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CASE STUDIES

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Executive Summary

The case studies of the Agricultural Development Program (PDA) were carried out by a team of experts from Prodesarrollo under contract with the firm Louis Berger International Inc. This document should not be considered as an isolated product, but as complementary to other studies (survey of beneficiaries, institutional analysis, study of the results on a national level).

The emphasis of our work was on evaluating, from a qualitative perspective, the expected and unexpected impacts from the point of view of the beneficiaries of the various small irrigation systems. The basic technique of the study consisted of in-depth interviews, complemented with the observation and group discussions. The central unit of analysis was the irrigation system and, complementarily, the home.

It is necessary to emphasize the contrast between the group of systems visited in the west with those in the east. The western systems had as common denominators following: They are formed by beneficiaries, mostly Mayan, in communities where Protestant presence is significant, even where the Catholic sector is bigger. The plots of land owned by the beneficiaries are small, but of good quality. The logic of the commercial and export market has been learned only recently, and the peoples' lives are more rooted in subsistence. The communities visited in the east-center-north are formed by *ladino* beneficiaries, are almost exclusively Catholic, with generally larger land properties but of inferior quality, and with more of an understanding of the market logic (except the Mayan communities from El Tempisque in San Miguel Chicaj and partially Chibul, in Cubulco, both belonging to the province of Baja Verapaz).

The most important result of the study, from the viewpoint of the systems' beneficiaries, consists in a positive valuation of the small irrigations. Even where there are important negative impacts (such as the deterioration of the environment and social and intercommunity differentiation), the positive impacts (such as the increase of the agricultural production and income, the decrease of migration, job creation, etc.), seem to justify the activities undertaken during many years by the Agricultural Development Program (PDA).

There is a global appreciation originated from the interviewee's opinion that makes us think in a positive impact: bigger production, income, job creation, decrease of migration, and increased crop diversification. The expected results for the diverse stages of PDA do not seem to have been accomplished, with the exception of the increase in production and income, which increased in many cases as much as 50%. However, the unexpected

results regarding job creation and slowing of the rural migration, together with the decentralized regional development that were stimulated by the systems are important to emphasize.

The most important negative impact consists of the deterioration of the soil, small watersheds, and the environment as a consequence of inputs whose use was not totally sensible (especially pesticides), and whose consequences may be felt for some time. It would seem that there is not a clear consciousness of its effects.

Regarding the conclusions, the most important ones are the following:

1. The increase of income and the improved level of living of the beneficiaries:
2. Disappearance of the rural temporary migration flows between beneficiaries' homes and its slowing down between homes of its area of influence.
3. Generation of temporary rural work.
4. Slow rise in the educational level in beneficiaries of the systems' homes.
5. Economy and investment of the beneficiaries in lands.
6. Relative knowledge of the environmental impact and the appropriate use of the technological package among the beneficiaries.
7. Significant advances regarding the protection of the persons who use pesticides.
8. Little organized action oriented to marketing as an initiative organized by the beneficiaries.
9. Acceleration of the social intercommunity differentiation process.

The most important lessons are the following:

1. Perhaps the most important lesson is that this program should be repeated, with the pertinent adjustments. Although it may be that it shows many weaknesses, considering overall results, it is better than most of the projects of sustainable rural productive development.
2. It is obvious that, from the national perspective, the small irrigation projects are the most successful and the

type which should be done in the future. Here, problems are minimized and the results are better.

3. Despite the criticisms that occur during the process of diversification and introduction of new crops that are subject to market oscillations, the beneficiaries consider it a learning experience. This helps the beneficiaries to prepare themselves better for dealing with the logic of the market as opposed to subsistence.
4. It is important that the project implementers in the future evaluate the impact of a project that generates more participation of women and children in the irrigation projects. From our perspective, it tends to overload these social segments with work, exposes them to risks, causes them to ignore other activities which are important both for biological and social reproduction (among married women) as well as for the improvement of conditions through education (especially among children).

I. Introduction

The investigation that we present consists of case studies of the Agricultural Development Program. It was carried out by a group of experts from Prodesarrollo under contract with the firm Louis Berger International Inc. It should not be considered as an isolated product, but as complementary to other studies (survey of beneficiaries, institutional analysis, study of the results on a national level).

The emphasis of our work was based on evaluating -from a qualitative perspective- the expected and unexpected impacts from the point of view of the beneficiaries of the various small irrigation systems. The interview was the basic technique used in the study, complemented with observation and group discussions. Twenty irrigation systems distributed throughout the country were selected; these systems are the central unit of analysis with the home as secondary unit of analysis.

The document contains four principal sections. In the first one of them, the methodology is presented. Subsequently we describe briefly each one of the communities where irrigation systems are located. Then, the results are presented in the diverse subsections by topic. Finally, we present the conclusions and lessons learned that can be utilized in future projects.

II. Methodology and Study Strategy

The study was done between June 28th and July 30th 1993. The first week was dedicated to the selection of the team and the work material, selection of the irrigation systems, logistics, development of the interview guide (see Annex), field methodology, data organization sheets, and a draft of the structure of the work report.

The team consisted of Carlos Arriola (agricultural sociologist), Rossana Rodríguez (social worker), Patricia Romero (sociologist), and Guillermo Pedroni (social anthropologist, coordinator). Two work teams were formed as planned. The first, consisting of Rossana Rodríguez and Carlos Arriola, focused on the western highlands while the second, consisting of Patricia Romero and Guillermo Pedroni, focused on the center, the north, and the eastern parts of Guatemala.

The second and third weeks were dedicated to visiting the irrigation systems and carrying out the pertinent interviews. At the same time as the field work, data organization sheets were utilized and a sketch of the report was made. The last week was dedicated to writing the final report of the study.

Although we were guided with the terms of reference for the development of the study, we established the irrigation system and complementarily the home, as the central unit of analysis and the community as the contextual reference. As a consequence, we selected systems based on the regional distribution, type of system, size and estimated degree of success, using as a point of departure the visits made with the application of the survey, done previously. In this manner, we established a list of twenty-four irrigation systems: ten to be visited by each of the work teams and two substitutes (two FEAT systems were included). Thus, between July 5th and July 17th (one day per system and two to three of intermediate rest) the following systems were visited:

1. Quiajola, Huehuetenango
2. Chichán, Río Blanco, Huehuetenango
3. Buxup, Jacaltenango, Huehuetenango
4. Concepción, Sololá
5. Duraznales, Concepción Chiquirichapa, Quetzaltenango
6. El Aguacate, Concepción Chiquirichapa, Quetzaltenango
7. Buena Vista, San Juan Ostuncalco, Quetzaltenango
8. Santa Rita, San Antonio Sacatepéquez, San Marcos
9. San Ramón, San Antonio Sacatepéquez, San Marcos
10. Ixcá, San Andrés Chápil, San Marcos
11. Saspán, San José La Arada, Chiquimula
12. El Jocotillo, Ipala, Chiquimula
13. El Suyate, Ipala, Chiquimula
14. Los Planes, San Juan Ermita, Chiquimula
15. El Tempisque, San Miguel Chicaj, Baja Verapaz
16. Chiul (Chibul), Cubulco, Baja Verapaz
17. Los Mixcos, Palencia, Guatemala
18. Río Frío, San José Pinula, Guatemala
19. Encino Gacho, El Progreso, Jutiapa
20. Las Pozas, Jutiapa, Jutiapa

Just as it was said before, the central unit of analysis was the irrigation system and complementarily the home. The case studies were carried out thinking in terms of the systems. If the homes would have been taken as case, it would have been necessary to increase the number of homes to obtain reliable results because of the variety of situations found in each system.

The interview was the central instrument used in carrying out the case studies. The guide was made up of two parts. The first part contains basic information on the system and the interviewee; the second part probes the basic themes that permitted us to establish the impact of the PDA in each of the cases. After an introduction to establish an adequate atmosphere for the interview and to contextualize the problem inside the community, the themes dealt with were the following: family economy, use of the agricultural work, participation of women in agricultural production, variations between types of irrigation, technical

assistance, handling of pesticides and pollution, and the expected and unexpected results of the project. In all cases, the questions in the second part were open, and responses were collected through taking notes and cassette recording. The components about women, especially those regarding their participation in agricultural work, were collected by the female members of the team.

The individual interview was complemented with group interviews and discussions (which in some cases tended to become focus groups), and interviews were also complemented by observation of the community, the irrigation system and the homes. The individual interviews were carried out before the group interviews. Although the selection of the interviewees was arbitrary, in all the cases we followed the same procedure: first, we identified the leaders, members of the irrigation committee board of management (in some cases it did not exist or performed a strictly formal role); the second step was to interview a prominent member of the board, an ordinary member, and a woman (preferably a beneficiary, if there were any). The group interviews carried out later were informal, done with the participation of all those who had the time to do so (usually those interviewed individually were also included in the group).

No significant problems were encountered while doing the interviews. On the contrary, the interviewees selected were quite willing to participate even though they were not paid for their time (in contrast to the survey, where interviewees were paid).

The data was organized on data organization sheets in which twenty-six themes, based on the terms of reference of the case studies, can be commented. There were two sets of data organization sheets, one for each field team.

The areas for each field team, plus the irrigation systems and the communities involved, were presented together to focus on a particular problem. This is especially important if we consider that the data are presented by themes and not by systems in order to get a certain degree of generality and contrast. The emphasis was in establishing changes and impact in each one of the proposed themes. The basic information used consisted of the information given by the surveyors involved in the base study, the preceding study by Prodesarrollo, and documents provided by Hugo Orellana of the evaluation effort about each of the stages of the Agricultural Development Program.

The presentation of the results appears by themes into which conclusions and lessons learned for the future are added. For these last sections we put all the emphasis on the positive and negative impacts, based on the terms of reference and on the expected results in the different stages of the PJA.

III. Regions and Irrigation Systems

Although the distribution of the work between both teams in the natural environments was based on a field strategy, here a comparative methodology viewpoint was also implemented. Western Guatemala contrasts with the center, the North and particularly the East.

The group of systems visited in the West have a common denominator: they are made up of beneficiaries, mostly Mayan, in communities where the Protestant presence is significant, even where the Catholic sector predominates; the properties are small, the quality of the land is good, and an understanding of commercial and export markets is recent.

On the other hand, the small irrigation systems visited in the other region are formed by *ladino* beneficiaries, these communities being almost exclusively Catholic with larger properties than in the west but with inferior quality of land, and the market understanding prevails over subsistence farming (except those from El Tempisque in San Miguel Chicaj and Chibul, in Cubulco, both belonging to the province of Baja Verapaz).

