

SOCIAL IMPACT EVALUATION

**PROJECT “FUND FOR THE PROMOTION OF
MICRO HYDRO POWER STATIONS (MHSP)”**

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INTRODUCTION

This paper presents the social impact evaluation of the Project “Fund for the Promotion of Micro Hydro Power Stations (MHSP)”, which was carried out by ITDG with the support of the Inter American Development Bank (IADB) through a Finance and Technical Cooperation Agreement.

In accordance with the terms of reference, the study’s objectives were diverse:

- To reconstruct the implementation process of the MHSP Project.
- To identify the direct and indirect impacts of the MHSP Project.
- To discuss the lessons learnt regarding the intervention model.
- To identify the conceptual and operational aspects that are replicable and/or that may be relevant to the formulation of policies in the field of rural electrification.
- To serve as an example of the application of the livelihoods methodological approach so that this methodology be incorporated to ITDG practices.

This evaluation was carried out through a quick research combining qualitative and quantitative data-gathering techniques, such as interviews, the application of sample survey questionnaires, and data sheets for each locality. The study was carried out from February to April 2005, and counted with the participation of ITDG’s sociologist Jose Zambrano and of sociologists Bertha Gutierrez Lopez, Graciela Blanco Hauchecorne, and Benito Ramirez Ocas. The author wishes to acknowledge the support of ITDG, and is particularly grateful to Alfonso Carrasco, Director of ITDG, and to Saul Ramirez, Head of the Energy, Infrastructure and Basic Services Programme, as well as to the helpful comments of Rafael Escobar.

1. THE CONCEPTUAL FRAMEWORK

This impact evaluation uses the Sustainable Livelihoods approach as the framework for its analysis¹. This approach aims at offering an opportunity to reduce poverty by providing a holistic view of the living conditions of the poor and of the way the poor perceive themselves. The guiding principles of this approach include considering the family together with other groups, such as those established on the basis of gender and age, as well as taking into account the strengths and inventiveness of people and not only their needs. The tools used in the framework of the Livelihoods approach allow to integrate several approaches, such as:

- The social approach, which refers to the differences in terms of access to mechanisms of power, valoration of assets, organisations, and participation.
- The economic approach, associated with income generation and family budgets.
- The institutional approach, which analyses the functioning of structures and local impact of policies.
- The environmental approach, which refers to the effect of Livelihoods strategies on the environment, including health and contamination aspects, as well as the impact of environmental factors on livelihoods and poverty.

The Livelihoods framework is flexible and not a straitjacket. Therefore, and for the purpose of this study, it has been adapted to the requirements of a social impact evaluation on the installation of electricity supply systems in rural communities. Among the various tools of this framework, special emphasis will be given to:

- The gender analysis, which may be classified as the social relationships, activities, access to and control of resources, and needs that differentiate men and women in a given context.
- The evaluation of the governmental function, which refers to justice in the exercise of political power, to the efficiency of social providers and to the honest, efficient, effective, and accesible nature of governmental structures, particularly of local governments which are closer to communities.
- The institutional evaluation, which is related to analysing whether the responsibilities concerning the provision of services are reasonably assigned within the governmental structure, as well as between the state and the private sector.

The Sustainable Livelihoods framework orients the focus of the study towards the distribution of assets among the rural groups considered, including the poor; towards the institutional management of these assets; and towards the ways in which these contribute to improve the living conditions of the people. In this way, this study differs from traditional approaches on electrification in rural areas that establish unmediated links between electrification and “rural development” and that assume that electrification implies increasing productivity, decreasing emigration, creating new jobs, etc.² From a systemic perspective, although technology may generate important changes in the functioning of the productive apparatus and social

¹ .- Departament for International Development (DFID), *Guía sobre medios de vida sostenibles. Sección 4. Métodos*. Electronic version, MultiCopy.

² .- According to this perspective, rural development is the result of the introduction of certain inputs (technology, among others) addressed to “recipients”. However, many evaluations carried out show that electrification does not have the expected impact or that it is not possible to determine clearly the role that electricity plays in achieving development objectives. This perspective does not take into account elements associated with the historical, socio-cultural, economic and institutional context that are located and mediate between electricity and the modification of aspects such as education, income, and migration, among other aspects. See Alfonso Carrasco, K. Juvas and M. Seppo: *Electrificación y desarrollo rural. Proyecto de electrificación en el área rural del Cusco, Perú. Informe final*. University of Helsinki, 1990.

organisation, the economic and social structure reciprocally defines the frames in which electricity may have certain impacts. The results of an electrification project depend both on the project itself and on the characteristics of the local system.³

Finally, three other considerations should be taken into account regarding the conceptual framework that has been adopted.

First, the social impact of rural electrification, including its effects on the quality of life, on people's initiatives, and on the reduction of poverty, is to be understood in relation to the regional and micro-regional economic dimension where electrification projects take place. Electrification projects are installed in areas that are part of economic corridors and that include localities with different hierarchies, ranging from localities that are real articulation nodes to other communities that are isolated or located at the end of roads or of bridle paths. Rural "urban centres" are usually the last links of the chain, but there are differences among them in terms of their role as articulators at the micro regional level and this fact will influence, and condition, both the quality of life of the people and the prospects for development.

Second, the inter-related levels of community and family should be distinguished. For communities, electrification represents a series of positive impacts related to the provision of services (basically public illumination in streetlights) which are associated with social uses of public spaces (squares, parks) or with prolonging the day. For families, energy is a service that represents the possibility of having access to goods for personal consumption (radios, television sets) and also to goods that will improve their incomes, such as machinery that may be used to develop activities in the sectors of services, commerce and industry. Access to these goods will depend on the economic capital, on the entrepreneurial initiative of the families, on the cultural capital of family members (technical studies, for instance),⁴ on the location of their houses within the communities (processes of formation of differential rents of every soil), and on the location of the community within a region or micro-region.

Third, a precision should be made concerning the concept of *social capital*. The DFID document refers to social capital as a slippery concept, associated with trust and reciprocity aspects which are generally intangible, and whose assessment is indirect, interpretative, and subject to discrepancies. In this paper, social capital will be understood as the degree of trust that exists among the agents of a given society and that spares potential conflicts; as the norms regulating civic behaviour practices (including aspects ranging from respecting and taking care of public spaces to paying obligations) and that contribute to the general well-being of individuals; and as the levels of associativity that express the capacities of acting in a cooperative manner, of establishing networks as well as all sort of negotiations and synergies.⁵

2. THE METHODOLOGICAL APPROACH

The Social Impact Evaluation is the process of identifying, analysing and making explicit the changes and modifications that have been produced in the social conditions of people as a result of the implementation of a Project. It is therefore understood that the execution of a Project generates changes both in terms of the direct beneficiaries or stakeholders and in terms of the context or setting where the action is carried out.

³.- Carrasco, et al. Op. Cit.

⁴.- The definitions of economic capital, cultural capital and other similar definitions are taken from sociologist Pierre Bourdieu. See Patrice Bonnewitz, *La sociología de Pierre Bourdieu*. Nueva Visión, Buenos Aires.

⁵.- Kliksberg, Bernardo "El rol del capital social y de la cultura en el proceso de desarrollo", in *Capital social y cultura: claves estratégicas para el desarrollo*. BID – FCE, México 2000.

A key issue in Impact Evaluation is the definition of “control scenario”, that is, to be able to determine that the changes produced are the result of Project activities and not the result of other actions external to the Project. The Project consisted of the installation of Micro Hydro Stations in rural communities which, in most cases, did not have energy services before, and therefore it is feasible to assume that the pertinent changes actually resulted from the Project intervention, or that these changes were due to social and economic initiatives that were promoted by the Project. However, when the same cause –electrification– produces diverse effects in various localities, other explanatory factors have to be taken into account (the economic advantages of a particular locality, for example).

The short timeframe in which this evaluation had to be carried out –a total of ten weeks– conditioned its nature as a quick research which included secondary data, such as previous evaluation reports that had been carried at the request of ITDG, but also included first-hand data produced on the basis of semi-structured interviews with several key informers (mayors, MHS operators, social leaders) in order to carry out triangulations, as well as sample survey questionnaires to gather specific information of livelihoods and on people’s perceptions.

In the combination of qualitative and quantitative research, priority was given to the extractive objectives of the study rather than to empowerment objectives, which would have better corresponded with a participatory study. The objective of the study has been to evaluate the results of a Project.

Comparing the present situation with the situation prior to the installation of the MHSs poses some methodological difficulties. The evaluations carried out at the request of ITDG, such as the one carried out by Aréstegui (*Estudio de impacto del Proyecto Fondo de promoción de MHS*, 1998), have given priority to technical aspects and cover a period after the installation of the MHSs. On the other hand, the socio-economic diagnostic studies on the localities of Las Juntas, Tamborapa and Incahuasi, which do include information on the situation prior to the installation of the MHSs, were not elaborated with the Sustainable Livelihoods approach and are not a Baseline or “line zero” study which could thereafter be monitored or continued by ITDG. In addition, these studies provide a lot of information on the family incomes generated through agricultural and livestock-related activities, which are not relevant for the purpose of this evaluation. Nevertheless, these studies have been used as much as possible to establish some comparisons.

The study included the following instruments:

- A data-sheet was elaborated for each locality under study in order to measure the social impact in each locality. A total of eight data-sheets were produced.
- A sample survey of households was applied in each locality. The survey measures the social impact at the level of families and households. A total of 174 survey questionnaires were applied.
- Semi-structured interviews were carried out with Project key informers/ stakeholders: ITDG officials, municipal and local authorities, entrepreneurs and leaders of social organisations. 18 interviews were carried out (Annex 1).

These instruments were designed and submitted to ITDG prior to their application in fieldwork. ITDG’s comments and suggestions were incorporated, and the instruments were modified accordingly.

3. THE PROCESS OF CONSTITUTION OF THE MHSs

In 1992, ITDG received a grant from the Small Grants Programme of the the Inter American Development Bank (IADB) to establish a credit program for the installation of micro hydro stations (MHSs) in rural communities, which also included training and technical assistance. A new Finance and Technical Cooperation agreement was signed between ITDG and the IADB in June 2000. By the end of 2004, 29 loans had been given to install a similar number of MHSs, which amounted to a total of US \$ 800,000. Most of the MHS stations are operating and 5 are either being built or are out of service..

The criteria used for approving the loans were that the beneficiaries be considered reliable subjects of credit, that a water source exist in the area, and that the area be rural and isolated, with a low-income but not poor population. Responding to previous evaluations, the second Project mentioned above sought to address the productive use of the MHS. But this intervention addressed more the state of the demand rather than the power required by these systems. In other words, the power of MHSs depended more on the availability of water and on payment capacity, rather than on eventual productive uses.

