distribution lines and transformers covers mainly the population centres. On the other hand, because the range of a transformer is limited to 500-1,000 metres. People with activities far from inhabited areas do not have access to electricity. A client who wants EDM to make a T-off to his area must pay the extra cost. Not all of them can afford this.

In some cases, however, all in the industrial field, EDM has helped finance the expansion of the grid through cost sharing with the respective owners. This was how a carpentry workshop and a mill, both some distance from the established grid, got connected . They

were 200-300 metre extensions from the transformer to the site where the industry was located. The aim of EDM's participation in cost sharing was to promote the creation of job opportunities in rural areas.

Even though financial capacity in rural areas is very weak, more families are managing to pay to have electricity in their homes than the registered number of domestic tariff consumers. More families and other potential clients in the various neighbourhoods in Ribáuè town, Namigonha and Iapala, have contacted EDM and expressed their interest in getting a connection. While it is true that not all those who have expressed interest will be able to afford electrification, others will. Some already have the necessary installations in their homes, and are just waiting for a connection.

During the implementation of the project, all the material used up to the connection and the installation of the metre was financed by the project. Later, potential domestic tariff clients and general tariff clients had to start paying for the material needed for the line from the post to the prospective house. It thus became more expensive to get connected after the project ended than during its implementation.

According to the electricians in the Ribáuè distribution area, this is due to the lack of material. EDM does not have the necessary material, neither the twisted cable and posts to extend the line, nor the concentric wire needed for connections. So anyone wanting a connection must buy the necessary material that the EDM electrician will use to make the connection .

With this situation, another problem has arisen. The potential connection client does not always find the appropriate material. If the cables, posts and wires are not of the required quality, the electrician cannot make the connection – although we did see a number of connections with inappropriate material and extensions using weak, twisted and untreated posts. This situation worries the population. They are afraid that the posts and lines will fall down during rainstorms and heavy winds, causing fire and killing people.

It is hoped that there will be no more instances of inappropriate materials as the EDM management in Nampula has taken measures to prevent this from happening again. In addition, at the end of 2001 the Ribáuè distribution area received more new material for new connections.

Another short-term factor that is constraining taking advantage of electrification is that in some cases the location of the transformers does not correspond to demand. While more people are requesting connections in almost all the electrified areas, in two neighbourhoods in Ribáuè town there are few consumers per transformer. We anticipate that in the long-term the supply and demand for energy will balance out. However, in order to avoid such a situation in future rural electrification projects, them must be closer contact with communities during the project planning phase. Ways must be found of identifying the real number of potential clients, but this must be done locally.

EDM-Community Linkage

Various local leaders and consumers spoke of the importance of improving communications between EDM and communities, as many consumers still need more instructions and explanations about:

- how the energy supply works;
- the possibilities or limitations of extending the line and making more connections;
- the correct use of energy;
- the tariffs and fees.

Some consumers have also asked EDM to introduce the client consumption record card and to distribute the consumer's manual not just in urban areas but also in the Ribáuè area.

People have great respect for electricity but many are also afraid that electrification will cause death or other disasters. They are also suspicious when the material used is different to that used under the project. For this reason there must be contacts with communities and they must receive information in order to avoid misunderstanding. Local leaders also wanted that EDM to keep in close touch with them so that they are better able to explain to the population the various aspects of electricity supply.
According to the EDM electricians, there are no clandestine installations or connections. People in rural areas are usually afraid of "playing around with the wires" without contacting an electrician. On the contrary, if someone wants to take advantage of his neighbour's electricity for a festive occasion or a ceremony, he first informs EDM that lends him his neighbour's energy.

Conclusions

Electrification programmes are high cost investments that are not always profitable in the short term and in the strict commercial sense. Nevertheless, they are necessary in order to permit satisfactory development for the entire population in the country and for all sectors of society. They thus fall into the category of long-term public investments.

Although there are still not many electricity consumers in the district, electrification is already stimulating its development. There are general benefits for the population arising from new economic and commercial activities, better education and health services and better access to recreational activities. However, a more profound analysis of the impact of electrification will only be possible after the district has had electricity for several years.

Given that it is only a year an a half since the construction of the transmission line, little of the installed capacity is being used. The reasons for this include:

- limited financial capacity of the economic actors who could undertake activities that use electricity;
- the high prices charged by EDM for a T-off or for extending the line;
- EDM's shortage of material means that it cannot extend the line or even make new connections;
- the change in practices related to the connection costs to be paid by the client.

The Ribáuè distribution area could have more consumers than those registered at the end of 2001 if there were no constraints on the extension of the network and connecting new consumers.

The public sectors have various kinds of financial problems. However, according to the district health and education authorities, the government budget allocations for electricity consumption in health units and schools is always sufficient. What happens is that the budgeted amount is arrives late and this means that the institution in question is unable to pay its bill on time.

According to EDM Nampula, about 25% of payments in the Ribáuè distribution area is used to finance its administrative structure.

Benefiting from electrification is not just a question of having a house with electricity. There are general benefits for the population through the impact of electrification on economic development, improving health and education services and the greater interest shown in the district by a variety of actors.

Annex 1. Maps

Annex 2. Load Forecast

Annex 3. EDM tariffs and fees