This is why the bigger generalizations and differences derive from this basic regional contrast. However, it is obvious that differences and contact points between systems exist, as will be seen from the following brief description of the communities and small irrigation systems.

IV. Description of the Communities and the Irrigation Systems.

A. Quiajoló, Huehuetenango

The irrigation system is located in the village Quiajoló, in the municipality of San Sebastián, department of Huehuetenango (Region VII). The system is quite big, uses sprinklers, is gravity fed, and has a superficial source (spring).

The village of Quiajoló is approximately four kilometers from the city of Huehuetenango. It is located at the foot of the mountain and is between the river Selegua and the highway to the Mexican border, going through La Mesilla. The village population is mostly Mayan of Mam ancestry; they make a living from agriculture and are economically poor. The people live in scattered houses at some distance from one another.

The most important crops are corn, beans coffee, tomato, broccoli, cauliflower and cabbage. The migration of laborers to the plantations in the south coast is quite common. The basic problem that the beneficiaries have to face lies in the difficulties found when irrigating the plots that are in the upper part of the system.

B. Chichán, Río Blanco, Huehuetenango

Chichán is an irrigation system located in the village Río Blanco Chiquito, in the municipality of Jacaltenango, in the department of Huehuetenango (Region VII). The system is of medium size, uses sprinklers, is gravity fed, and of superficial source.

The community is Mayan, Mam-speaking, with traditional catholics and with a certain presence of Protestant churches. The central activity is agriculture, complemented with handcrafts. The principal crops are garlic, beans, onion, tomato, cauliflower, broccoli, pepper, jalapeño chili, corn, and recently pony.

With the irrigation, the community cultivates garlic, onion, tomato, cauliflower, pepper and corn. The system is going through a series of problems as a result of the lack of an adequate pump. In consequence, there is not enough water to irrigate all the plots. This system has only had little success.

C. Buxup, Jacaltenango, Huehuetenango

This irrigation system is in the village of the same name, located in the municipality of Jacaltenango, in the department of

Huehuetenango (Region VII). The system is medium size, uses sprinklers, is gravity fed, and has a superficial source.

The community is quite big, with partially uneven land and basic services (education and health). Access is by a passable dirt road through Jacaltenango. The system receives a small support from DIGESA, which together with MINDES, are the only development organizations in the area. The people are mostly Mam-speaking Mayan. Catholicism is the prevailing religion, both traditional and charismatic.

In this community the basic economic activity is agriculture; the most important crops are corn, beans, chili, anise, peanuts, tomato, hibiscus flowers (for tea), and chipilín. With the irrigation system, the principal crops are beans, corn, peanuts, and tomato. The main problem that the system faces is the obstruction in the pipes. It cannot be considered a successful system (nor it is a failure) in which a relatively successful process of diversification can be observed.

D. Concepción, Sololá

This system is found near the municipality of Concepción, in the department of Sololá (Region VI). The system is located in a semi-mountainous area, with fertile soil. The irrigation system is quite big, uses sprinklers, is gravity fed, and of superficial source. The community population consists of 320 homes. The population is mostly Mayan of Cakchiquel origin, and is traditional Catholic.

The properties are small, where the people cultivate corn, beans, potato, onion, beet, broccoli, cabbage, carrot, green beans and peas. The irrigation system shows a high degree of agricultural diversification, with no problems in the irrigation system. The problem lies in the litigation that the people face because of the property of the water spring. The beneficiaries state that, if they lose the litigation, the system will surely disappear. If it were not for this problem, the system could be considered a successful one.

E. Duraznales, Concepción Chiquirichapa, Quetzaltenango

The system is located in the village Duraznales, the only one in the municipality of Concepción Chiquirichapa in the department of Quetzaltenango (Region VI). The small irrigation system uses sprinklers, and uses electricity to pump water from a well.

The village has around 1,600 inhabitants who speak the Mayan language called Mam. The area is mostly Mayan and has few basic

services. It is located in an area on medium altitude in an uneven land. The main activity is agriculture, the main crops being corn, potato, onion, carrots, beet and broccoli. The crops under irrigation are potato and broccoli. The principal problem that faces the beneficiaries is the cost of electric energy. Irrigation in this region can be considered only a modest success.

F. El Aguacate, Concepción Chiquirichapa, Quetzaltenango

This system is in the municipality of Concepción Chiquirichapa in the department of Quetzaltenango (Region VI). The irrigation system is medium size, uses sprinklers, and uses electricity to pump water from a well.

The community is located fourteen kilometers from Concepción Chiquirichapa. It is mountainous, uneven and of medium altitude. Its population is mostly Mayan (Mam). Even though Catholicism is the main religion, there are also numerous different Protestant churches.

Apart from agriculture, there are no important economic activities and handicrafts are almost nonexistent. The main crops are corn, beans, broccoli, onion, and cauliflower. The natural center of supply and market is the city of Quetzaltenango.

The irrigation system can be considered as successful and diversified. The principal problem lies, according to the beneficiaries, in the cost of the electric energy.

G. Buena Vista, San Juan Ostuncalco, Quetzaltenango

This small irrigation system is located in the hamlet of the same name, located two kilometers away from San Juan Ostuncalco, in the department of Quetzaltenango (Region VI). It is a small irrigation system, uses sprinklers, and uses electricity to pump water from a well. This municipality is mountainous, medium altitude and mountainous humid vegetation. It is mostly Mayan of Mam ancestry, mostly Catholic but with a significant presence of protestant churches.

Although the economic activity centers on local agriculture, another sector of the population works as wage earners in Quetzaltenango. Moreover, migrations to the coast are quite common.

The most common crops are corn, beans, potato, onion, brussels sprouts, carrots and peas. There are two markets of reference: one in San Juan Ostuncalco and the other one in Quetzaltenango.

This recently installed system has worked only during one month (February), because the natural rain cycle makes it unnecessary. Even so, the people do not know whether they will use it again in February next year because of the high cost of electricity.

H. Santa Rita, San Antonio Sacatepéquez, San Marcos

This small irrigation system is found in the village of Santa Rita, two kilometers away from San Antonio Sacatepéquez in the department of San Marcos (Region VI), by way of a dirt road passable all year long; San Antonio is nine kilometers away from San Marcos on an asphalt highway. The system is small, uses sprinklers, is gravity fed, and has a surface source (spring).

The topography of the municipality is mountainous, of medium altitude and its forest is mountain-tropical humid. Santa Rita is a ladinoized village, whose inhabitants stopped speaking the Mam language two or three generations ago. Catholics predominate despite the existence of numerous Protestant churches.

The economy is based on agriculture, raising cattle, goats, and sheep, and textile handcraft. The most important crops are corn, potato, Lima beans, cabbage, beet, carrots, cauliflower and acelga (chard/saltwort).

The basic problem the system beneficiaries face is water shortage, which does not allow the irrigation to reach all the land during the dry season. We should also mention that there is little diversification regarding crops.

I. San Ramón, San Antonio Sacatepéquez, San Marcos

The system is located in a small community with easy access to the San Antonio Sacatepéquez, in the province of San Marcos (Region VI). It is linked to San Antonio Sacatepéquez by a dirt road. The irrigation system is medium size (at present it has 14 beneficiaries), uses sprinklers, is gravity fed, and has a surface source (spring).

It is a small community on hilly land. The people are new ladinos (although with Mayan features), and Catholicism is the dominant religion. Services are few, although they do have piped drinking water. Agriculture is the main economic activity, and they harvest corn, beans, wheat, potato, cabbage, radish, carrots, onion, lettuce and peas. In the area under irrigation, people cultivate cabbage, carrots, beets, acelga, potato, cauliflower, broccoli, brussels sprouts and onion.

The beneficiaries' main problem lies in the shortage of water; they even face the need to use the water that the irrigation system generates for domestic consumption.

J. Ixcá, San Andrés Chápil, San Marcos

This small irrigation system is located in the village San Andrés Chápil, which belongs to the municipality of San Pedro Sacatepéquez in the province of San Marcos (Region VI). The system uses sprinklers, is gravity fed, and has a surface water source.

It is found at a short distance away from San Andrés Chápil, with a dirt road joining both communities. The land is mostly level and the village is large. Even when Spanish is the principal language spoken in the region, (Mam is not spoken anymore) this village must be considered ethnically a Mayan community. More than the 50% of the people are Protestant, belonging to different churches. The rest of the population is Catholic.

In contrast with the rest of the communities visited, the main economic activity is industrial: Mayan-style clothing, shoes, tailoring, carpentry and masonry. The people also cultivate corn, beets, onion, cabbage, cauliflower, carrots, radishes and flowers. In the area under irrigation they cultivate potatoes, beets, onions, cabbage, cauliflower, carrots, radishes, flowers and corn. The system is quite successful, with no significant problems.

K. Saspán, San José La Arada, Chiquimula.

The village of Saspán has approximately seven hundred inhabitants and belongs to the municipality of San José La Arada in the province of Chiquimula (Region III). It has a small irrigation system that benefits five families.

The village is mainly *ladino*, although it is not a typical eastern village. Access is difficult over a five kilometer dirt road leading to the improved dirt road that joins Ipala with Chiquimula, making the transportation difficult to Chiquimula, the principal market. Their most important crops are corn, beans, chili and tomato. With the introduction of the irrigation system (using sprinklers, gravity fed, and with a surface water source), onion and loroco were added to the crops; there are also vegetable gardens for family consumption.

There is little technical assistance, although one of the beneficiaries is an agricultural representative of DIGESA in the community. The people practice a variety of methods of soil conservation. Undoubtedly, this system must be considered as one of the most successful ones.

L. El Jocotillo, Ipala, Chiquimula

This irrigation system is situated in a hamlet of the same name, belonging to the municipality of Ipala in the province of Chiquimula (Region III). It is joined to Ipala by a 10 km dirt road in fairly good shape. Both the community land and the irrigation system land is level and swampy. This system, which began operation the summer of 1992 is drip system, has an underground source (well), and uses electric energy.

The population is made up of nineteen families, of which eleven are beneficiaries of the system. All of them are wealthy *ladinos*, usually related to each other through kinship and marriage.

The priority crop is rice, and production is market oriented. The crops grown using irrigation are limited to tomato which because of market difficulties has become a negative experience.

At present the beneficiaries receive technical assistance from DIGESA. The situation is difficult for this system because of the failure of the tomato crop, their high debt with BANDESA, and the high cost of electricity.

M. El Suyate, Ipala, Chiquimula

This irrigation system is situated in a small hamlet of the same name near the municipality of Ipala in the province of Chiquimula (Region III). The road to El Suyate is in good condition and all 22 beneficiaries live in Ipala. The system began operation in 1990 with support from DIGESA. The irrigation system is uses sprinklers and electricity, and has an underground water source. The irrigated land is level.