The training provided by ITDG to productive businesses has been oriented towards the establishment of grain mills, and other businesses offering juices, videos, battery loading, hair saloons, as well as carpentry, welding and locksmith services.

ITDG has also trained MHS operators so that they may administrate the systems in an entrepreneurial manner and autonomously (independently of municipalities). In this way, not only may political interferences be avoided, but the experience can also show that by empowering the community it is possible to take the challenge of managing the MHS in a more orderly, transparent and fair way. In all the cases (Conchan, Las Juntas, Tamborapa), the operation of the MHSs is not established in terms of a concession but rather as a contract for the management of the service. In the case of Conchan, a Pilot Project was developed with a private operator that has been supported by ITDG and a manual including aspects concerning regulations, fares, contracts and instruments was elaborated. Having faced problems concerning the payment obligations of municipal enterprises –aggravated by the fact that public sector enterprises are nonseizable–, ITDG considers that municipal enterprises are neither sustainable nor reliable.

Table 1 shows the eight cases of MHSs where the social impact has been evaluated, and includes the Yumahual MHS although this station belongs to a private company and is therefore for private use.

Table 1: Localities and MHSs Under Study

Name of the MHS	Location: District/ Province/ Department	Started operating in	Power (kW)	Beneficiaries	Comments
Las Juntas	Pomahuaca Jaén Cajamarca	2000	25	60	Located at a bend in the road between Chiclayo and Jaen (approx. 4 hours)
Tamborapa Pueblo (1,206 m.a.s.l.)	Tabaconas San Ignacio Cajamarca	2000	40	140	Leaving the Jaen – San Ignacio road (Km 40) and traveling 4 hours on a bridle road.
Huarango	Huarango San Ignacio Cajamarca	2000	50	150	Leaving Jaen, road in very poor condition, to San Ignacio (7 hours). River must be crossed with boat in Puerto Ciruelo
Incahuasi (3.200 m.a.s.l.)	Incahuasi Ferreñafe Lambayeque	1999	50	150	Access from Chiclayo through bridle road (6 to 7 hours)
Conchan	Conchan Chota Cajamarca	1995	80	114	Cajamarca- Chota- Conchan, 7 hour-drive by road in very poor condition
Chugur	Chugur Hualgayoc Cajamarca	1998	75	200	Cajamarca- Hualgayoc, road in very poor condition (2 hours)
Chalan	M. Iglesias Celendín Cajamarca	1994	25	87 (85)	Cajamarca- Celendín, 9-hour drive, road in very poor condition
Chetilla	Chetilla Cajamarca Cajamarca	2001	80	89	1-hour drive from Cajamarca
Yumahual	Magdalena Cajamarca Cajamarca	1997	25	5	40-minute drive from Cajamarca

Most MHSs started operating in 2000 and have been operating for an average of 6.6 years. In all cases, enough time has gone by so as to observe the social impact produced. Seven MHSs are located in the Department of Cajamarca, three of which are located along the Chiclayo-Jaen-San Ignacio economic corridor, and four of which are located around the node of the city of Cajamarca. One case refers to an MHS located in the province of Ferreñafe, in the Department of Lambayeque.

The approach in each case studied consists of describing briefly the location of each locality within the micro regional and regional contexts, and the information presented emphasises on the exercise of the government function (the exercise of political power, efficiency of providers, and the honest, efficient, effective, and accesible nature of local governments) and on the institutional evaluation. In this sense, the focus is on the levels of trust (intrinsecal aspect of social capital) resulting from the relationships established between the municipalities and the communities in the administration and management of MHSs.

Las Juntas

Las Juntas is located at 1,000 metres above sea level in the district of Pomahuaca (province of Jaen), by the side of the marginal road between Chiclayo and Jaen, and by the Quismachi river (at a four-hour drive from Chiclayo). The MHS operating in Las Juntas was donated by ITDG in 2000 and, therefore, this community is not financially indebted with ITDG. ITDG has

also provided advisory to a private limited liability company which was hired to operate and administrate the service, and which is responsible for the functioning of the MHS (with has a power 25 kW).⁶ Community members consist of around 60 families engaged in farming activities.

The houses have electrical meters, and those used as residence pay a minimum of 10 Soles per month while those used also for commercial purposes (bodegas) pay between 30 and 35 Soles per month. Community members pay these charges and the service is cut after two months of non-payment. Originally there were 40 beneficiary families, but the service was expanded to include other 20 families who had to request this expansion to the Committee in charge of the service, and had to pay 200 Soles each as connection charge. Three months ago, the district municipality of Pomahuaca, located two kilometres away, donated some land to the community members of Huarmaca who, after having settled on this land, are now requesting the expansion of the service. However, this extension depends on the municipality's covering for the costs of installing the required posts and networks.

On the community members side, some problems arise concerning the payment of electric charges. There is a certain malaise vis-à-vis their having to pay for the service according to meter readings, which in many cases forces families to pay between 14 and 16 Soles despite the fact that they consider that they do not have many electrical appliances. These families say that the families of the district of Pomahuaca only pay the minimum⁷, that they have to pay more, and even that the fares have increased. They propose that the Committee should not only be elected but also controlled by all community members. Another criticism is that the "wealthier" families, who use over 60 kW (and even up to 200 kW) pays very little, and that charges are not proportional to consumption. The suggestion is to include more "levels" or categories of charges. The case here could be that, given the availability of energy, a greater consumption does not represent a greater cost which, in fact, does not correspond with what is evident in terms of common sense. This situation might require that some training be carried out in this respect.

Huarango

Huarango's MHS is located in the district of Huarango, in the province of San Ignacio. Inaugurated in 2000, this station has a power of 50 kW and services 150 families. Access to the district of Huarango from Jaen requires driving for three and a half hours on a poorly maintained road, crossing the river with a boat in Puerto Ciruelo since there is no bridge, and driving three additional hours on a bridle road. Despite this, Huarango is a locality that articulates other towns and that has a considerable automobile traffic.

The MHS's administration is currently in a stage of transition. It was originally administered by the district municipality of Huarango, but as a result of several complaints, a Supervising Committee (*Comité de Fiscalización*) was established. Finally, in September 2004, an Administration Committee was established. This Committee had been in charge of managing the operations of the MHS under difficult conditions for almost seven months by the time our field visit to Huarango took place.⁸ This administrative transference was carried

⁶ .- The President of the Mothers' Club, Mariana Santiago, mentioned in the interview that the MHS was administered by an Administration Committee which was elected by the community and that, therefore, should be controlled. This version differs from the one provided by ITDG according to which this is a private company. This should be clarified.

⁷ .- It is recommended that information be obtained regarding the management of energy services in Pomahuaca, which might be administered by the municipality and might include subsidies. If this were the case, it would affect the community of Las Juntas in comparative terms since the community intends to have an entrepreneurial management system.

⁸ .- Information provided by Homero León, President of the MHS's Management Committee.

out without taking into consideration legal or social criteria that may provide greater stability to the process.

The service is provided without having electric meters in the houses and the minimum monthly charges are 5 Soles for residences, 10 Soles for houses-stores (*bodegas*), and around 15 Soles for industrial uses and businesses offering photocopying services. The incomes the Committee receives are barely enough to manage the service and there are no possibilities of expanding the system to service new users. Few families are behind with their payments (actually only one case was mentioned); the service is suspended after two months without payment and it is reconnected only when all charges have been duly paid. At the time of the field visit there was no street lighting in Huarango, except in the main square. There is even a sector of the town located in the upper parts that only gets the service occasionally when there is greater availability, although the families living in this area contributed with the initial works for the installation of the MHS.

The people complain that there is no energy when there is no rain or when rainfall is heavy and that despite this, they still have to pay the minimum charge. They mentioned that only once was the rate reduced when they hardly had any service at all during a complete month. Complaints also refer to the fact that “businesses” use up much more energy but do not pay much more than households. They would like the Management Committee to take this situation into account. They also mentioned that the square had previously a better lighting when a gasoline engine was used.

Committee members lack knowledge to deal with problems concerning the functioning of the MHS. For example, they do not know whether malfunctioning is caused by problems associated with the supply source or with the machine. They have requested ITDG’s support for the advisory of electrical engineers. Our general impression is that the MHS’s service is saturated.

Conchan

Conchan is located in the district of Conchan, province of Chota, in the department of Cajamarca. This district is an interconnection node with the city of Cutervo and other districts and towns, such as Chiguirip, Tacabamba – Chimban and Santo Tomas. Most of the people in this area have land and are engaged in farming activities.

The MHS, built by PRONAMACHS, started operating in 1995 with a power of 80 kW. The district municipality was paying for the debt resulting from the installation of the MHS but, as part of his electoral campaign, President Alberto Fujimori condoned this debt in the year 2000. In the period 1995-2000, the MHS was managed by a Committee which was headed by the mayor and integrated by the council members. It was agreed that the monthly rates would be 15 Soles for users and 20 Soles for industrial users. However, the political utilisation of the service increased the number of users in arrears (the phrase “votes for volts” was coined).

In 2000, via a bidding contest, the Company San Isidro was granted the concession of the service for the period 2000-2005. This concession is currently going to be extended for the next five years. The private management of the service has been profitable, has contributed to save energy considerably (users’ demand of energy dropped from 49 kW to 20 kW during peak hours), and the rate of in-arrear payments is now between 6% and 7%. The service is cut after two months of non-payment and the cost of reconnection is 10 Nuevos Soles. The number of users has increased from 114 to 368. ITDG’s loan of US \$ 18,000 was used for the installation of house meters, to purchase an electronic regulator, and, above all, for training in entrepreneurial management which has allowed the community to become a Pilot Project to test a modality of private management.

The MHS currently has 368 users and a maximum demand of 51 KW, and the service has been expanded to the villages of San Pedro and Chames. In 2003, support was obtained from the Regional Government of Cajamarca for electrification and for the installation of electrical networks for the communities. Nestle Company will soon inaugurate a cooling plant which will use the energy supplied by the MHS. The relationships between the municipality and private businesses are optimal and most of the users are satisfied with the quality of the service.

Tamborapa Pueblo

The urban settlement Tamborapa Pueblo is located in the district of Tabaconas, province of San Ignacio, in the department of Cajamarca, at around 12 hours from the city of Chiclayo, including a six-hour drive on a bridle path. Despite its distant location, Tamborapa is a town that connects several other localities. Inaugurated in 2000, Tamborapa Pueblo's MHS was built through the support of various organisations: FONCODES provided funding for the electrical laying, and FRONTIER for civil engineering works (water inlet, sand control device, canal). The municipality of Tabaconas provided the financial guarantee. Then, after a system's overload, ITDG provided funding for the installation of meters. This was carried out based on the assumption that, as demonstrated in the experience of Conchan, nothing could be achieved in terms of electric fares without having meters, and neither could business be developed nor an entrepreneurial approach be promoted. The municipality of Tabaconas owes ITDG around 45 thousand dollars. As stated by an industrial businessman, this attitude negatively affects other new loans for entrepreneurs.