The chief crops in the area are corn and beans, the latter grown primarily for market. From the beginning, the main crop for exportation on the land under irrigation has been okra.

The inhabitants of the community are *ladinos*, as in the rest of the municipality. The beneficiaries belong to a middle social level and some of them were not mainly farmers when they joined the small irrigation system.

The basic problem lies with the expenses for electric energy made by the beneficiaries to INDE, which will probably cause the system to be abandoned shortly. The high cost of energy prevents us from considering this a successful system, even though in past years the prospects were promising.

N. Los Planes, San Juan Ermita, Chiquimula

This is an irrigation system in Region III in the province of Chiquimula, municipality of San Juan Ermita. The system is situated in the village Los Planes, on the road that joins Vado Hondo with the border of El Florido. The village is situated on uneven land.

The community is *ladino* with approximately one hundred and fifty families dedicated the cultivation of corn, beans, onion and tomato. The irrigation system began in 1986 with support from DIGESA; at that time it was made up of twenty four beneficiaries. The system uses sprinklers, is gravity fed, and has a surface water source. At present it still has some support from DIGESA.

The small irrigation system took the place of the traditional rustic irrigation system. Since the introduction of the new system, the previous problem between beneficiaries of high and low areas was inverted. At present, the ones "above" are the ones who complain of the shortage of water, while the ones "below" have it in abundance. Despite this contrast and different technical problems, this system can be considered successful.

O. El Tempisque, San Miguel Chicaj, Baja Verapaz

This irrigation system is located in a village of the same name, which has approximately two hundred inhabitants, all of them Mayan (Quiché-Achí), and of the total, twenty five are beneficiaries of the system. El Tempisque is approximately twelve kilometers from the city of Salamá (Region VIII), connected by a dirt road in good conditions and passable all year long.

The community cultivates corn, beans, peanut and tomato. The irrigation system was installed in 1988 as a donation with the support from COGAAT and AID, in contrast to the rest of the systems visited. The system consists of a reservoir built in the river Salamá, from which the beneficiaries pump water to irrigate their plots with hoses.

The institutional support that the beneficiaries receive at present comes from DIGESA, one of the beneficiaries is the DIGESA agriculture representative. The main problem of the system is that sand gets into the reservoirs preventing their proper use. Difficulties regarding credit and marketing, added to the poverty in the region, explain why most of the beneficiaries farm for subsistence and consider the irrigation system a complementary activity. We also detected a high rate of desertion from the system. For these reasons, this system cannot be considered very successful.

P. Chiul (Chibul), Cubulco, Baja Verapaz

This is a small hamlet located in the municipality of Cubulco, province of Baja Verapaz (Region II). Even though Cubulco is essentially Mayan, 30% of the community is *ladino*, and 70% of the irrigation system beneficiaries are *ladino* population (it is common in the municipality that *ladinos* control water sources. Access to Cubulco is somewhat difficult, even though it is not further than three kilometers. Nevertheless, it must be noticed that this municipality is the one located the furthest away from the capital in relation to all the others of the province.

The irrigation system is a traditional one and in spite of having formed a committee and carried out negotiations with DIGESA for the installation, they have not been able to do so, not only because of the costs, but also because of certain conflicts in the control and use of the available sources.

This irrigation system, in the beneficiaries' opinion, wastes water. It shows a process of early diversification with the local market and in which the Mayans supply labor to the *ladino* beneficiaries of the system.

Q. Los Mixcos, Palencia, Guatemala

The irrigation system is found in a community of the same name in the municipality of Palencia, province of Guatemala (Region I). Access is good, and the community near Guatemala City, which is its natural market. The turnoff to Palencia is kilometer 20 on the highway to the Atlantic coast.

Los Mixcos is a thickly populated *ladino* village, where the irrigation system has operated since 1981 with more than seventy beneficiaries.

The irrigation system uses sprinklers, is gravity fed, and has a spring with a reservoir. The problems the system faces are caused by the mud that has accumulated in the reservoir and the shortage of water from February on, because the spring is also used by other nearby villages. Because of the water shortage, this cannot be considered a totally successful system.

R. Río Frío, San José Pinula, Guatemala

The irrigation system is in a small hamlet of the same name, located on the outskirts of the municipality of San José Pinula in the province of Guatemala (Region I). The access to the community is by a dirt road in good shape which is passable all year long. The system is small (only three beneficiaries) but it is connected

with the system of a nearby hamlet (El Colorado, with ten beneficiaries).

The inhabitants are *ladinos* who grow corn and beans on a minor scale, because of the uneven land, and who also produce cattle. The irrigation system combines sprinklers and hoses, is gravity fed, and has a surface source. It began in 1986 with support from DIGESA, though at present no institution provides services (neither in Río Frío nor in El Colorado).

Both in Río Frío and in El Colorado, the irrigation system has introduced new crops, like onion, tomato and vegetables, which have transformed the community in several ways. Both systems are successful.

S. Encino Gacho, El Progreso, Jutiapa

This small irrigation system is in a community of the same name, approximately six kilometers from the asphalted road that joins Jutiapa with Jalapa. It has approximately three hundred families, of which twenty two are beneficiaries of the system. This community belongs to the municipality of El Progreso in the department of Jutiapa (Region IV).

Populated by *ladinos*, this community is situated on level and fertile land, surrounded of other communities that also have irrigation systems, particularly the village Quebrada de Agua. The system began working in 1987 with technical support from DIGESA, although this technical assistance is now almost nonexistent.

The irrigation system uses sprinklers, is gravity fed, and has a surface source from nearby natural springs. From its beginning, it was an incentive in the production of traditional crops in the region. The irrigation system is at present a modest success.

T. Las Pozas, Jutiapa, Jutiapa

This small irrigation system is located in a village of the same name in the municipality of El Progreso, department of Jutiapa. It is two kilometers by dirt road from the asphalted highway that runs from Jutiapa to Asunción Mita. The village is made up of approximately four hundred *ladino* families, of which ten are beneficiaries. The chief crops are corn, beans, maicillo, tomato and onion. Of these, onion and tomato are the result of the process of diversification due to the small irrigation system.

This system, which began working in 1990, uses sprinklers and electricity, and has an underground source. Begun with support from DIGESA, this institution still works with the system, for one

of the group members is agriculture representative (although its technical assistance is minor).

Even though the beneficiaries state that the irrigation system has allowed them to produce in the dry seasons, this year they plan to abandon the system because of the high costs of the electricity from INDE. For this reason, it must be considered as not successful.

V. Presentation of Results

A. The Home

The homes of the Mayan beneficiaries in the western part of the country, for various reasons, contrast with those of the East. The former are usually made up of extended families and have a larger number of members. This situation, added to their small areas of land, explains the difficulties they face to subsist as well as to confront all the other challenges regarding their plots, like diversification, marketing, etc.

In the center-north-east region, the average number of family members oscillates between five and seven people, and 85% of them are nuclear families with none but parents and their children. On the other hand, 53% of the families in the western region are multiple, with two or three families living under the same roof. Moreover, the 47% which are nuclear families have an average of seven to thirteen members.

It is unusual to find extended families in the East. When married, each child forms an independent home, based in most cases on inherited land. This characteristic of the *ladino* families contrasts with that of the Mayan families, in which the extended families are frequent. This style of Mayan home composition is the result of Mayan customs and to the extreme poverty conditions of the people in the rural West.

On the other hand, 93% of the beneficiaries in the west have not completed primary school, and the cultural characteristics of the interviewed population in the West allows one to understand the situation, regarding both biological and social reproduction, with the consequent demographic impact. The combination of extended families, associated with minute extensions of land explain the great difficulties and challenges the beneficiaries of the West have to face. In the East-Center-North a higher education level was found: 20% with complete primary education and even one interviewee with university studies.

B. Income

The income of the beneficiaries basically comes from agriculture, although not necessarily from the plots under irrigation, showing a modest process of diversification. 66% of the interviewees have only agriculture (and cattle raising on a small scale) as a source of income; this tendency is more accentuated in the West than the other regions of the country. Cattle raising, wage labor, work of their own or money received

from their children, are peripheral in Regions VI and VII of the West.

Among the non-agricultural income alternatives, a minority are dedicated to occasional or permanent wage labor and to working for themselves, for example, workers in State institutions (i.e. agriculture representatives from DIGESA), transporters (with their own vehicles), weaving, masonry, etc., which in a few cases constitutes their principal source of income. In some cases, cattle raising is a complementary source. Funds sent home by children were most common in the East.

Activities on the land are not just for subsistence or gain: they are also something that gives meaning to the lives of the beneficiaries:

- We do not know any other work other than agriculture. We learned it from our fathers (parents) and we teach it to our children (José Gabriel López, Las Pozas).
- Without land there is no life... (Francisco Moguel, Río Frío).

The diversification of the process of resources creation seems to be a need felt by most of the interviewees, although it does not mean abandoning agriculture. However, among the young people (especially the beneficiaries' children in the East-Center-North region), there is a tendency to abandon the agriculture activities for other "less tiring" ones.

Even though the case study does not allow us to establish with precision the role played by the crops under irrigation in the process of resources creation, we noticed evident contrasts from system to system from those who consider that their role in the system is essential to their incomes (Concepción, Río Blanco, Río Frío, Saspán) to those who consider their work more as a source of expenditures than of income (San Ramón, Buxup, Las Pozas). Nevertheless, the dominant feeling seems to be that agriculture under irrigation plays a complementary but significant role.

C. Domestic Expenses

The "gasto" (that is, the minimal family budget) is limited to salt, sugar, coffee, rice, pastas, etc., and among the beneficiaries it has not suffered significant variations as a result of the introduction of irrigation. Non-essential expenditures and investments also do not seem to be important either when comparing the patterns of expenses before and after the introduction of small irrigation systems. The exception regarding

investment and economy is the purchase of land in successful systems.

The minimal family budget seems to be constant, despite oscillations registered in income. Consumption patterns are stable. Changes are found mostly among young people than the systems' beneficiaries. Where the systems are bigger, there is a tendency to purchase in the nearby towns with better prices and bigger purchases rather than in the community store. Some beneficiaries mentioned that the quality of vegetables has improved and also that they save money when production makes it possible. This means that their land covers, in some way, their nourishment needs.

- It helps to have fresh vegetables. (Mr. Gabriel Montejo: Buxup I, Jacaltenango).
- What grows, we plant; why buy if we have land and irrigation? (Eduviges Orozco: Ixcá I).

We should point out that meat consumption has not varied, usually being once a week. Only in one case it was mentioned that it had changed: before irrigation they had meat just once or twice a month (Río Blanco Chiquito). Even though irrigation has contributed or benefitted farmers economically, toward family support, there have been no real changes regarding the customs or habits in diet.

Regarding the quantity of products, approximately 50% of the interviewees purchase more, but adduce this phenomenon to the growing of the family. A minority stated that the reason for this is because there is a little more money (Río Blanco Chiquito, Los Mixcos and Saspán).

The impact caused on luxury items and investments was not significant, as more than 60% had none. Saspán is one exception, where one beneficiary told us that irrigation generated income made it possible for him to buy a pick up truck last year. Investments in housing were few with the exception of El Suyate.

Whenever beneficiaries made important amounts of money, they invest in land; this happened in the 30% of the cases. This is usually in response to the desire to provide an inheritance for their children than to an interest in improving economy.

The investment in technological packages for crops, on the other hand, is not important. The small and medium farmer beneficiary invests in technology only when he receives credit or when agricultural exporters supply the inputs. In this aspect, investment and risk seem to be absent.

Some beneficiaries mentioned that expenditures in transportation to marketing centers was significant. One type of investment pointed out by beneficiaries was the education of their children (35% mentioned it). As one interviewee said:

-The children studied, that's where I invested (Eduviges Orozco: Ixcá I).

D. Plots: Tenancy and Crops

The area of the crops under irrigation showed an outstanding contrast between the two regions. While in the West the plots are only a few cuerdas (0.04 hectares), in the East-Center-North these are measured by manzanas (0.7 hectares). However, this contrast is mitigated by the higher quality of lands in the West and a shortage of water in the systems of the East-Center-North. On the other hand, the interest and dedication put in the plot under irrigation seems to be more than among farmers who do not have the system and also more than in non-agricultural alternatives.

100% of the farmers interviewed farm lands both with and without irrigation, but most of the land is situated in areas without irrigation. In the West, irrigation is at present making the production of these crops possible: potato, broccoli, beans, peanuts, tomato, corn, beet, garlic, onion, cauliflower, pepper, carrots, cabbage and brussels sprouts. Meanwhile, in the East-Center-North the main crops are corn, beans, tomato, onion, okra and pepper.

As for tenancy, 100% are owners of the land they work, but it must be mentioned that three interviewees rent land. One rents 25 cuerdas; another rents 75 cuerdas in the southwest of the country for Q.500 for the whole plot, on which corn is cultivated.

To have a better idea of land tenancy in the communities with irrigation systems, we present the following statistics: of the interviewees, 53% own 1 to 10 cuerdas of land without irrigation; 30% own 11 to 20 cuerdas; 13.3% of farmers who own land have it all under irrigation, usually from 2 to 7.5 cuerdas, although one farmer owns 25 cuerdas and has them all under irrigation in Buxup I.

As for the plots with irrigation in the West, the information is as follows: 40% of the farmers own 4 to 6 cuerdas under irrigation; 23.3% own 3 cuerdas; 16% own 2 cuerdas; 13.3% own 7 to 10 cuerdas; 3.3% own 1 cuerda. In the East-Center-North the numbers are different, as 45% of the owners between one and two manzanas under irrigation, but more of a water shortage, which usually prevents them from irrigating all the land.

65

The difficulties in estimate quantitatively the work done by the beneficiary on his plots (and particularly in the area under irrigation) are well known. From a qualitative perspective, it is even more difficult. Even so, we can mention about the beneficiary's "interest, dedication and worry". Compared to the plots without irrigation and other non-agricultural activities, the plot under irrigation is where beneficiaries put most dedication and interest. This seems to be in response to: a) their self-identity as farmers; b) the few non-agricultural alternatives; and c) the nonexistence of other important activities in the dry season, which allows them to concentrate all their efforts on the plot. This is essential, for there are no other distractions. Moreover, the farmer that uses the irrigation system obtains prestige: while the beneficiaries produce, the non-beneficiaries must wait for the next rainy season (in a later paragraph we comment on the process of social differentiation caused by the irrigation system). Finally, it is necessary to point out that this attitude appraisal of "interest, dedication and concern" does not necessarily mean that the plot under irrigation is the central source of income (see previous paragraph on the subject).

E. Family Agriculture Labor

In general, we must point out that in most cases there is some degree of family participation in agriculture labor, with or without irrigation. The interviewees tended to hide and/or underestimate the incorporated family labor. Contrast exists between the West and the East-Center-North: family participation in the West is much more important. Also, strong contrasts were seen in the overall family participation, both in crops and in tasks; in this sense, the vegetable garden as a crop and the harvest as a task involved the highest family participation. Finally, it is necessary to observe that increased diversification created by the small irrigation systems led to an increase in family labor.

Participation in family agriculture labor is as follows: with 30% of the interviewees, wives and children work; with 30% only children; with 13% only wives; with 13% other relatives and with 13% no-one. Family labor participation in the East-Center-North region is lower. This is the result of the question of prestige, better economic conditions, and the prevalence of a market orientation. Furthermore, we suppose there was a certain degree of hiding in the region: it is difficult for an eastern farmer to accept that his family works on the farm because by saying so, he would be accepting indirectly that he is poor (not so much before the researcher, but before his community).

Most of the family members who participate in agriculture, work on all plots both with and without irrigation. While the

total amount of time they spend on agricultural tasks is little, this time is an important contribution.

Family members spend little time on agricultural tasks because they have other things to do, such as studies or other activities in the case of children.

- On Saturdays, when they don't have classes, my children work, but they only dedicate a few hours. (Mr. Eduardo Mendoza: Buxup I);

- When they're not studying, my children help me. (Natalio Orozco: Ixcá I);

In the wives' case, they dedicate time to house work:

- (She helps) from time to time but she doesn't have too much time, she has a lot to do at home, she has the house work. (Mr. Oscar Cabrera: Duraznales).

The aforementioned shows that, with only a few exceptions, the beneficiary is the only one directly involved in farming (especially in the plots under irrigation).

30% of the cases where only children participate, the economically active population is made up of the wives, who carry out domestic tasks, and this by decision of the husband. There were only two cases (Ixcá I) in which the wives do not participate in agriculture because they were older women (60-95 years old).

It is possible to observe that family participation is a relevant activity, and where children help even while still attending school, it is a way for them to begin "inheriting" their life's work which at a later date will be their means of subsistence.

- As my father taught me how to work, I also teach my children, so that they will know how to take care of themselves. (Leonel Orozco: Ixcá I).

The above means that even though formal education is recognized as valuable, in some cases it is not considered as the most decisive educational experience for future development of the beneficiaries' children.

These family labor relations are linked in a practical way with avoiding having to pay for labor. Even though paid labor is contracted, family participation means that less money will have to be invested in paid labor. As one interviewee said:

What!
contradicting
see p 19
para C.!

- In the peanut harvest, my children help me, so I don't have to pay one or two days of labor (Gabriel Montejo: Ruxup I).

Thus, children represent an economic value in the agricultural production process.

Finally, it is necessary to point out that, as mentioned above, the introduction of irrigation brought with it agricultural diversification, and this has meant the need to incorporate more labor into the process. Thus, family agricultural labor has increased although not excessively, even when these activities can be considered more intensive, since family labor is concentrated in the dry season when other agricultural activities are at a minimum.

F. Woman and Agriculture Work

The introduction of irrigation systems with the consequent crop diversification has intensified the participation of women in agriculture labor. This phenomenon is more notable in the West than in the East-Center-North (especially in the East and Center). The greater participation of women in the West is caused by conditions of extreme poverty and by the predominance of vegetable gardens, which require more work in certain tasks. From a gender point of view, this situation does not bring a positive impact, because it forces women to add this activity to the ones they traditionally carry out.

Wrong, plowing by hand & planting are the 2 most time consuming activities for com!

It has been observed that rural woman traditionally carry out work that directly or indirectly helps in the family budget (i.e. taking care of animals, carrying wood and water for family consumption, etc.) and women also help in agriculture because of the role she plays in the family support. To these activities must be added those linked to biological and social reproduction (bearing children, early education, taking care of the home, cooking, etc.). The subordinated role of women is well known and was clearly visible in visits to the irrigation systems.

Women carry out the following agricultural activities: planting, weeding, harvesting, irrigation, and composting, tasks which men carry out as well, or which are carried out by paid labor.

- The women almost always participate in the harvest (Andrés Vicente Mendoza: Río Blanco Chiquito)

These tasks represent an added burden for women (mothers and daughters), since the situation is not shared by men in the sense that they also carry out tasks and responsibilities in the home and contribute with their labor in this area.

There is some consideration concerning the tasks carried out by women, since they are not permitted to do the following: land preparation, fumigation, and transplanting. According to the beneficiaries, these are hard and delicate tasks which might hurt them physically.

In the West, in all of the communities investigated women participate in agriculture from an early age. In the East, just 28% of women participate. 70% of farmers said that girls began working in agricultural activities at the age of 10-12, usually in the planting, weeding, and harvesting, although less in planting.

- They help their father. Very few help, because they go to school. (Gaspar Vicente Velásquez: Río Blanco Chiquito)

- They are given easy tasks to do (Oscar Cabrera: Duraznales).

In this sense, young girls are denied the opportunity to learn other tasks, abilities and knowledge that could contribute to higher expectations of development, but this possibility simply does not occur to the farmer because on the one hand, rural communities have few service institutions to help with this development, and on the other, their incomes are not usually enough to allow them to invest in these kind of opportunities.

As for most older women, single or married, they too participate in agriculture, doing the same activities as the girls and also other things as fertilizing, fumigating, transplanting, and hoeing, and in some cases land preparation: in short, all farm activities. Even though fumigation could seem unusual, 26% of the interviewees said that it was normal for them to do so.

- Women do what men do, although now the woman has her place, she has her house work. (Mr. Oscar Cabrera: Duraznales).

Another activity which is indirectly associated with farm work is the sales of the products in the market and the buying and selling of agriculture products in general.

With the irrigation systems, women's participation in agriculture labor has increased, according to 53% of the interviewees; production diversification means they need to work harder and longer.

- Yes, because we now see there is more work, so the wife helps her husband more. (Andrés Vicente Mendoza: Río Blanco Chiquito).

- Nowadays, on the other hand, there is more work for the woman because there is more production. (Gabriel Montejo: Buxup I).

In two communities with irrigation there were no changes in the activities the woman did in agriculture (Concepción, Sololá, Duraznales and Concepción Chiquirichapa), except regarding time, in that women now help in a task that has to be carried out in one day (for example, fertilization must be done uniformly). Therefore, women have to become involved even more in agriculture, having to re-organize her house work. This reaffirms what was said above about the extra work: unlike agriculture labor, house work is not shared equally between men and women.