The MHS has a power of 40 kW and is managed by a company providing the service to 178 active beneficiary families, within a total of 184 meters installed. Some beneficiaries move to the country from January to March and stop using the service, but then return and pay 10 Soles for reconnection of the service. Arguing that it had provided the financial guarantee required, the municipality of Tabaconas initially wanted to manage the MHS, but people opposed to this fearing that the municipality would take too long to put the system back to service in the event of damages or malfunctioning.

According to the company managing the service, electrical fares were reduced through the installation of meters since users paid 10, 15 or 25 Soles/ month and now pay a minimum of 6 Soles. The company faces problems of arrears and there are some 20 users who are behind with their payments (10.8%). The monthly fare has increased from 10 to 15 Soles as agreed in a meeting. The company's incomes are sufficient to cover administrative and operational costs, and any surplus is deposited in a bank account and used for reposition and maintenance expenses. Moreover, there is great demand for the service in the upper areas of Tamborapa Pueblo, but the MHS is already operating at its greatest capacity and industrial activities have to be suspended during peak hours.

At the beginning of the MHS's operation, an overload was produced on the system due to excessive residential and industrial use. The families used 100 Watt lightbulbs in their homes which, together with energy consumption by workshops, caused power failures at around 7 p.m. Training was provided by ITDG members on energy saving and, as a result of this, consumption fell from 40 kW to 20 kW. During daytime, the demand for energy ranges between 6 and 7 kW.

Chugur

Chugur is located in the district of the same name, province of Hualgayoc in Cajamarca, and is relatively close to the cities of Cajamarca, Chota, Cutervo, and Bambamarca. There are hopes that a road to Ninabamba will be built. Public transportation does not operate on a

daily basis and, in general, there is little traffic. Most of the people are engaged in agriculture and not many businesses may be observed in the square.

Chugur's MHS initiated operation in 1998 with a power of 75 kW. It was built through a donation of Chota's Sub Region and therefore implied no indebtedness. In 1998-2000 the MHS was managed by the district municipality; there were no meters in households and the charge was set at 15 Soles per month. In 2000, and in order to avoid political interferences, the users established a Management Committee for the MHS which was initially presided by a nun. In May 2003, the users –around 95 families– elected a new board for the Management Committee. This board has been reelected and board members perform their functions ad honorem.

ITDG's contribution of US \$ 35,000 allowed to install a medium-tension network and to purchase household meters which were paid by all of the users. At present, the minimum charge (up to 10 kWh) is 06 Soles; consumption between 10 and 30 kWh costs 0.50 Soles /kWh, and 30 kWh and over costs 0.40 Soles/ kWh. Approximately 650 Soles are obtained each month and the operator's cost is 400 Soles. The company saves this surplus to cover maintenance expenses. Currently, US\$ 4000 is required to solve a malfunctioning problem and due to the pressure of community members', the municipality has agreed to cover 50% of the required expenses despite its initial reluctance.

During winter months, the MHS operates without problems, but in the summer the service is provided from 7 p.m. to 10 p.m. The problem is the lack of water since in the dry months water supply drops from 100 L/seg to 30 L/seg. Most users have meters and those who do not pay a minimum of 06 Soles per month. Users behind with their payments range between 5 and 6 people each month (un 6%); service is cut after a two-month tolerance; and the reconnection cost is 10 Soles. The service in Chugur has expanded from the original 95 - 98 beneficiary families to service several rural hamlets such as Nuevo Perú (37 families), Paraiso (19 families), La Palma (30 to 35 families) and La Kolpa (18 families). Part of this expansion has been possible through a donation of FONCODES for the installation of secondary networks. Both the Management Committee and the district municipality support the idea of promoting private enterprises that may take over the MHS's management.

Chalan

The town of Chalan is located in the district of Miguel Iglesias in the province of Celendin, departament of Cajamarca. This is an isolated area which only connects Celendin with the district of Chumus, in the border with the departament of Amazonas. There is one van which provides public transportation services once a day.

The MHS initiated operations in 1994, with a power of 25 kW and servicing 87 (or 85) beneficiary families. ITDG granted the municipality a loan of USD 19,218 and a donation of USD 10,000. Additionally, the municipality contributed with USD 17,382 and *Diaconía* with USD 17,600. At the time this study was carried out, the MHS was not operating and a policeman, the only authority present in Chalan, reported that the mayor was in Lima (or in Chiclayo, according to other testimonies) and that the deputy mayor was nowhere to be found. There was a general malaise vis-à-vis the mayor and the district municipality due to the way in which the MHS had been managed. Several negative rumours on the mayor circulated in Chalan.

In 1994, the MHS was managed by a Committee, but then the district municipality took over the administration of the MHS for eight years although maintenance was neglected and the service was used for political purposes. According to some community members, the municipality charged less for the service than the actual cost and covered maintenance operations with subsidies. Moreover, municipality authorities and officials had had no

training to carry out this administrative task. By 2004, the community took control and established a Management Committee but the MHS already presented diverse mechanical and electrical failures. From January 2005 on, the MHS has had continuous problems and has been functioning only on certain occasions. The Committee is being advised by a private firm of engineers, but apparently the MHS does not operate adequately. The people of Chalan believe that they will benefit from the “Mantaro’s interconnected system” so little effort has been made to repair the MHS.

Approximately 50% of the families and households are not connected to the service, and only a part of the families that are connected have meters in their homes. The 25 kW power is estimated to be insufficient and apparently some industrial entrepreneurs were forced to abandon the area due to the lack of energy.

Incahuasi

Incahuasi is located in the district of Incahuasi, province of Ferreñafe, in the department of Lambayeque. It is an isolated district, located at a two-hour drive by the Chiclayo-Ferreñafe highway and then at six-hour drive by a bridle road. One or two vehicles –trucks– are used for daily public transportation of both passengers and freight. The municipality requested a loan in 1998 and the MHS initiated operations in 1999. The installed capacity of the MHS is 50 kW, and the maximum demand is 25 kW to provide the service to 150 beneficiary families. ITDG granted a loan of US \$ 30,000 that has already been paid by the municipality.

The municipality administers the service with a subsidy policy. No problems have emerged in terms of the administration despite management changes. There are no meters installed and each family user pays a monthly charge of 05 Soles. Businesses (bars, restaurants, stores) are charged 10 Soles per month, totalling around 700 Soles / month, which is insufficient even to cover operational costs (use 960 Soles / month). The municipality encourages families to use energy-saving lightbulbs. The users mentioned that the service sometimes fails but are not aware of the reasons for this.

In general people contribute to pay the fare and the very few users behind with their payments have three months tolerance before the service is cut. Then, they have to pay 5 Soles to have the service reconnected. In dry seasons, the electrical power is insufficient and households are serviced but there is no public street lighting. According to community members, people pay because the service is better and more economical than what they previously had. No problems were detected between the municipality and community members.

Chetilla

The hamlet of Chetilla is located in the district of Chetilla, in the province of Cajamarca, department of Cajamarca. Although Chetilla is not too far away from the city of Cajamarca (1-hour drive), this is an isolated district located at over 3,000 metres above sea level and to which there is no public transportation. The MHS has a power of 80 kW and provides service to approximately 89 families. The district municipality has managed the service since the MHS was inaugurated in 2001. However, at the time of the field visit, it was out of service. This MHS was built through a donation of the *Consejo Transitorio Regional* –CTAR (Transitional Regional Council) and the investment of the municipality. ITDG contributed with technical assistance. According to the mayor of Chetilla, the construction of a new MHS (with a power of 280 kW) is being considered in order to have enough power to provide the service to the higher areas.

The municipality charges users “according to production costs”, that is, there are no meters and a minimum fare is charged to most users, except for those who have businesses. The

mayor reports that the incomes generated through these charges cover the operational costs of the service, but not maintenance costs. The municipality authorities have thought of opening a specific bank account in order to save the surplus for maintenance costs. However, the mayor has doubts regarding the likelihood that private management companies might work in hamlets such as Chetilla since he considers that a subsidy policy is required and that the MHS must be viewed as a service to the community. The people of Chetilla, on the other hand, complained for the lack of energy and said that they had been given information on the reasons why the service had been interrupted.

4. IMPACT ON BENEFICIARIES

4.1. Impact on direct beneficiaries.

According to the data collected, the direct beneficiaries are approximately 910 families and 4,550 people, excluding the Yumahuall MHS which is for the private use of a company. The beneficiaries consist of people who live in “towns” or “urban settlements” in rural areas and who also have farming lands. It should be also said that the poorer families of these people live in their own farms, that is, in agricultural lands, and do not benefit from electrification efforts. These families refer to the “urban settlement” as “the town” and only go to the town when they need to buy certain products.

According to the sample survey, most beneficiary families have farm lands (65%), and 35% do not have lands and in general work as agricultural labourers. The case of Las Juntas is to be highlighted in this respect as 75% have no land. The families with lands up to 03 hectares prevail (44%).

Table 2: Beneficiary Families and Ownership of Farm Lands (%)

	Las Juntas	Huarango	Tamborapa	Incahuasi	Conchan	Chugur	Chalan	Chetilla	Average
No land	75	30	28	26	44	24	18	33	35
Up to 3 Ha.	17	47	41	55	39	38	55	56	44
4- 10 Ha.	08	13	24	15	17	34	09	11	16
11 - more Ha.	00	10	07	04	00	04	18	00	05
Total number of survey questionnaires	12	30	29	27	23	24	11	18	174

Source: Survey carried out as part of the study.

In terms of composition, most families have an average of 3-4 members (37%), followed by those with 5-6 members (32%). There are not many families with few members (1 or 2) or with many members (7 - 8, or more). However, the case of Incahuasi should be highlighted as 48% of the families living in this area, which is one of the poorest areas that was visited, have between 7 and 8 members. In most cases, these are nuclear families, with parents in the ages of 30-40 years and children in school age. Youths generally abandon the localities once they complete their secondary education and go to the cities of the region or to Lima in order to work or study.

Table 3: Family Structure of Beneficiaries (%)

Members	Las Juntas	Huarango	Tamborapa	Incahuasi	Conchan	Chugur	Chalan	Chetilla	Average
1-2	25	07	14	00	09	12	09	28	13
3- 4	41	53	38	18	35	42	45.5	22	37
5-6	17	20	27.5	30	39	46	45.5	33	32
7-8	17	10	20.5	48	04	00	00	17	15
9 and more	00	10	00	04	13	00	00	00	03

Source: Study survey.