In the irrigation of San Ramón, as a result of the introduction of the irrigation system, some participate in family vegetable gardens, which is a program of DIGESA.

- Now they know how to make family vegetable gardens. (Filomeno de León: San Ramón).

In the East-Center-North, the participation of women is less. This is related both to the kind of crops and to the cultural pattern, in which the woman's place is in the kitchen. The removal of women from agricultural labor is a symbol of prestige and power, based on the typical eastern *machismo* concept. However, although women's participation is notably less, we detected a continuous hiding of the existence of this work with the male informants. In El Jocotillo, only the female researcher could detect, talking with the women, that women also participate in the work in the plots and under a certain pressure, while the male researcher did not obtain an affirmative answer from the beneficiaries despite his insistence.

G. Migration and Wage Labor

Even when migration and wage labor form two apparently autonomous themes, their interaction brings to light a positive impact of the project: while the beneficiary and his family have stopped migrating in the dry season, his neighbors in the same community or nearby have found wage labor in the plots under irrigation, therefore decreasing the migration flow and stimulating regional development.

At present, migration has disappeared in the families of the irrigation system beneficiaries. Even though in many cases this tendency is related to the irrigation, it is not necessarily a result of these projects, for the dynamic of the farmer's life has continued to be based on their own income creating activities (weaving, wage labor, agriculture, etc.).

- We are all dedicated to our own work. (Oscar Cabrera: Duraznales);
- I never had the need to leave Ipala. (don Jorge, El Suyate).

However, the irrigation projects are giving the farmer a certain economic stability and are contributing to the enrichment and organization of their agriculture activities, although not with a degree of efficiency or technology that is particularly high.

In the East-Center-North region, beneficiary migration tends to be toward Guatemala City. Moreover, in this same region it was stated that hired laborers are not usually from the same community, but rather from other poorer and sometimes Mayan neighboring communities (Los Planes, Río Frío, El Jocotillo). In the irrigation systems of Las Pozas and Chibul, migration was mentioned, especially among young people.

In relation to labor hiring, 70% of the interviewees hire one to four laborers, whose time working varies according the importance and needs of the crop.

- The irrigation needs to be done quickly, that is why I hire people, so that we may finish quickly. (Julián Méndez: Río Blanco Chiquitio).

In eastern regions such as El Suyate and Los Planes, there are beneficiaries who hire up to ten laborers during several weeks for the tasks that require the most manual labor. In general, contracts last three to six days, depending on the economic resources of the farmer, the area to be worked, the tasks required, etc. Among the poorest people, however, there are who hire no additional labor.

- We do not hire laborers because we don't have money to pay them. (Eduviges Orozco: Ixcá I).

Generally, the form of payment is by the day and in cash, from Q.7 to Q.15 per day. Most of the people hire laborers for all their plots with and without irrigation. In the East-Center-North, daily wages are from Q.13 to Q.20.

The tasks they have to do are: land preparation, planting, weeding, harvesting and fumigation. No hiring of women was registered in the East-Center-North.

- When women are hired, they only weed and harvest, they don't carry the product. They are paid Q.7.00. (Mr. Leonardo Cabrera: Duraznales).

H. Irrigation Systems: Types, Problems, Costs, Maintenance and Organization

The main type of system uses sprinklers, gravity fed, and has a surface source of water, usually a spring. The essential problems, which are present in 80% of the systems visited, are the following: shortage of water (either during the last of the dry season or because it is impossible to irrigate all plots under the irrigation system), pipe obstruction, and the costs of electric energy in the systems that require it (undoubtedly the most serious problem). In some cases the interviewees mentioned as problems technical calculation errors between the available source and the area to be irrigated, or problems in the source at the end of the dry season. The attitude beneficiaries have about the systems is positive, despite the problems and especially among those who have surface water sources.

The access to credit is mostly associated with the debt cancellation, particularly from BANDESA. Maintenance does not seem to be a problem, regardless of whether someone responsible is hired or in those systems in which the initiative is organized by the beneficiaries. Formal organization is generally present in the form of an irrigation committee, but the making of decisions is usually informal, especially in the small systems. Women, even though they may be beneficiaries, are excluded from decision making and participation in general. No external management was observed.

In the West, 100% of the irrigation systems work using sprinklers. In the East-Center-North, sprinklers are used by 80%. The time the systems have been installed and functioning ranges from three to 15 years in the West and from two to twelve years in the East-Center-North region. 50% of the systems have been working for seven to 15 years (Santa Rita, San Ramón, Quiajoló, Buxup I, Ixcá I), and the other 50% of the systems have been working for two to three years (Duraznales, Concepción, Río Blanco Chiquito, El Aguacate and Buena Vista, which has been working for five months). In the East-Center-North region, 50% of the systems have been working two to three years (El Jocotillo, Las Pozas, El Suyate) and the other 50% five to 12 years (Saspán, Los Mixcos, El Tempisque, Encino Gacho, Río Frío).

In both areas 70% of the water source is surface water (it usually comes from water springs) and its energy source is gravity. In the West, the remaining irrigation systems (30%) are have an underground source and their source of energy is electricity; two of them have been in operation two years and the other one approximately 5 months. In the East-Center-North region, the remaining systems (30%), have the same characteristics. These conditions allow us to compare the age of the systems, and also to understand that the type of system has been determined by the availability of water in the communities,

The most recent systems are those with an underground source. This may be an indication of the difficulty of finding new surface sources, which can be associated to the deterioration of the environment and the over cutting of trees, which naturally affects the natural water sources and which are harmful to beneficiaries of underground source systems, because of the high costs of investment to tap underground water.

One of the contrasts found between both regions is between the potential of underground and surface sources of water. The underground system's potential is greater in the West as the number of beneficiaries is usually from 60 to 70, while in the superficial source systems the number of beneficiaries is from 14 to 30. In the East-Center-North region the number of beneficiaries of underground source systems is from ten to fifteen, while in the surface source systems the number of beneficiaries is from twelve to twenty-two.

As for problems in the irrigation systems, the one that affects the most when there is an underground water source is the high cost of electric energy. For example, in the irrigation systems of El Suyate and Las Pozas (where the system uses sprinklers), beneficiaries have had to ask for the disconnection of the system because of the high costs. In El Jocotillo, they have a debt of Q.1400 per manzana (there are some beneficiaries who own up to three manzanas). In the West, people say:

- Before, we used to pay Q.8.00 per cuerda, now it is Q.50.00; sometimes we pay from Q.12000 to Q.18000 monthly. I think it isn't fair for the poor peasants. (Marceliano López. Duraznales).

- We have an accumulated debt for more than Q.50000; we cannot continue operating. (don Esteban, Las Pozas).

This increases the crop production costs, which are not recuperated in the market, which is characterized by changes of prices according to the supply and demand.

- When it stops raining, some say the irrigation project should be canceled, the beneficiaries noticed that money in the project didn't produce profit, because of the high cost of electricity. (Leonardo Cabrera: Duraznales)

- They are forcing the peasants very much. Do you know why? Because they are not prepared. The government has forgotten the farmer. The community of Duraznales recently planted 1000 cuerdas of broccoli in land rented from owners in Xela (Quetzaltenango); with agricultural labor we see we create work for the other people [referring to enterprises like INAPSA, VERDUFLEX and ALCOSA]. (Oscar Cabrera: Duraznales).

In the superficial source systems, the main problems are pipe obstructions (people throw objects into the holding tank which causes the pipes to break or the natural accumulation of earth and mud) and shortage of water (this also happens in the underground source systems), especially during the dry season.

- We would be better, but the water source is drying out; we found another source but we don't have the resources to tap it. (Eduviges Orozco: Ixcá I);

- From February onwards, we cannot irrigate because we haven't enough water. (don Francisco, Los Mixcos).

Some beneficiaries (in El Jocotillo and Los Mixcos, for example) stated that the technicians did not carry out adequate studies to calculate the water necessary for the amount of land. This appears to have occurred because of the rush to install the systems, the fact that funds happened to be available at the time, plus the lack of skill of the technicians who installed the systems which has caused inequities between the water source and the area of land to be irrigated.

Even though the systems have their limitations, two of them (El Aguacate and San Ramón) benefit the farm families with water for family consumption with the rationalization:

- We provide water to new families for their own consumption at home. (Filomeno de León: San Ramón).

The solutions to the different problems in the irrigation systems is determined by the nature of the problem. Thus for electric energy, it is essential for the farmers to pay the bills even though they are hurt financially. As for the pipes and water shortage, they have planned to take turns, to take better care of the holding tank, collect economic resource, but these solutions have not brought them positive results.

- During whole days we have to go and take care of the tank, but this hurts because we lose a whole work day (Gabriel Montejo: Buxup I).

With regard to whether the systems which are working are the worth while, 90% of the interviewees said it was. 60% of them said the reasons were the following: it allows them to save time, they count on the water; it is modern; and it irrigates uneven or hilly plots. The remaining 30% didn't know of any other system, so they couldn't compare. In one case, they said they would prefer a gravity fed system:

- if it were a system by gravity, there would be more benefits. (Leonardo Cabrera: Duraznales).

10% of the interviewees didn't give their opinion, because they still do not have experience enough with production parameters from the irrigation system, as in Buena Vista.

Most of the interviewees are optimistic. Even when the problems difficult, they generally consider them solvable. With very few exceptions, the general feeling was that the irrigation system does not bring enough disadvantages to eliminate it. Even when these attitudes are not optimistic, they express a positive impact from the beneficiary point of view.

Although we could suppose that a marked difference exists in the costs of the surface and underground source irrigation systems, the information shows that the costs are similar, except some which have been working eleven to seventeen years (Quiajoló and Buxup I). However, the agriculturist have received credit assistance from BANDESA and technical assistance from DIGESA, on how to carry out small irrigation projects, which helps facilitate their participation. The irrigation systems which are economically stable are: Quiajoló, Santa Rita, San Ramón, Saspán, Los Planes e Ixcá I, which represent 40% of the interviewees. The other 60% are still behind on payments.

As for interest, most of the interviewees think it was low in the past, but now interest is high in any financial transaction. Most of the payments have been done at the BANDESA office located in the departmental or municipal capital (which in some cases were referred to as BANDESA rural outlets).

An interesting impact to comment is the relation between the cancellation of the systems' debt and the success fulfilled with the help of credit (particularly of BANDESA). In this sense, it is clear that those who have paid for the system have relatively easy access to credit at this bank, but where the system is still in debt, credit alternatives are very limited because private banks do not work with this type of producers and the loan shark loans is available for only a few (in El Jocotillo two cases were mentioned).