4.1.1. Beneficiaries and the Use of Electricity

At the level of families, almost all beneficiaries use electrical energy (table 4). Only 1.5% of beneficiary families, those living in the Huarango, do not use energy. This does not include the families that had temporarily requested the suspension of the service or those not receiving the service due to non-payment of electrical charges. Energy is predominantly used for residential or mixed purposes (when households also used for business purposes), and there are practically no beneficiaries using energy only for business purposes. In average, 26% of beneficiary families have established businesses in the “urban centre”; that is, one of each four families has some kind of business (see table 10 below).

Nevertheless, table 4 shows that households with a mixed use (used both as residence and as business) are in the order of 59%, followed by households that are exclusively used as homes (39%). This predominating mixed use is due to a bias in the application of the survey given that the main focus of the survey was to examine the impact of electricity on the family economy, which is expressed in the implementation of small businesses.⁹

With this in mind, some remarks should be made concerning the percentage of households using energy only for residential uses. 55% of the households of Incahuasi and Chetilla, the most isolated and poor localities of our sample, use electricity exclusively for residential purposes. There are fewer small businesses in the “urban centre”.

Table 4: uses of electrical energy in the localities studied (%)

Name of the MHS	Number of survey questionnaires	Uses of electrical energy (percentages)			
		Used exclusively for household purposes	Mixed use (household and business)	Used exclusively for business	Does not use electricity
Las Juntas	12	34	58	0	8
Tamborapa Pueblo	29	40	60	0	0
Huarango	30	36	60	0	4

⁹ - Apart from this bias, field work involved a programming to cover “a locality in one day”. The research team left at dawn (at 5 or 6 a.m.), travelled for 6 or 7 hours, and arrived in the localities around noon when most of the farmers were working in the farmlands. At this time, most of the people that were in the “towns” or “cities” were state officials and the people who had shops or small businesses. It was common to find that some of the houses were locked since their owners were then working in the fields.

Name of the MHS	Number of survey questionnaires	Uses of electrical energy (percentages)			
Incahuasi	27	55	45	0	0
Conchan	23	35	65	0	0
Chugur	24	42	54	4	0
Chalan	11(*)	18	82	0	0
Chetilla	18	55	45	0	0
Average		39	59	0.5	1.5

Source: Survey applied as part of the study.

(*) Only 11 survey questionnaires were applied in Chalan and the resulting data should be taken with caution. At the time the questionnaires were applied, the mayor apparently was in Lima and the MHS was out of service, which generated malaise among community members.

The benefits of electricity that people perceive reflect the particular usefulness of energy as a livelihood. As shown in table 5, the main utility perceived has been lighting in houses, which was perceived by 82% of the surveyed. The next aspect mentioned (74%) refers to the comfort associated with the use of several appliances (television set, iron, blender) that contribute to make life more comfortable for families. Education was perceived as a benefit derived from electrification by only 62%, and is mainly perceived as a benefit by the families of one of the poorest localities: Incahuasi (89%). It is symptomatic that only 44% of the families of another very poor community, Chetilla, identify this as a benefit. The impact of electrification in terms of communications is not clearly perceived, especially in Chalan, Chetilla and Conchan.

Table 5: Benefits of electricity in households by localities (%)

	Las Juntas	Huarango	Tamborapa	Incahuasi	Conchan	Chugur	Chalan	Chetilla	Average
Light	83	70	83	89	83	75	91	83	82
Education	58	57	55	89	65	67	64	44	62
Communications	25	27	24	48	13	17	09	11	22
Comfort	58	63	79	44	87	88	100	72	74

Source: Survey carried out as part of the study.

The utilisation of physical assets, such as electrical appliances, shows the benefits that electrification has provided in terms of the goods used both for individual and family consumption in the rural areas studied. The most commonly used appliance is television (69%); seven of each 10 surveyed people have a television set. The exceptions are Chetilla, where there are no television sets (as there is no TV signal), and Incahuasi, where only half of the people have TV sets. Radios, which are traditionally associated with rural areas, rank second with 56%. Only in Chetilla and Incahuasi does the use of radios outnumber that of TV sets. The use of blenders (46%) and irons (45%) rank third and fourth respectively. Almost half of the people surveyed use these appliances. The fact that 24% of the families surveyed use refrigerators should be highlighted, as these appliances are generally associated with a mixed used of households (as home and also for business purposes).

Table 6: Utilisation of electrical appliances by localities (%)

	Las Juntas	Huarango	Tamborapa	Incahuasi	Conchan	Chugur	Chalan	Chetilla	Average
Television	83	83	83	52	93	79	82	0	69
Radio	58	33	31	70	65	58	64	72	56
Blender	67	43	52	12	60	67	55	17	46
Iron	50	67	38	04	65	63	64	11	45
Sound	42	33	34	22	30	33	45	22	33

equipment									
Refrigerator	58	43	34	00	35	08	09	5.5	24
Freezer	25	07	04	04	04	04	09	00	07
Computer	00	04	04	04	04	04	09	00	04
Washing machine	00	00	00	00	00	08	00	00	01

Source: Survey carried out as part of the study.

Benefits among social groups: Women and children¹⁰

Like the rest of the family, women benefit from the use of means of communication and entertainment, such as television and radio. Moreover, it was reported that the progressive use of appliances, such as blenders and irons –owned by almost half of the families surveyed–, is generating changes among the families of these areas that benefit women. In this way, traditional household devices such as charcoal irons, artisanal methods of blending, and the use of candles for lighting purposes are being replaced and “making it easier” for women to carry out their house chores, as was reported in Las Juntas, Chugur, Conchan and Chetilla.

A controversial point, however, is whether the impact of electrification relieves the workload of women or whether it extends their working day. According to Rafael Escobar, ITDG officer, “there is no evidence that women are assuming more burdens within the family division of labour and therefore may be working more hours”.¹¹ His argument includes two examples:

- In Chetilla, where weaving was always an important activity carried out by women, now, thanks to electricity, children (both male and female) are also able to participate in this activity which is even being diversified. Electricity has contributed in this case to incorporate more labour, to diversify the activity, to increase production, and probably to improve the economy. A certain specialisation has been produced in terms of women’s participation in the activity, and some sort of working schedules have been adopted that represent benefits for women.
- The case of Conchan is also significant since the women who participate in the activity of knitting sweaters can now delegate the chores of cooking and cleaning to other people.

In contrast, other people reported that women who usually help and participate in farming-related activities now take advantage of electricity and do the housework in the evenings, as was stated by the mayor of Chetilla. In Incahuasi, energy allows knitters to extend their working day to the evening. According to this version, women now have more time which is not used for leisure, but for productive activities or house chores.

It would be interesting to research this situation with a gender approach since, at least in one case, better forms of organising labour that derive from electrification would be generating changes within the family division of labour and modifying unequal gender relations. The incorporation of child labour, on the other hand, is another variable that affects this division of labour, although this form of labour is without doubt also controversial.¹²

¹⁰ .- The considerations hereby presented refer to the relationship between rural electrification and impact on social relations, such as gender relations. However, all aspects concerning gender-related issues have not been addressed. For example, it has not been uncommon to observe that boys go to school with better and warmer clothes than girls do. But gender as a general topic will not be addressed.

¹¹ .- R. Escobar *Comentarios al informe preliminar de la consultoría*.

¹² .- Other house chores are carried out without using electrical appliances or rarely involve using these. For example, only in one case was a washing machine used to do the laundry. Firewood is still used to prepare food.

With respect to children, there is a wide consensus on the fact that children have benefited the most with the installation of electricity, particularly in terms of education. In this sense, direct and indirect benefits are diverse: i) children now have light at home and may do their homework in the evenings with electricity; ii) electrification has promoted several small businesses that provide photocopying services. Photocopies of learning materials are used by children to do their homework; iii) the infrastructure of schools has improved and some schools have even been able to get computers, which opens up possibilities of using very modern technology; and iv) energy has contributed to the establishment of lodging houses, and has brought television and sound equipments, among other goods, which have made the towns more attractive. This allows that teachers be willing to stay for longer periods and that teaching hours be increased. In addition, and like the rest of family members, children also benefit from television entertainment.

4.1.2. Benefits related to saving on energy expenditures

One of the benefits of using electricity that was recurrently mentioned in the towns visited was the savings on energy expenditures that were produced after the installation of the MHS. For comparative purposes, we have used the diagnostic studies that had been previously elaborated by ITDG.¹³ On the basis of this information, table 7 shows an average family expenditure on energy of 36.7 Soles in the case of Tamborapa, of 44.7 Soles in Las Juntas, and of 15.5 Soles in Incahuasi per month.

Table 7. Monthly expenditure on energy per family (Nuevos Soles)

Locality	Families	Candle	Lamp	Burner	Car battery	Batteries	Other	Total	Average Spend
Tamborapa	60	76.5	1,362	268	246	254		2,206.5	36.7
Las Juntas	42	136	928	40	126	77.40	57.2	1,879.4	44.7
Incahuasi	36	41.2	192	210	118			561.2	15.5

Source: ITDG Diagnoses.

Note: the cost of using kerosene (for lamps and burners) was updated for comparative purposes. When the diagnostic studies were carried out, this cost was 1.20 Soles, while the present cost is 2.00 Soles.

Considering the number of families as constant for analytical purposes, Table 8 compares the average and total expenditures on energy prior to the installation of the MHSs with the current average expenditures on electrical energy per family. This comparison considers the average family expenditure on energy for residential uses only, and the information is based on the survey which was applied as part of the study. As shown in Table 8, the impact of electrification has been significant since Tamborapa families spend 4 times less on energy than what they used to, families in Las Juntas spend 2.7 times less, and families in Incahuasi spend 3 times less.

Gas is used to a lesser extent mainly because of its cost (38 Soles cylinder/ month which is equivalent to around USD 11.50). Only one electrical stove was detected, but this stove is seldom used.

¹³ .- The diagnostic studies on the communities of Las Juntas, Tamborapa and Incahuasi that were carried out by ITDG prior to the installation of the MHSs were used here.

Table 8. Savings on monthly expenditures on energy after the installation of the MHSs (Nuevos Soles)

Locality	Tamborapa		Las Juntas		Incahuasi	
	Total	Average/ family	Total	Average/ family	Total	Average/ family
Spend prior to MHS	2,206.5	36.7	1,879.4	44.7	561.2	15.5
Spend after MHS	540	9.0	693	16.5	180	5
Difference	1,666.5	27.7	1,186.4	28.2	381.20	10.5

Source: ITDG Diagnostic studies and study survey.

4.1.3. Impacts on the family economy and income levels

Most of the persons surveyed –six of every ten– consider that their family incomes have improved with the installation of the MHS. This improvement is perceived mainly in Chalan (82%), Las Juntas (75%), Tamborapa Pueblo (69%) and Incahuasi (63%). Only in two cases, Conchan and Chetilla, is this not perceived as an improvement by most people, and negative answers are 61% and 55%, respectively.

Table 9: Improvements in family incomes

Name of MHS	Have family incomes improved in your family?	
	No	Yes
Las Juntas	25	75
Tamborapa Pueblo	31	69
Huarango	50	50
Incahuasi	37	63
Conchan	61	39
Chugur	42	58
Chalan	18	82
Chetilla	55	45
Average	40	60

Source: Study survey.

Two additional questions were asked to those people answering that their family incomes had improved after the installation of the MHS: these people were asked to provide an estimation of how much the improvement consisted of and to specify the causes for such improvement.

As shown in table 10, most people (41%) consider that their incomes have increased by less than 33%; a second group (25%) considers that incomes have improved in 33%; and another group (23%) considers that incomes have increased in 50%.¹⁴ Among the communities with greater benefits is Huarango, where 40% of beneficiary families consider that their incomes have improved in 50%; Las Juntas, with 33% of benefited families; and Chetilla, with 38% of benefited families. It should be also said that 12% of the families in Incahuasi declared that their incomes had increased over two-fold, and that this is the only community where such a

¹⁴ .- Taking into consideration the people's reluctance to declare monetary incomes, the survey questions on income increases referred to the portion of increases that could be attributed to the installation of the MHS.

response was given. The relative impact of the MHS on the communities of Chetilla and Incahuasi –which are among the poorer communities visited– should also be highlighted.

Table 10: Improvement in family incomes in the communities

Name of the MHS	How much have family incomes increased?				
	Less than 33%	33%	50%	Two-fold	More than two-fold
Las Juntas	44	11	33	0	0
Tamborapa Pueblo	35	25	40	0	0
Huarango	40	40	6	0	0
Incahuasi	46	18	18	6	12
Conchan	56	22	22	0	0
Chugur	36	43	14	7	0
Chalan	44	44	12	0	0
Chetilla	50	0	38	12	0
Average	41	25	23	3	1.5

Source: Study survey

With respect to the reasons explaining this increase in family incomes, the first reason mentioned by most people (60%) is that this was generated by the presence of goods and the establishment of businesses that in turn were possible thanks to the installation of the MHS (table 11). These businesses are basically part of the service sector or “urban economy”, including activities such as restaurants, bars or cafeterias which require refrigerators and freezers to store cool beverages, and goods such as television sets or sound equipments. In poorer areas, these businesses are small shops or stores (*bodegas*). Other businesses are carpentry workshops, lodging or room rental, and the manufacturing of ice cream. Some bakeries and grain mills have also been established.

The answers “sold more” (13.3%) or “improved production” (13%) share the second position as explanations for improved incomes. While the latter refers to improvements in some productive activities carried out in workshops (wood or metal carpentry), the first answer is associated with the effect of extending the working schedule of some commercial activities or services that already existed before the installation of the MHS. Answers related to more or better employment only reached a 6.3%, which allows us to infer that improved incomes were mainly the result of the establishment of family businesses (both service and productive businesses), rather than the result of the creation of new jobs.

The field-visits allowed us to observe that an important factor for the establishment of businesses and, therefore, for improved incomes, is the location of households or premises. Buildings located around the central areas of the towns (main square, park, bus-stop) have comparative advantages in terms of location that allow owners to obtain a differential rent. For example, the houses that have benefited the most in Las Juntas are located close to the square, while the most distant ones have less opportunities in terms of their commercial use. In Incahuasi, the houses that benefited the most are located in the lower areas, near the square or close to the road. The houses located in the upper areas, on the other hand, are constrained in terms of developing businesses. Moreover, most of the people living in the lower areas have a TV and a better house than those living in the upper areas, who only have radios and whose houses are in poor conditions.

Table 11: Reasons why incomes have improved

Specify why your income has improved (percentages)						
	Established a business	More job opportunities	Improved production	Sold more	Saving	Other
Las Juntas	78			11	11	
Tamborapa Pueblo	35	10	20	20	5	10 (*)
Huarango	67		13	7		13
Incahuasi	59	6	29		6	
Conchan	33	11		56		
Chugur	93		7			
Chalan	67	11	22			
Chetilla	50	12.5	12.5	12.5	12.5	
Average	60	6.3	13	13.3	4.3	3

Source: Study survey.

(*) This refers to two cases of room rental, which could have been included in the category of “establishing a business”, but we wanted to highlight this activity.

As the interviews and the survey show, electrification has had no impact on agricultural and livestock production. Farmers continue to use the same farming practices that they had before the MHS was installed. ITDG has not directly promoted the use of equipments in agriculture in the frame of the project and, therefore, it is not possible to establish a relation between rural electrification and improved incomes in the sector of agriculture and livestock.¹⁵

4.1.4. Impacts on the local economy of the “urban centre”

After visiting the communities and interviewing qualified informers, a data-sheet was elaborated on the productive and commercial uses of each community (table 12), which provides an overall view of the individual and family businesses established.

The installation of the MHS contributed to the establishment of 216 businesses, most of which are small *bodegas* (54), restaurants (23), and bakeries (16). By relating the number of businesses established and the total number of families that electricity has benefited, it may be stated that an average of *26% of benefited families, that is, one of every four families, have established businesses in the “urban centre”*.

With respect to productive uses of electricity, metal carpentry workshops (08) and wood carpentry workshops (16) have been established by young entrepreneurs who returned to their communities after having been trained in one of the Higher Technological Institutes of a big city (such as Chiclayo or Cajamarca). Their production addresses local demand (doors, furniture). The presence of these workshops reveals a local demand and a certain purchasing capacity. Their absence, on the other hand, reveals greater poverty in the communities (Incahuasi and Chetilla).¹⁶

Furthermore, activities in the service sector, such as restaurants and, above all, homes offering accommodations (which require for implementation an initial capital that is relatively

¹⁵ .- However, it should be noted that the diagnostic studies to which we have had access emphasise on income generation based on the activities of agriculture and livestock –and not so on the concept of “urban economy”-, although the Project was not geared towards an intervention on the incomes generated through these activities.

¹⁶ .- There are no workshops in Las Juntas, but this community is a special case since it is located by the roadside of the marginal highway, and is only 15 minutes away from the capital of the district which is the town that provides Las Juntas with services and equipments.

important in the area) now offer more comfort not only to foreigners, but also to the public officials that work there (teachers, health personnel, etc).

Table 12: Productive and commercial uses of electricity

	Las Juntas	Huarango	Tamborapa	Incahuasi	Conchan	Chugur	Chalan	Chetilla
Metal carpentry		01	03		01	02	01	
Wood carpentry		03	05		02	03	02	01
Pharmacy or sickbay	01	02	01		01	01		
Battery service	03	02	02	02	02	03	03	01
Appliance repair			02	01			02	
Grain mill				03	01			02
Bakeries	02	03	04	04		03		
<i>Bodegas</i>			21	12	06	07	07	01
Restaurants		05	08	05	02	02		01
Accommodations	01		02	01	02	01		01
Photocopies				02	01			
Dental technician		01	01	01	02		01	
Other	13 (*)	01	21 (**)	01	08	04		
TOTAL	20	18	70	32	28	25	16	7
Ratio of businesses to total number of beneficiary families	33	12	50	21	24.5	21	18	8

Source: Data-sheets on communities.

(*) Includes 08 fruit stands or kiosks.

(**) Includes 07 bars.

There are exceptional cases that are above the average, such as those of Tamborapa Pueblo or Las Juntas, where the percentage of families engaged in businesses is 50% and 33%, respectively.¹⁷ Comparisons may be established in both cases with the 1998-situation through ITDG diagnostic studies on these communities.¹⁸ Tamborapa has today 21 *bodegas*, 04 bakeries, and 02 restaurants whereas before the installation of the MHS there were 22 *bodegas*, 02 bakeries and 06 restaurants. In Las Juntas, the number of fruit stands has increased from 06 to 08 since the MHS was installed, but the number of other services, such as the sickbay or accommodations, has remained the same. However, this percentage is much lower in the cases of Chalan, Incahuasi and Chetilla as these communities have a less advantageous location within the economic corridors. The information provided by the initial diagnostic studies stated that there were one or two dental technicians and 7 bakers in Incahuasi in 1998. Today, there is one dental technician but there are four bakeries. Significant changes in Incahuasi are associated with the establishment of grain mills, photocopy businesses and homes providing accommodation.

This positive impact on the local economy is perceived by most of the people (87%) who have benefited from the installation of the MHSs (table 13). Furthermore, when this information is contrasted with that of table 9, which shows that 60% of surveyed people recognised that improvements had taken place at the family level, we can see that even

¹⁷ .- The particular location of these communities, as articulation nodes within the economic corridors, contributes to this. Tamborapa is an intermediate town connecting with three other small cities in this urban system, and Las Juntas is located by the side of the marginal highway that leads to Jaen, a city that is currently experiencing an important growth in demographic terms.

¹⁸ .- The diagnostic study on Las Juntas does not specify when it was carried out, but we assume that the study was done in 1998 or 1999.

those who did not perceive any personal or family benefits admit that improvements were produced at the level of the local economy.

Table 13: Impacts of the MHS on the local economy

Name of the MHS	Do you believe that the impact of the installation of the MHS on the local economy has been positive rather than negative? (percentages)	
	Yes	No
Las Juntas	92	8
Tamborapa Pueblo	93	7
Huarango	73	23
Incahuasi	100	0
Conchan	87	13
Chugur	75	25
Chalan	82	18
Chetilla	94	6
Average	87	12.5

Source: Study survey.

Enterprise and productive uses

The evaluation study also included the case of Yumahuall, the only MHS considered to have a productive use at the service of a private company (ANIDE). This company used to buy and sell chickens, and now is engaged in breeding reproducers since the electricity generated by the MHS contributes to the incubation process. Project files show that ITDG decided to give a loan to this company in order to increase the supply of fresh products to the city of Cajamarca, lower the cost of these products via the reduction of transport costs, promote local agro-industrial development, and generate more jobs in the area.