Irrigation system maintenance is sometimes covered by the beneficiaries themselves and sometimes a person is hired. In 50% of the cases in the West and in 20% in the East-Center-North (which are mostly of underground source), a person is hired, usually paid between Q.250.00 and Q.300.00 monthly, and for electricity they pay between Q.30 and Q.50 monthly per cuerda (at present, Buena Vista has made no payments). It is seen that the complexity of these systems requires better control in their maintenance, which implies a larger investment by beneficiaries.

In the rest of irrigation systems the farmers have no electric energy or maintenance personnel costs, because they organize

themselves to work on repairs and purchase the materials, resulting in very low operation costs. These systems are probably the most profitable, because of the low costs in maintenance investment.

Irrigation systems administration presents similar characteristics in all the cases studied. Without exception, the irrigation committee boards of management are made up of the associates and is rotating, changing a maximum of every 2.5 years and minimum of one year, giving all the associates the opportunity to be a member of the board of management. Only in one case, the board could be for life, and that is when "no one wants to be a member of the board because it means more work" (Eduviges López: Ixcá I). Another common element is acceptance of how the board has functioned; excepting one case (some beneficiaries of Los Planes), everyone state they were satisfied with them.

Even so, as an organization the irrigation system has some serious weaknesses, for the irrigation problems and needs are cared for only partially. In all cases, the board of management's basic worry is the good functioning of the irrigation system installations. Concern for marketing, production, technical assistance, credit, etc., are not a part of their work. Only in one case (Buxup I), the board orients production through conversations with the beneficiaries, and what to grow is suggested.

It must be mentioned that in some systems, the presence of the organization seems to respond to a formal requirement of the donor or loan institutions and not to an initiative organized by the beneficiaries. This phenomenon was especially notable in the small systems (for example Río Frío or Saspán). In many cases, when we asked a board of management member what his particular role was, he had to stop and think or ask a fellow member. Another important aspect is the absence of women within the structures of the irrigation committees. They are not taken into consideration for the meetings organized by the beneficiaries, even when there are women beneficiaries.

There were no indications of outside interference found in any of the systems. The decisions on irrigation are in some cases, decided by the board of management at meetings and in other cases through informal conversations.

A contractual relation with enterprises which buy certain products is quite common. In 80% of the irrigation systems, farmers contract to produce a certain crop for exporters, such as INAPSA, VERDUFLEX, ALIANZA and ALCOSA. The beneficiary's decision is voluntary and it does not mean that all the irrigation beneficiaries have to all enter into such a contract.

I. Technical Assistance: Institutions and Coordination

Public sector technical assistance is limited, intermittent and inefficient. The most evident presence is from DIGESA. There were no NGO's registered in any of the systems. The assistance from FEAT is considered superior. Likewise, the technical assistance given by the agroexport companies is evident. The interinstitutional coordination, both between the public sector and private enterprise and between various public sector institutions is nonexistent.

Technical assistance is a vital element in the development of irrigation systems, and it has clear impact in spite of being rather weak. The problem begins with the institutional presence of the agriculture public sector in the places where the irrigation systems are located. In only one system (Concepción) was the presence of public sector institutions found to be active and efficient (DIGESA, DIGESEPE, DIGEBOS and ICTA). In five irrigations DIGESA and DIGESEPE were found, and only DIGESA in the remaining systems. In several cases the presence of DIGESA was probably in response to the fact that some beneficiaries were also DIGESA agriculture representatives and had worked for some time with DIGESA (El Jocotillo, Río Frío, Los Planes, for example). However, when asked about the activities carried out by them, these same agricultural representatives expressed doubts and noted the irregularity of institutional action. In not in one case was support from public institutions for marketing mentioned. In the case of systems that used technical resources from FEAT the opinions were more positive.

As for irrigation, DIGESA does not respond to farmers' needs nor does it fulfill its role of a service institution. 20% of the beneficiaries stated they received assistance once a year; 10% stated they received very little assistance; 40% stated they never received any assistance at all. This means that 70% receive practically no assistance. The remaining 30% receive constant assistance from DIGESA, almost always because among the irrigation beneficiaries there is at least one who works DIGESA.

It is evident that the technical assistance limitations are a critical and chronic problem, which is proven by the following statement:

- Since eight years ago we don't receive any technical assistance (Agustín Juracán: Concepción)
- They have visited us only in words (Eduviges López: Ixcá I).

Despite the above, the technical assistance given by DIGESA in some of the irrigation systems was said to be acceptable:

- It was good because it taught us about crops, distances and inputs" (José García: San Ramón).

In general terms, the following aspects of technical assistance were considered important: pesticide applications, planting of crops, good orientation, crop rotation, time of fumigation, etc. On the contrary, speaking of the technicians, some said that they "don't know them" (don Francisco, Encino Gacho). In El Jocotillo, the DIGESA technician said it was not worth while assistance to all of them because there was no way he could really know all the beneficiaries' problems. So assistance becomes selective and produces discontent in the group, and the more it produces individual benefit, the more accentuates social differentiation within the system.

Public sector institutions' technical assistance deficiency and the absence of non-government organizations to provide this service may not be that important (at least for the study sample). This is because assistance is often supplied satisfactorily by the agroexporters which buy the products directly from the irrigation beneficiaries. In this way, in the irrigation systems where their products are marketed this way (80%), technical supervision is constant, because this guarantees quality for the exporter. This is favorable for the farmer, because the assistance is accompanied by inputs for planting and other services that the exporter provides or sells.

The lack of technical assistance in the sensible use of pesticides is notable. Technicians usually limit their assistance to reading the instructions for their use; in no case to they provide training oriented toward explaining the short and long-term consequences of pesticide use on the environment (see next paragraph).

In other cases technical assistance is supplied by the technicians from FEAT, which has brought good results and has been carried out satisfactorily, due to the contractual relationship established.

Interinstitutional coordination is practically nonexistent, both between state and private institutions and inside the public sector. In Saspán, there has been coordination between DIGESA and DIGEBOS and the Trifinio project -CEE- especially regarding soil conservation, but this seems to have happened either from personal initiative or the ample funds of the Trifinio project, and not because of a joint action of the organizations. In the rest of the systems we did not find any evidence of coordination, at least from the viewpoint of the interviewees.

J. Pesticides: Types, Practices, Costs and Security in its Use

The use of pesticides seems to be high and with poor knowledge by the beneficiaries, who appear to depend on the agrochemical businesses and on the agroexporters. In almost all cases, the equipment used during application is incomplete, and there have been cases of poisoning (especially in the East-Center-North region). There are contrasts regarding the understanding of the effects of the use (or incorrect use) of pesticides on the environment in general and on the land in particular (a short term view prevails).

The types of pesticides used in the agricultural production in the different irrigation systems are determined by the type of product. The characteristics and similarities of the irrigation systems regarding altitude, climate, soil's organic composition, etc., allow for the cultivation of the same new crops in all the irrigation systems. This situation has permitted the general and very diversified use of different types of pesticides. The most common pesticides are the following: thiodan (in 80% percent of the systems), ambux (60%), tamarón (60%), folidol (40%), ditane (40%), volatón (40%), metasistox (30%), arroquim (20%), bondoseb (20%) and antracol (20%). The list includes others, like decis, dacomil, barrot, vitán, ridumil and gramoxone, which were mentioned only once and each of them in only one irrigation system.

Pesticides have the common characteristic that they are used by all the farmers of the irrigation system where they were identified. Another characteristic is none of the interviewees knew of any possible restrictions in their use.

The diversification of agriculture production in the different irrigation systems has brought a strong dependence on the use of chemical products. The wearing out of the organic composition of the soil through constant use means systematization in the use of chemical fertilizer without which the possibility of a profitable harvest is almost impossible. When the soil does not rest or when there is no rotation of the crops, the chemical fertilizer causes the soil to become exhausted (this opinion emerges from information given by some interviewees; other informants did not mention this problem).

On the other hand, the introduction of new crops has brought pests and illnesses unknown to the farmers, who have controlled their effects with the use of chemical products. The farmers' need for a good crop (economically speaking) has denied nature all possibility of balancing the natural cycle where the crop grows, meaning once again, the use of larger quantities of pesticides and of new products to attack the resistance of the pest.

So, pesticides are used in all the crops of all the irrigation systems. The only product in which no pesticide is used is corn (milpa); the reason is that it is not attacked by pests. Few pesticides are used with crops of little importance for most farmers, like coriander, peanuts, chili and rosa de jamaica, crops which are not found in all the irrigation systems. The crops that used pesticides the most are broccoli, potato, tomato, cauliflower, beets, carrots, green beans, onion, garlic, okra and anise.

As for the quantity of pesticides used in the crops, generally it is one or two Bayer measurements (1 Bayer measurement = 25 cm³) per 4 gallons of water. The variation depends on the specifics of the chemical product and on the crop on which it is used.

Regarding the knowledge of the quantities used by the farmers, there are two basic sources: technicians from DIGESA (in all the cases) and the label on the bottle. This is reinforced by the assistance given by the technicians from the exporters which buy the products in the irrigation systems and by the paid technical assistance (FEAT).

The costs of the pesticides used by the farmers in the different irrigation systems show are uniform. No significant variation was found, so its impact on production costs does not affect the competitiveness of the product in the market. There is a notable increase in the cost of pesticides (a generalized observation), caused by inflation, but as in all economic reality, it only affects the final consumer.

In general terms, pesticides' costs of more use are the following: tamarón, Q.60 per liter; metacisto, Q. 120 per liter, ambux, Q.60; folidol, Q.40. At first glance, the impact on the farmer is that they are "a little expensive" (a generalized expression), but when related to the market prices of their products, the reasoning of the farmer demonstrates his sense of the market. Thus, we find that the costs of pesticides are high "because sometimes the product which they (farmers) sell has a low price" (Jorge Díaz: Río Blanco Chiquito), or pesticides are expensive "because there are no big profits on the sale of products (Alberto Martínez: Buxup I), or "because much product isn't sold, it stays on the field or the prices are lowered" (Pedro García: San Ramón).

Regarding the equipment used in the application of pesticides, they use a back pack fumigator. The nature of the crops and the areas of land worked by the farmers do not require any other special equipment.

In our sample, 100% of the farmers use a pump to fumigate and could explain the equipment and how it was used in the application of pesticides. This last point is because there is no other way to

apply them: "without it we cannot fumigate" (Leoncio Sequec: Concepción).

Apart from this pump or backpack, other equipment used in the application of pesticides are rubber boots (in 60% of the farmers), gloves (70%) and mask, which in most cases is a damp piece of cloth (60%). Only one farmer said he used nylon to protect the body, two used sun glasses and 40% said they did not use any additional equipment.

One of the weaknesses in the irrigation systems are the security measures used by the farmers in the fumigation. This is important, regarding both the personal aspect and the impact which this activity has on environment. However, it is necessary to point out that a significant number of beneficiaries or their workers (even up to 60%) use protection measures that contrast with those producers who are not the systems' beneficiaries and do not use these measures.

The problem is critical, not only because almost half of the farmers do nothing to protect themselves, but because what they do use really is no protection. The use of special equipment for this kind of work was not mentioned in any of the cases.

Three aspects are crucial for this situation to change among the farmers. First, the problem is economic, for the purchase of this equipment constitutes an extra expense and therefore cuts into their income or profit. Second, knowledge of the impact of exposure to pesticides on the body, though it has advanced considerably, still needs additional efforts. Third, there is an excess of trust among some farmers who think fumigating with care does not cause any harmful effect. While in the West 100% of the interviewees affirmed that they had not had any problem with poisoning, in the East-Center-North several beneficiaries said they had had symptoms of intoxication (headaches and vomiting). Likewise, in this last region cases of poisoning of non-farmers were mentioned, both in laborers and community members (one interviewee said that in Los Planes the son of a beneficiary had died because of incorrect use of pesticides over a long period but this was not proven).

The farmers' way of solving a possible intoxication (at the moment of fumigation) is the following:

- You have to fumigate in the wind's direction, so as not to breathe the air with poison (Alberto Martínez: Buxup I).

But 40% consider it is not harmful or they don't know; the remaining percentage consider it can be harmful with time.

In this critical situation, the wage laborers working temporarily in the plots of the irrigation systems are the ones taking the greatest risk, for they carry out a series of tasks, including fumigation, without any protection. Regarding this situation,

- the people who have problems are the ones hired, because they are not given any equipment (Salvador Mazariegos: Concepción Chiquirichapa).

Knowledge of the use of pesticides contains two aspects: the farmer's knowledge before entering the irrigation system and what is learned while he is in the system. 80% of the sample admitted to not knowing anything about the use of pesticides before entering the project. The rest knew something through their experience with traditional crops like potato, where pesticides have been used for a long time, or through their experience in the plantations in the coast. In the East-Center-North region, there is a significant number of members who feel the use of so much chemical product affects their lands. Some said "the soil is very acid", and they have begun rotating the land so as not to exhaust it.

Thus at present, all the farmers have some knowledge about the use of pesticides, but this knowledge is basic, limited and sometimes incorrect. What was already known and what was learned in the irrigation system are basically the same: how to use the pump, when to fumigate, which products for which crops, where to store the pesticides, and their application, all of which must be considered as significant gains of the Project.

As can be seen, it is still partial knowledge, the purpose of which is to make fumigation effective. Because of this, in some cases in the West, especially those who already had some information on the subject, the irrigation experience has not provided them anything new about pesticide use.

All the aforementioned explains the lack of knowledge of the farmers on the subject of the impact of pesticides on the environment. A very small number of interviewees said they thought pesticides contaminate the air "because it takes the poison away" (Eduviges López: Ixcá I) and the water, because "if it rains, the water is contaminated" (Pedro García: San Ramón). The rest of them think it may not cause any trouble, or they simply do not know.

K. Positive Impacts

An overall appraisal based on the interviewees' opinion is positive: higher production, income, job creation, decrease of migration, and diversification. The some results expected for the different stages of the PDA do not seem to have been accomplished,

except the production and income increase (in many cases up to 50%). Nevertheless, the unexpected results such as job creation, deceleration of the rural migration flow and decentralized regional development which the systems have stimulated are important to point out.

This section includes both expected and unexpected positive impacts. Our only parameter is the "expected results" corresponding to the three successive stages of the PDA (stage I,II,III). Many of the results mentioned come from quantitative goals which we cannot evaluate with precision. Likewise we think that other expected impacts are not mentioned here.

If we base our appraisal of the small irrigation systems on beneficiaries' comments, the appraisal is positive, despite the diverse problems. Thus, there is a diversity of answers which go from the openly critical to the passionate defense and support, but the average is found in an affirmative statement with reserves: "We're better, but..."

There is a group of indicators which seem to support this overall consideration. The interviewees speak of greater crops, higher prices, diversified production, less migration, better incomes, and a better level of life. However, the universal or most generalized indicator of the system was "we produce all the time."

It must also be observed that a subjective aspect of positive impact among beneficiaries rests on the satisfaction of watching the land irrigated during the dry season, which is considered extraordinary because of the simple fact of defying the natural conditions of the environment.

If the expected results for the three stages of the PDA are observed, they will not be found in the case studies. If we think of the forest handling, water shed and soil preservation, pesticide use, strengthening of the agriculture public sector and a minimum increase of 50% in production and incomes due to the application of new technology, the opinions seem to be negative, except the last one. Even when we could not measure the production and income levels, two thirds of the interviewees assured us of being in better economic situation and a better level of life.

Nevertheless, other positive impacts that were not contemplated clearly by the Program must also be mentioned. In the first place, the positive transformations created as a consequence of the production and impact in the rural employment structure. It is impossible to evaluate with our data what impact this may in slowing down temporary migration flows and the crops in the large plantations, but it has had, without doubt, a significant influence. If this program had not existed, temporary migration

would be an even greater problem. It must be observed, we insist, that the systems suppose both the disappearance of the migration cycle among beneficiaries and its diminishing among community neighbors or from nearby communities. This phenomenon has produced a break in the small plot-large plantation model and is an important stimulus in the regional modernization process which reevaluates the rural context.

From our point of view, there have been investments by beneficiaries regarding education, which should create a medium term impact that, from one point of view, can be considered positive because of the new alternatives which it creates, but maybe negative because education is related to the break with agriculture production and the successive technological transformation of the sector.

L. Negative Impacts

The most important negative impact consists in the deterioration of soils, water sheds and the environment as a consequence of inputs whose use was not totally rational (especially pesticides), and whose consequences will be felt in the medium and long term. It would seem that there is not a clear consciousness of its effects.

Although negative impacts seem to be more numerous than the positive ones, it does not mean that the positive appreciation aforementioned is negated. A negative impact still difficult to measure with precision is the effect of pesticides. A short term view prevails at present, based on production and agriculture process, and if these increase at a short term, the negative effects at medium and long terms are less important.

Related to the above and in contrast to the expected results, the handling of water sheds and agroforestry, together with soil preservation, seem to have had limited results. Moreover, as a consequence of the irrational use of agricultural inputs, a deterioration in the watersheds might be expected.

The introduction of the irrigation systems has made the intercommunity social differentiation processes more acute. As a result, there are richer irrigation system beneficiaries who control a valuable resource (water), and the rest of the poorer population, with no control over this resource.

Although not a negative "impact" but rather an unaccomplished goal, it must be mentioned in regard to the strengthening of the SPADA and particularly of DIGESA, there were no indicators found which could confirm it. On the contrary, many beneficiaries are critical of the work done by the State.

VI. Conclusions

A. General Estimation

According to the opinions expressed by most of the beneficiaries and despite the problems found, the perception is positive. The production and income increase are more important than the debts acquired or the deterioration of the environment.

B. Particular Conclusions

1. The process of resource creation of families who use irrigation systems essentially depends on agriculture.
2. The small systems give better results than the large systems because the difficulties in the large ones multiply and because of the difficulties practicing democratic decision-making. This is especially true when internal problems appear among beneficiaries. When some large systems showed favorable conditions (for example Concepción), it was because they obtained external institutional support, which may not be necessarily sustainable.
3. The gravity fed systems present less problems than the ones using electric energy. It seems that there was no plan to build systems independent of INDE's energetic supply, and that the cost of this service is the second most expensive in Latin America, being Guatemala one of the poorest countries of the continent.
4. From the technical point of view, errors occurred regarding the appraisal of the quantity of water needed to satisfy the beneficiaries' needs in all their land area or to satisfy the beneficiaries' needs during all the dry season.
5. The irrigation committees, although from the formal point of view they work legally, do not seem to play an essential role. The informal organization based on natural leaders is the one that makes decisions and imposes them among the beneficiaries.
6. Beneficiary solidarity to repair the systems or to solicit more favorable conditions in debts with BANDESZ. or INDE are notable.
7. In contrast to the previous conclusion, not many signs of initiative organized by the beneficiaries were registered for marketing.
8. Temporary migration flows of rural labor have slowed, but the flows to Guatemala City and to the United States tend to grow (especially in the East-Center-North region).

85

9. The small irrigation systems have created jobs which explains the decrease of temporary rural migration flows.
10. The intercommunity social differentiation process has become acute as a consequence of the introduction of the irrigation systems in some cases.
11. Under the irrigation systems, the production for the subsistence is less dominant. Even though corn and beans are present, the crops oriented to the local, national, or export and the first world market, are dominant.
12. The profits generated by the irrigation systems' incomes are invested especially in land. Luxury expenses are few.
13. The interest in the land under irrigation during the dry season is significant. This responds to the self-definition of farmers of almost the whole of the interviewees, a strong dependence on this activity and the prestige obtained from growing during the dry season.
14. There is a certain contradiction regarding the deterioration and exhausting of the soil, which is more evident in the East-Center-North than in the West, in which if the volumes of production and incomes are high, deterioration is not a real concern, although it may eventually affect the beneficiaries' land.
15. It is necessary to point out the progress achieved by the irrigation systems' beneficiaries regarding protection and security, even when these are still not optimum.
16. Access to credit increases when the beneficiaries cancel their debt with BANDESA. If they do not, they are not eligible for credit and must do without it or resort to loan shark credit.
17. In the East-Center-North region, market understanding is more common than in the West. But the introduction of the systems in the latter region, added to better levels of productivity and quality of the lands, are changing dramatically this contrast.
18. Marketing is still the weak point of most of the beneficiaries. Except for a few systems (eg. El Jocotillo, where all are relatives) there is no collective attitude oriented to better prices and markets.
19. Technical assistance of the agriculture public sector is deficient. NGO's do not support any of the irrigation systems visited. Interinstitutional coordination is practically nonexistent.

not according to the data
Maize = #1

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?

?

20. The process of agricultural diversification is notable. Most beneficiaries find advantages in this process, not only because they are better able to increase income but also because it is considered a lesson to be repeated (especially with their children).

21. It is necessary to point out that when the irrigation systems are successful and they incorporate vegetable gardens, they tend to place excessive work demands on wives and children (especially in the West of the country).