However, although the MHS was inaugurated in 1997 – 8 years ago-, the number of workers working in this company is still the same and, as the manager reported, this economic activity has become more difficult because there is a lot of competition. Due to their production, the big companies of Trujillo are the ones that set the prices, which leaves little margin for small businesses. ANIDE sells 500 -1000 chickens per month. In addition, the main water source in the area is now also used to supply water to the town of Choropampa, in the district of San Juan de Cajamarca, thus reducing the amount of water supplied to the MHS. The people of Choropampa demanded that this water source be also used for Choropampa, a demand that was supported by the Yanacocha Mining Company operating in the area.¹⁹

4.1.5. Impacts on social and demographic aspects

In social and demographic terms, the installation of the MHSs is producing two different dynamics in the communities: internally, it is generating factors of attraction for the people of these communities and of other areas, such as comfort and other aspects derived from economic agglomeration. However, in the external level, which is associated with the regional dynamic, young people continue to emigrate to other areas (see section 4.2.3). This situation is strongly conditioned by the location of the communities within the regional urban system.

¹⁹ .- In Chalan we were told that the level of the river feeding the MHS had been affected because farmers in the higher lands had built canals for irrigation. The level of the river is particularly affected by this in the summer.

Improvements in terms of comfort, which are expressed in the acquisition of electrical appliances, is leading farmer families to settle progressively in the “urban centres”. Except for Las Juntas, where 75% of the families have no land, most of the families living in the other communities have lands with up to three hectares (they are small farmers). Attracted by comfort, these families are moving to the urban centres where they usually also own a house. Moreover, the comfort enjoyed by some families is also leading other families to imitate those who live in the urban centres. Thus, for example, an Incahuasi municipality official reported that people are now more willing to work in order to have the necessary incomes to buy “the comfort” others enjoy. This is evidenced, for example, in the acquisition of a TV set (the cost of which ranges between US \$150 and US \$ 250).

The installation of the MHSs and their impact on the development of businesses, such as *bodegas*, restaurants, accomodation and boarding houses, and industrial workshops, is generating advantages in terms of economic agglomeration. The people of Tamborapa Pueblo, for instance, no longer need to go to Jaen to buy metal doors or photocopy documents, since this may now be done in their community. Moreover, like in Chetilla, electricity (electric light) has made the communities more attractive to teachers who know remain longer, with the consequent improvement of education. In Incahuasi, the *Asociación Incawasi Awana Tejedores* has now more time to produce the textiles that they will sell in Huaraz or Chiclayo. The bakeries established in the communities produce the goods that had to be imported from other towns. This process of economic agglomeration has made the communities more attractive to local dwellers and even to outsiders who are now willing to invest in these areas.

Some people come to these communities attracted both by energy and by their commercial activity: there are immigrants willing to settle and establish businesses in these areas. In the case of Tamborapa Pueblo, a community connecting several towns, people come from Huancabamaba or Jaen to buy land or houses, and teachers come from Chepen, San Pedro or Cajamarca. Even in the case of Chalan, which has little commercial activity, we found that a woman from another area had bought a house and opened a small *bodega*. The house this lady bought does not have electricity, so we assume that the price was quite convenient for the buyer.

4.1.6. Impacts on public services: health, education, and communications

The installation of MHSs has only had a relative impact on public services such as communications and education. In terms of health, the impact is related to an improvement and to the modernisation of equipments.

In the field of communications, some municipalities have been able to install parabolic antennas as well as television retransmission systems. There are parabolic antennas in Chalan, Chugur and Chetilla, even though none of the persons interviewed in Chetilla had a TV set. There are also TV retransmission systems and radio stations in these areas.

With respect to education, educational infrastructure has been improved only in a few communities with the installation of computer modules, as in the cases of Chetilla (02 modules) and Tamborapa. The most important benefit has been lighting in classrooms. Television sets, VCRs (VHS), and sound equipments that contribute to modernise education have been installed in Chetilla and Chalan. Regarding teachers, table 14 allows some time comparisons. There are currently 20 teachers in Tamborapa Pueblo, while seven years ago there were 19. Las Juntas has one teacher and used to have two. The information on Incahuasi does not allow comparisons. The bottomline is that it is difficult to establish connections between electrification and the number of teachers, since the latter depends on

other factors such as the availability of public resources, the number of persons in school ages, among other factors.

With respect to health services, the greatest benefit has been the lighting of health care centres and the installation of computers, as in the cases of Incahuasi, Chetilla, Chugur and Conchan, that is, in half of the communities visited. Health care centres have also been provided with heaters, refrigerators, nebulisers, freezers, centrifuges, television sets, VCRs, sterilisers, electric boilers and radios. In terms of personnel, in some cases, as in Tamborapa Pueblo, a person has been hired to digitise data.

Table 14: Personnel providing education and health services

Community	Current year	Base year
Tamborapa Pueblo	2005	1998
Education		
Pre-school	02 teachers and 52 students	01 teacher and 53 children
Primary	08 teachers and 227 students	10 teacher and 236 students
Secondary	12 teachers and 258 students	08 teachers and 162 students
Health		
Health care centre	01 doctor, 01 nurse, 01 midwife, 01 laboratory technician, 02 technicians, 01 "digitiser"	01 doctor, 01 nurse, 01 midwife Other technicians
Incahuasi	2005	1996
Education		
Pre-school	01 teacher and 70 students	02 teachers and (undetermined) number of) children
Primary	08 teachers and 316 students	(undetermined number of) teachers and 35 students
Secondary	07 teachers and 250 students	(undetermined number of) teachers and 25 students
Salud		
Health care centre	01 doctor, 01 laboratory technician	01 doctor, 01 nurse, 01 midwife Other technicians
Las Juntas	2005	1998 or 1999
Education		
Pre-school	No pre-school.	1 teacher and 15 students
Primary	1 teacher and 25 students	1 teacher and 20 students
Health		
Equipment	Community sickbay, 1 person	1 health adviser (<i>promotora de salud</i>)

4.1.7. Impact on access to infrastructure: water and sanitation, roads

No relation is observed between the installation of the MHSs and access to infrastructure. At the same time that electrification was implemented, and in most cases, previously, the communities had been trying to obtain services such as water and sanitation. These services are managed by the municipalities, with subsidised rates. No conflicts are perceived between the MHS's use of water and the water used for human consumption. With respect to roads, bridle roads and paths, conditions have not improved. For example, no road has been built on what used to be a bridle path. The central government and, in some cases, the municipalities provide a road maintenance service which is subject to several financial constraints.

An extreme case of a community lacking roads is that of Huarango. Despite the fact that due to its location this community is an interconnecting node with other communities, and despite its relatively important traffic, Huarango is still isolated since there is no bridge that connects this town with the main cities of this regional urban system.

4.1.8. Impact on natural resources

The installation of the MHSs has had little impact on practices such as using firewood for food preparation and, therefore, deforestation continues to be a problem. The permanence of this practice is due to economic reasons. The majority of families continue to use firewood, which they get without cost in their lands. The families with no lands usually buy two to four loads of wood, for which they pay between eight and 16 Nuevos Soles per month (USD \$ 2.4 to USD \$ 4.8). A small group of families, estimated in 10% of the total number of families or, at the most, in 15% in the areas with greater economic activity, uses gas stoves. Usually a cylinder of gas is used per month, which represents an expenditure of 38 Nuevos Soles (USD \$ 11.50).

There are no environmental problems concerning the use of water sources for MHS purposes. In general, there is enough water to both operate the MHSs and to supply the water service either collectively to the communities or to the individual houses. The cases of Yumahuall and Chalan have been mentioned above, but water-related problems in these communities are associated with insufficient water flow for the operation of the MHSs and not with environmental aspects. Only in the case of the locality of Chugur were there complaints regarding the pollution of the river and the disappearance of trouts, but this was later attributed to mining operations in the higher areas and not to the installation of the MHS.

4.1.9. Inter-institutional relations between the community and the local government

Section three referred to the process of relationships established between the community and the local government regarding the management of the MHSs. In terms of the livelihoods approach used as analytical framework, these inter-institutional relationships are related to the evaluation of the government function (How efficient and accessible are the providers of local services? Are governmental entities honest, efficient, effective, and accessible?); to the institutional evaluation itself (Are responsibilities reasonably distributed between the State and the private sector?); and to the levels of *trust* which are a significant component of the social capital of each community.

The cases that have been analysed show that three MHSs are privately managed, through contracts with private companies; three MHSs are managed by Administration Committees which were promoted by the people of the communities; and two MHSs, those located in the poorer communities, are managed by the municipalities (table 15).

Table 15: MHS institutional aspects

Management	Rate		% satisfied with service	Do you now spend more on energy than you used to?		
	Mixed	Residential		Yes	No	The same
Private company						
Conchan	24.36	19.0	83	57	30	13
Las Juntas	42.75	16.25	50	9	55	36
Tamborapa	22.53	9.0	79	21	62	17
Administration Committee						
Chugur	13.40	8.40	88	4	75	17
Chalan	8.0	7.33	18	0	100	0

Management	Rate		% satisfied with service	Do you now spend more on energy than you used to?		
Huarango	10 a 15	5.0	40	7	73	17
Municipality						
Chetilla	14	7.0	72	17	66	17
Incahuasi	10 a 15	5.0	85	16	85	11

Source: Study survey.

Although the processes have been subject to several marches and countermarches, the general trend regarding the administration of the MHSs is the transition from municipal to private management or to that of an Administration Committee. The current process shows that municipalities have not been efficient in managing the MHSs and that their providing the service does not ensure either the operation or maintenance of the MHSs given their persistence to subsidise energy. Although the application of subsidies may be justified in terms of favouring the poorer, the fact is that these subsidies conceal political interferences or are used by mayors to secure advantages for themselves. Moreover, the municipalities have had a poor capacity for the innovation of municipal administration in terms of operational and managerial aspects. They are hardly able to install house meters, the municipality books are unclear, community members are neither informed or empowered on the situation of the service, and there have even been cases when the terms of financial agreements have not been complied with.²⁰

Only two MHSs of the cases analysed are currently managed by municipalities. One is Incahuasi, where 85% of the people are satisfied with the service. There are no house meters in Incahuasi, and residential users pay 5 Soles/ month and users combining home and business pay 10 to 15 Soles. The people are satisfied with the service but the municipality has difficulties to ensure maintenance and the expansion of the service. The other case is Chetilla, where 72% of the people are satisfied with the service. There are no house meters and the service had been cut off at the time of the field visit. Users were given no information on the reason why the service had been suspended. Residential users pay 7 Soles/ month and those with a mixed use pay around 14 Soles in average.

Three MHSs are managed by Administration Committees. In these cases, inefficient service generated conflicts between the municipality and the community, as well as mistrust among the latter. Chalan is a case of inefficiency since the MHS was out of service at the time of the field visit. Only 18% of the people surveyed are satisfied with the service and the mayor's former municipal administration is blamed for the inefficient service. The Administration Committee maintains a low-rate policy (7.33 Soles for residential uses and 8 Soles for mixed uses). Only 50% of the people have access to the service, but not all have house metres and only pay a "minimum". Huarango is a similar case. At the time of the field visit, the Administration Committee had been managing the MHS for seven months. Only 40% of the users are satisfied with the service. There are no house metres, and the rates are similar to the ones the municipality charged. The service is frequently interrupted, there is poor street lighting, and there are no resources to expand the service so as to incorporate new users.

Chugur is the locality where the Administration Committee works better. This is probably due to the fact that this Committee has been managing the MHS over the past five years and to the fact that the Committee was established as the result of a progressive process of "autonomisation" from the municipality. Home meters were installed with the support of ITDG and paid for by the users. According to survey data, a residential user pays an average of

²⁰.- This is the case of the municipality of Tabaconas (where the Tamborapa Pueblo MHS is located), although it should be mentioned here that the opposite case is that of the municipality of Incahuasi. The fact that the public sector is nonseizable aggravates this situation.

8.50 Soles/ month and mixed users pay 13.30 Soles/ month. The company saves revenues to cover maintenance and service users have committed the municipality to cover a repair cost, despite its initial reluctance. Around 88% of users are satisfied with the service and 75% consider that they do not spend more on energy than what they used to. There is consensus regarding moving towards a private management of the service.

Three MHSs are managed by private companies. Conchan is an ITDG's pilot experience whereby a private company became responsible for the management of the service. In this case, 83% of users are pleased with the service, and the average monthly rates are 19 Soles for residential uses and 24.36 Soles for mixed uses. 57% of users consider that their expenditures on energy have increased. In Tamborapa, 79% of the people are satisfied with the service, and 21% think that they now spend more on energy. Rates for residential uses are practically half of those in Conchan, as showed in the table. Las Juntas is a special case since only 50% of users are pleased with the service and there are complaints concerning service interruptions and uneven charges for residential and mixed uses. The rates for mixed uses are twice as much as those paid in Conchan and Tamborapa, while residential rates are quite similar to those of Conchan. The company's relationship with the district municipality (Pomahuaca) is not optimal, since the latter does not support the former with the necessary connections to expand the service although it has contributed to relocate a shanty town.

As may be seen on table 15, the rates increase as the MHSs change from being municipality-managed to being Committee- and private company-managed. The rate for residential use in Conchan and Las Juntas is practically four-fold higher than the ones in Huarango, Chetilla and Incahuasi. A relation may be established between higher rates and a more efficient and effective service, as well as between higher rates and a private management of the service. A better service implies higher rates and, moreover, municipal subsidy policies do not guarantee an effective service.

The inter-institutional relations between the private companies or administration committees, on the one hand, and the municipalities, on the other hand, are quite varied. In Conchan and Tamborapa there has been a gradual and harmonious transference of the service to the private sector, while in Las Juntas this has not been the case. In Chugur, the people had to pressure the municipality to obtain its financial support for a repair that cannot be covered with service revenues. Although community members want an autonomous management of the MHS, they do not want the municipality to have nothing at all to do with the service.

In general, the relationship between users and MHS administrators (regardless of whether the administrators are private companies, committees or the municipalities) has not advanced much in terms of *empowerment*. Although community members decide the kind of management they want and also elect Committee members, which evidences democratising processes, they generally do not receive information on the running of the MHS nor on the rate system. This leads to misunderstandings and to users' dissatisfaction, which generates a climate of mistrust that could be avoided through an adequate training of users.²¹

²¹ .- This is the typical case of complaints referred to the fact that people who have businesses pay proportionally less than those who only use electricity for residential uses. However, the price per kilowatt decreases as the consumption of energy increases, both because energy is not wasted and because of the "marginal profit", a technical criterion that is not understood by people. Training and empowerment on this and other related aspects are required.

4.2. Impacts on indirect beneficiaries

4.2.1. Impacts on the sector of goods and services associated with the production of equipments

The MHS Project has contributed to the establishment of five companies in the goods and services sector associated with the production and provision of equipments. These companies received training from ITDG's Energy Programme, and were provided with blueprints for the manufacturing of equipments, such as turbines, and had also courses on the construction and assembly of electronic regulators. The training provided by ITDG is considered to have been very good.

The technology implemented is considered to be adequate for the reality of these areas because it is simple and because it may be operated by community members themselves, once they have been trained. A secondary level of education is required to operate the equipments. Peruvian local companies train operators during the process of installation of the equipments and also provide technical advisory and carry out *in situ* visits which are previously coordinated. This technology is considered to have been implemented without the profitability criteria of the big energy suppliers working in the area, since these criteria would have prevented big companies from opening offices or having resident engineers for their operations in these communities. The process has also led to a reduction in costs and to a better care of the MHSs. Previously, the equipments had to be imported or required the presence of a technician or an engineer for their operation and maintenance. This technical hurdle has been overcome.

An additional feature of the MHS's technology is that its operation and maintenance costs may be afforded by rural beneficiary families. A connection to the interconnected system would represent losses for some stakeholder as people living in these areas are unable to cover the total costs. In this way, the State would have been forced to subsidise the costly installation of networks to reach distant localities, or energy distributors would have had losses because they would have been unable to charge real rates. Nevertheless, as mentioned above, the central government promoted a *no-to-isolated-networks* policy during the second half of the nineties that led to the withdrawal of many foreign companies working in this field and to a subsequent reduction in the manufacturing of equipments.

4.2.2. Impacts on local social organisations

The social tissue in the localities studied is in general rather weak, although there are differences among them. Apart from Producers' Committees, social organisations are limited to some institutions supporting school infrastructure and the distribution of the food that is donated by the Peruvian State. In terms of social capital, the levels of associativity are low and, in fact, remain at the same levels that existed prior to the installation of the MHSs.

The communities may be grouped in three categories:

- In some localities there is a relatively developed social tissue, as in the case of Huarango, which has several organisations including a *Comité de Productores de Arroz* (rice producers' organisation), a *Comité Productor Ganadero* (livestock producers), a *Comité de Regantes* (irrigation users), *Asociaciones de Padres de Familia* or *APAFAs* (parents' organisations), a *Comedor Popular* (soup kitchens), *Comité de Vaso de Leche*, *Club de Madres*, and *Comités Pro Servicios*. Likewise, Conchan has a *Comité Vecinal* (neighbours' organisation), three *APAFAs*, a *Comité de Vaso de Leche*, *Club de Madres*; and a *Junta Administradora de Servicio de Saneamiento – JASS* (water and sanitation administration committee).

- Other localities have an intermediate level of organisations. This is the case of Tamborapa Pueblo which has an *Asociación de Productores del Valle Tabaconas – APROVAT* (an organisation of coffee producers, whose 158 members are concerned with coffee processing and selection), a *Comité de Vaso de Leche* and a *Club de Madres*. Incahuasi could also be included in this group as it has 05 *APAFA*s, a *Comité de Vaso de Leche*, a *Club de Madres*, a *Comité Vecinal*, an *Asociación de Tejedoras* (knitters association) and a Producers Committee involved in the soil conservation programme promoted by *PRONAMACHS*, the *Instituto Nacional de Investigación Agraria (INIA)* and the international NGO *Solidaridad*.
- Finally, there are localities that have a weak social tissue, such as Chugur (which only has a *Comité de Vaso de Leche*), Chetilla (with one *Club de Madres* and three parents' organisations or *APAFA*s for each educational level and school), and Chalan (also with 03 *APAFA*s, one *Comedor Popular – Vaso de Leche*, and one *Club de Madres*). Social organisations in these places are established practically with the sole purpose of contributing to provide schools with educational materials and equipments, or to distribute the food that is donated by district municipalities and of which they strongly depend (they have little autonomy). In this way, the *Vaso de Leche* programme distributes food through the *Comités de Vaso de Leche*,²² *Comedores Populares* (soup kitchens) and *Club de Madres*. Las Juntas should also be included here as it has a *Comité Vecinal*, *APAFA*, *Comité de Vaso de Leche* and a Soup Kitchen, although bearing in mind that this locality is a hamlet with 60 families that is located by the side of the marginal road and that it is provided with services by the district capital that is 15 minutes away.

4.2.3. Impacts on spatial development

At the regional level, it is still premature to say that changes have been produced in terms of the urban/rural configuration of regional spaces. Despite the attraction factors that electricity has generated in these localities, and which reconfigure the spacial distribution of the population towards a more “urban- or town-oriented” distribution, migrations associated with educational ends continue to occur, and so do employment-related temporary migrations, although to a lesser extent.

Following table 16, a relation may be established between the greater poverty of some localities (Chetilla and Incahuasi) and greater temporary emigrations due to work-related reasons. This shows that there is no direct relation between electrification and overcoming poverty, and that other factors mediate.²³ In Chetilla, at least one family member emigrates in 55% of the cases, and up to three family members emigrate in 33% of the cases. In Incahuasi, at least one member emigrates in 52% of the people surveyed, and two family members emigrate in 22% of the cases. Retention factors would be operating in the cases of the most benefited localities (Conchan and Huarango) in terms of their connection to the urban and regional system, and particularly in terms of road infrastructure and connection with the cities of the economic corridor.²⁴ Emigrations occur, but to a lesser extent than before since the local economy is generating businesses that contribute to self-employment.

²² .- Actually, it is community members who distribute the food and, hence, that this group constitute an organisation is being questioned. For more on this, see Tovar, Jesús: *Organizaciones sociales urbanas*. SEA, Lima 1996. The main objection is that this group has no identity as a group, or common objectives beyond that of having access to food donations.

²³ .- That poverty has not been reduced and that some users complain about having difficulties to pay for electricity was reported even in Conchan. Interview with Wilder Alvarado, Manager of Empresa San Isidro.

²⁴ .- Chalan was excluded in this case due to the situation in this locality at the time of survey application.

It is not possible to establish a relation between self-employment generated by electrification and poverty reduction on the basis of the data available, as there is no information on whether the people who established businesses and improved their incomes were actually poor prior to the installation of the MHS. It should be said that having some relatively significant initial capital –that is, some previous savings– is a requirement in order to establish a business (to buy a three-phase engine or a refrigerator, for example) in this contexts.

Table 16: Family members who emigrated due to work-related reasons in 2004 and 2005 (percentages)

	Las Juntas	Huarango	Tamborapa	Incahuasi	Conchan	Chugur	Chalan	Chetilla
None	58	73	66	48	78	62.5	73	44
One	33	10	21	15	17	25	09	11
Two		07	10	22	4	4	00	11
Three		03.3	03	11	0	4	00	33
More than three		03.3		4	0	4	18	
NA	9	03.3						
Emigrated to study					(13)	(16)	(9)	

Source: Study survey.

In Conchan, the mayor considers that work-related temporary emigration has decreased in this community. There are still people that emigrate to the jungle (San Martín, Bagua, Soritor, Amazonas) or to the coastal cities of Chiclayo and Lambayeque to work in rice production. The MHS has had an influence on the demographic behaviour in the area but does not explain it completely, since other factors associated with the regional economy should be taken into account.

In terms of family composition, nuclear families prevail in the areas studied: grown-up parents with young children in school ages. Few young adults stay in these localities. There are also some elderly people who live on their own because their children have moved to the city. In some cases, as in Conchan and Chugur, emigration is believed to have had decreased due to the MHS. While adults work in agriculture, either as land owners or as labourers, the youths move to Cajamarca, Chiclayo or Lima in search of education or job opportunities. In other words, once they complete school, youngsters and teenagers have no option but emigration. Once they are trained, some may return to open a business with the financial support of their parents, but most of them will stay in the cities.

4.2.4. Impacts on other public organisations

The installation and operation of the MHS has allowed a greater articulation among the various public organisations. The cases studied show that synergies have been developed among the local governments of these localities and other public organisations including the Regional Governments, the *Sub Región de Chota*, FONCODES, PRONAMACHS. These organisations have signed agreements, and contributed with shared funding for electrification and network laying purposes, among others. As mentioned above, local health centres and sickbays have been provided with better equipment, for instance. Moreover, these processes of joining efforts have also involved private organisations such as Frontier, Diaconia, ITDG, CARE, whose work in the area is visible. In Conchan, even a big private company is (Nestlé) is planning to establish a cooling plant that will indirectly benefit local livestock producers.

5. CONCLUSIONS AND LESSONS LEARNT

5.1. *In terms of quality-of-life improvements*

- A. The installation of the MHSs generated significant improvements in the livelihoods of beneficiary families and peoples. The acquisition and use of physical assets such as electrical appliances has improved the quality of life in terms of well-being and comfort. The most commonly used appliance is TV with 69% of users,²⁵ followed by the radio (56%), which is an appliance traditionally associated with rural areas. Other appliance commonly used include blenders (46%), irons (45%) and refrigerators (24%). Street lighting has contributed to improve the use of public areas (squares, parks, etc) as well as socialising and self-esteem.
- B. Most of the people surveyed (60%) consider that their family incomes have improved with the installation of the MHSs. Of this total, 41% believe that their incomes have increased by less than 33%; a second group (25%) considers that incomes have improved in 33%; and another group (23%) considers that incomes have increased in 50%. The reason explaining this improvement has been the set up of a business (in services or in a commercial or productive activity). At least 26% of beneficiary families are estimated to have invested in the establishment of a business in a “urban centre”. In contrast, only 6% attribute income improvements to more employment. Therefore, it may be inferred that income improvements are the result of family businesses and self-employment, rather than the result of corporate creation of jobs.
- C. Families save money by using electrical energy. Using electricity allows families to spend less on energy than they used to before the installation of the MHSs. This is an important impact on the economy of families as, for example, in Tamborapa, families spend 4 times less on energy; 2.7 times less in Las Juntas; and 3 times less in Incahuasi.
- D. Women are benefited as electricity is relieving them of doing certain house chores. Future investigations should focus on the role that electrification may play in reducing gender inequalities (brought about by labour division). Some researchers believe that this process would be taking place.
- E. Children are the most benefited group by electrification, particularly in education-related aspects (light at school and at home; access to photocopying services; access to infrastructure such computers, TV, sound equipments; higher number of learning hours as teachers stay for longer periods), and also in terms of entertainment possibilities in leisure time (television).
- F. A positive impact on the local economy is perceived by most of the people benefited through the installation of the MHS (87%). Even those who do not consider that their family incomes have improved acknowledge this positive impact.
- G. In terms of services, the greatest benefits are those produced in health care (lighting in health centres and implementation of several equipments). Improvements are also

²⁵ .- En realidad si uno excluye a la localidad de Chetilla, en que ninguna familia tenía televisor, el Average de tenencia de este artefacto se eleva aproximadamente a un 80%.

observed in education but to a lesser extent. In other words, despite favourable conditions (electricity), schools are not being provided with better equipments.

5.2. In terms of institutionality and social capital

- A. The management of the MHSs is transiting from municipalities to private companies or to Administration Committees, as a result of a deterioration of trust relations between the communities and their municipalities. This loss of trust is mainly due to the mayors' political utilisation of the MHSs and to the poor managerial capacity of local governments to provide the service.
- B. ITDG has been promoting a privately-run management model which is gradually and widely gaining acceptance in the beneficiary communities. Indeed, except in the case of the poorer areas (Chetilla and Incahuasi), most mayors and local authorities consider that the MHSs have to be privately managed and believe that it is necessary to promote a greater participation of the private sector.
- C. The levels of associativity in the communities studied (that is, the social tissue) are in general rather low, and except for some producers' associations, the objectives of social organisations are limited to having access to food distribution and to some improvements in educational infrastructure which, as seen above, is indeed in great need of being improved.
- D. With respect to civic commitment, community members in general comply with their obligations in terms of paying electricity charges, even though a certain mistrust may exist vis-à-vis the rate system, particularly as business owners are considered to be favoured. The people's willingness to pay for the service is based on their acknowledgment that the MHSs have represented a saving in terms of their family budgets.

5.3. In terms of the urban/rural configuration in the region

- A. At the regional level, it is still premature to say that changes have been produced in terms of the urban/rural configuration of regional spaces. Despite the attraction factors that electricity has generated in these localities, and which reconfigure the spacial distribution of the population towards a more "urban- or town-oriented" distribution, migrations associated with educational and employment purposes continue to occur.
- B. Although to a lesser extent than before, employment-related temporary migrations continue to occur. This is due to the fact that poles are being generated in the "urban economy" of "towns". However, it should be highlighted that the family composition that prevails in these areas shows an important number of children in school ages that are likely to abandon these areas. A connection exists between localities showing greater levels of poverty (Chetilla and Incahuasi) and greater levels of employment-related temporary emigrations. This indicates that there is no immediate, direct relation between electrification and poverty reduction or overcoming poverty.
- C. Education-related emigrations of teen-agers who have completed their secondary education will continue to occur, affecting the big cities included in the regional setting (Cajamarca, Chiclayo, Trujillo) and even Lima Metropolitana.

6. RECOMMENDATIONS

- A. ITDG's proposal in terms of sponsoring and promoting private companies for the management of the MHSs is pertinent and appropriate in view of the experiences developed by the municipalities and the malaise generated among community members. However, it is recommended that a classification of MHSs be established according to their location in the region, levels of poverty, and other factors in order to evaluate if this option may be replicated in other poorer and more traditional areas that, symptomatically, are managed by municipalities applying subsidies.
- B. The training provided by ITDG should go beyond the objective of promoting private service administrators or productive businesses among beneficiaries. It cannot be denied that current companies and administration committees require ITDG's technical advisory and that this should continue via projects and the corresponding financial sources. However, actions should also be carried out to empower users-beneficiaries by providing them with training in the following areas: i) culture of energy saving; ii) information on economic decisions related to service rates and charges, the lack of which has generated a wide discontent vis-à-vis administration committees and private companies; iii) citizen culture and development of empowerment processes in line with the Sustainable Livelihoods framework. In the real world, empowerment actions do not necessarily go along with the criteria regulating private management. No private company is pleased with complaining users. Therefore, this issue should be addressed with great tact in order that the different stakeholders come to agreements.
- C. ITDG should redefine its policy concerning the installation of MHSs. The criteria used in the selection of beneficiaries (reliable subjects of credit, existence of a water source) are insufficient if this proposal is to be implemented in the frame of sustainable development. It is necessary to classify beneficiaries according to several potentialities (social capital, financial capital, spatial location) and on this basis define specific policies, that may range from promoting private businesses to including subsidies.
- D. In the same line, the MHS capacity should be in accordance with the potential residential and productive use that it will have. The experiences evaluated show that conflicts have already emerged in relation with residential and mixed uses of energy, both at an external level (Yumahual's company vs. a community) and internally in the localities, since it has been necessary to rationalise and control the use of energy in all the cases. Therefore, it is necessary to determine whether the objective is economic growth or to improve the livelihoods of the people. In both cases, this should orient the capacity of the MHSs.
- E. ITDG should contribute to clarify the government's current policy on energy and elaborate estimations on the number of localities that, on account of various reasons, will not have access to the inter-connected system (technical, economic, and political reasons) With this information, ITDG will be able to define a specific institutional policy to continue carrying out actions in this field.
- F. From now on, DFID's Sustainable Livelihoods methodology should be adopted by ITDG in the conception and design of its projects, as well as in the diagnostic studies on which projects are based. Despite the considerable time and staff that were required to carry out the diagnostic studies in connection with the installation of the

MHSs (which is evidenced in their quality), these studies were not carried out using a particular approach, nor a Baseline Study conception (BLS). Also, as previously mentioned, these diagnostic studies emphasised on the incomes generated by agriculture and livestock production, even though this aspect was not the focus of the Project and provided no useful information in terms of economic impact. Diagnostic studies should rather focus on other aspects associated with the urban economy. Had this notion been included, the diagnostic studies would have provided more useful information that would have served for monitoring and follow-up purposes. Nevertheless, the livelihoods framework has to be adapted and operationalised to the particular characteristics of each project.

ANNEX 1

Localities visited and activities carried out:

Locality	Date of visit	Results	
		Interviews	Survey questionnaires applied
Incahuasi	03/11/05	Héctor Purihuamán, Head of Personnel, District Municipality of Incahuasi. Evaristo Manayay, Treasurer of the <i>Asociación Comunal Incahuasi Awana Tejedores</i>	27
Las Juntas	03/12//05	Pascual Quiroz, member of the Administration Committee Mariana Santiago Huamán, President of the Club de Madres.	12
Huarango	03/13/05	Homero León, President of the Administration Committee. Francisca Castillo, member of the Comedor Popular	30
Tamborapa Pueblo	03/14//05	Luis Bobadilla Solorzano, administrator of the MHS. Melvin Yajamaco Contreras, operator. Francisco Ojeda, metal carpentry businessman.	29
Conchan	03/27/05	Wilder Alvarado Pita, Manager of <i>Empresa San Isidro</i> Fabriciano Delgado Tantaleán, mayor of district municipality	23
Chugur	03/29//05	Abel Díaz Alarcón, mayor of district municipality. Carlos Díaz Cubas, Vice President of Administration Committee.	24
Chalan	03/30//05	Hernando Velasquez Hoyos, former administrator (1994)	11
Chetilla	03/31/05	Antonio Soto, mayor of district municipality	18
Yumahuai	04/01/05	Andrés Sangay Terrones, Manager of ANIDE	

Interviews were also carried with:

- Alfonso Carrasco, ITDG Director 04/06//05.
- Celso Dávila, Manager of *Tecnología Energética Peruana, SAC.* 04/13/05.