C. Impacts

The central positive impact consists of:

22. The increase of incomes and the level of life of the beneficiaries' homes.

23. Disappearance of temporary rural migration flows among beneficiaries' homes and its slowing down among homes of their area of influence.

24. Creation of temporary rural jobs.

25. Steady raising of the education level in the systems' beneficiaries' homes.

26. Economy and investment of beneficiaries in lands.

27. Deterioration of the quality of land and the environment because of the unsensible use of pesticides (and agrochemicals in general).

28. Relative knowledge of the environmental impact and appropriate use of technological packets among beneficiaries.

29. Significant advances in the protection of the person using pesticides.

30. Little organized action oriented to marketing as an initiative organized by the beneficiaries.

31. Acceleration of the process of intercommunity social differentiation.

VII. Lessons for the Future

1. This program should be repeated with certain adjustments. Although it presents many weaknesses, it is better than most projects in sustainable rural production.
2. It is obvious that, from a national view, the small projects are the most successful and are the ones commendable to repeat. Here, problems are minimized and results are higher.
3. Another important lesson consists in the need to carry out more detailed technical studies which so as to minimize the negative impacts, just as the impossibility irrigating all the land supposedly under irrigation or during all the dry season.
4. In future projects, it is necessary to pay more attention to the use of pesticides (and of inputs in general), so as to prevent the negative effects.
5. Despite the criticisms that could be made because of the introduction and diversification of new products which are strongly affected by market oscillations, beneficiaries consider it a learning experience. It has helped them in the change over from subsistence to commercial understanding.
6. It is not beneficial to oppose subsistence crops in the areas under irrigation, like corn and beans. In most of the cases, the irrigation beneficiary himself discovers the advantages of diversification and increases market crops which slowly replace subsistence crops.
7. It is important that in the future project implementers evaluate the impact generated by the heavy participation of woman and children in the irrigation projects. From our point of view, work places a burden on these social segments, causing them to neglect other important activities, both for biological and social reproduction (among married women) and for the improvement of the life conditions through education (especially for children).

*NIAE
is based inherently
on the replacement of
labor.*

*The NIAE did
not replace corn & beans;
it displaced them.*

ANNEX: INTERVIEW INSTRUMENT

PROGRAMA DE DESARROLLO AGRICOLA
EVALUACION FINAL DE IMPACTO
ESTUDIOS DE CASO

GUIA DE ENTREVISTA PARA LIDERES Y CAMPESINOS

FECHA: ____/____/____

CODIGO: _____

A. TIPO DE ENTREVISTA

- 1. Productores
- 2. Líderes
- 3. Mujeres

B. UBICACION DE LA ENTREVISTA Y DESCRIPCION DEL SISTEMA

1. REGION: _____ 2. DEPARTAMENTO: _____

3. MUNICIPIO: _____

4. NOMBRE DE LA COMUNIDAD: _____

4.A TIPO: 1. Cabecera municipal

2. Aldea

3. Caserío de aldea: _____

4. Cantón de la aldea: _____

5. Paraje de: _____

6. Finca: _____

7. Otro: _____

5. NOMBRE DEL RIEGO: _____

6. TIPO DE RIEGO: 1. Aspersión

2. Goteo

3. Manguera

4. Otros: _____

7. FUENTE DE ENERGIA: 1. Gravedad

2. Eléctrica

3. Combustión (bomba)

4. Otras: _____

8. FUENTE DE AGUA: 1. Superficial

2. Subterránea

9. AÑO DE INICIO DEL SISTEMA DE RIEGO: _____

10. EL PROYECTO SURGIO CON EL APOYO DE: _____

11. EL PROYECTO ESTA SIENDO APOYADO POR: 1. PDA
2. FEAT
3. Otros: _____

C. DATOS GENERALES DEL ENTREVISTADO:

1. NOMBRE: _____

2. EDAD: _____ años 3. SEXO: M _____ F _____

4. RELIGION: 0. Ninguna
1. Católica
2. Evangélica
3. Otra: _____

6. OCUPACION/PROFESION:

6.A Principal: _____
6.B Otras: 1. _____
2. _____
3. _____

7. SABE LEER Y ESCRIBIR: SI _____ NO _____

8. EDUCACION (Ultimo grado): _____

9. IDIOMAS QUE HABLA:

9.A Idioma materno: _____
9.B Otros: 1. _____
2. _____

10. Grupos y organizaciones a los que pertenece o representa en la actualidad:

GRUPO/ORGANIZACION	CARGO ACTUAL
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____

11. Grupos y organizaciones a los que perteneció o representó en el pasado:

GRUPO/ORGANIZACION	CARGO
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____

OTRAS OBSERVACIONES

GRABACION:

1. INTRODUCCION

- a. Háblenos de la comunidad, por favor. Cómo es la gente, cuáles son los cultivos, que otras cosas hace la gente por aquí para ganarse la vida (pensando en alternativas no agrícolas). (Se pretende un breve perfil de la comunidad). Cuáles son los cultivos del riego en que usted participa?
- b. Háblenos de su familia, por favor. Cuántas personas viven en su casa? Es una familia o varias? Viven con usted algunas personas que no sean familiares? Quiénes?

2. ECONOMIA FAMILIAR

- a. De dónde vienen sus ingresos? (sondear para establecer qué viene del riego, que no viene vía agrícola y vía no agrícola -industria, artesanía, oficios, comercio, remesas, etc-Diferenciar cuenta propia de trabajo asalariado).
- b. Qué acostumbra usted (su familia) a comprar semanalmente. (se pretende establecer el tipo de canasta básica del sistema).
- c. Qué cosas ha comprado (inversiones importantes) en lo que va del año? (SONDEAR).
- d. Podría decirnos usted qué cosa compraba antes y qué ahora, hubieron diferencias? En dónde compraba antes del proyecto y dónde compra ahora que está en el proyecto? Compra más cantidad? Porqué? Cambió la calidad? (por ejemplo, más carne, productos empacados, etcétera).

3. UTILIZACION DEL TRABAJO

- a. Qué extensión de tierra trabaja? (diferencie lo que corresponde a bajo riego y sin riego) Cuánto tiempo le dedica usted al trabajo en su(s) parcela(s)? (explique si se refiere al día, al año o a qué cultivo) Cuánto en las bajo riego y cuánto en las sin riego? Qué extensión de tierra tiene bajo riego?
- b. Quiénes trabajan en sus parcelas. Su esposa? Sus hijos? Otros parientes? Trabajan en todas las parcelas? Sólo en las parcelas con riego o sólo en las sin riego? Hay alguien de la familia que no trabaja en las parcelas (que sea PEA)? Trabaja mucho o poco la familia en las parcelas? Hay gente de su familia que trabaje fuera de su parcela aunque viva en la finca?
- c. Ahora que usted participa en el sistema de riego, usted migra? Migran otros miembros de su familia? quiénes? Con qué frecuencia? A dónde? Por cuánto tiempo? Que tan importante es ese trabajo para vida económica de hogar? Afecta la migración al sistema? (ojo, preguntar con cuidado e indirectamente).
- d. Usted contrata a veces mozos o jornaleros? Cuántos jornaleros? Para qué parcelas? para qué tareas? Por cuántos días? cuánto les paga? Cómo les paga?

4. PARTICIPACION DE LA MUJER EN LA PRODUCCION AGRICOLA

- a. En qué actividades agrícolas participan las mujeres que forman parte de su familia? Y cuáles no se les permite? (Se refiere a las parcelas con riego).
- b. Desde qué edad participa la mujer en las tareas agrícolas? A las niñas qué tareas se les asigna? A las jóvenes y a las adultas? (Mujeres solteras)
- c. En qué actividades agrícolas participan las mujeres casadas?
- d. Antes del mini-riego, qué actividades realizaba la mujer en la agricultura? Cree que se han dado cambios desde que se inició el proyecto de riego? (sondear).

5. VARIACIONES EN PRACTICAS ENTRE TIPOS DE IRRIGACION

- a. Qué tipo de sistema hay aquí? Cuándo se instaló? Desde cuándo está en operación? Qué problemas se presentan? Cómo los resuelven? Usted piensa que el sistema que utilizan es el más adecuado?
- b. Cuánto pago usted por el sistema? Todos pagaron igual? Fueron altos los intereses? Está atrasado? Dónde pagaban, en el riego o tenían que viajar a algún lugar? Todavía debe? Cuánto debe?
- c. Paga por mantenimiento? Paga por electricidad o combustible? Cuánto al mes? Le pagan a alguna persona para que se encargue del funcionamiento? Cuánto le pagan? Le parece a usted que los gastos de operación son altos? Porqué?
- d. Hay un grupo administrador? Está formado por gente del riego? Es siempre la misma junta directiva o cambia periódicamente? Usted está conforme con esta administración? Decide la junta directiva "de afuera" dicen lo que hay que hacer, cultivar y cómo comercializar? (ojo, preguntar con cuidado la ingerencia externa).

6. ASISTENCIA TECNICA INTEGRADA

- a. Qué instituciones sirven aquí del sector público? Qué organizaciones no gubernamentales sirven aquí? (enumeración).
- b. De qué instituciones se recibe asistencia técnica y con qué frecuencia? Qué tan buena es esa asistencia técnica? Porqué? Cómo trabajan? (pedir que describan el proceso). Qué beneficios obtiene de la(s) institución(es) que colaboran en este lugar?
- c. Cada institución trabaja por su cuenta? Se coordinan actividades? Cuáles? Cómo? (pedir que describan el caso si existe coordinación). Qué piensa usted de la falta de coordinación o de la coordinación aquí utilizada?

7. MANEJO DE PESTICIDAS Y CONTAMINACION

- a. Qué venenos se usan aquí? Cómo se llaman? Los usan todos o sólo usted?
- b. En qué cultivos usa venenos? En cuáles no usa? porqué?

- c. Dígame el costo de los venenos que utiliza ? Le parecen caros en relación al costo de comercialización?
- d. Tiene algún equipo para pesticidas? Lo utiliza? cuál? Quién se lo suministró? Lo compró o lo alquiló o se lo prestaron ? Le parece necesario?
- e. Cuánto pone de cada veneno? (sondear) Quien le informó?
- f. Qué medidas de seguridad utiliza?
- g. Qué problemas le ha causado a usted el uso de pesticidas? y a su familia? y a otra gente que usted conozca? Usted piensa que le puede causar algún problema?
- h. Qué sabía usted antes de iniciarse en el proyecto sobre el uso de pesticidas? Qué cosa? Lo ponía en práctica? Qué aprendió durante el proyecto? Lo pone en práctica?
- i. A usted le parece que el uso de pesticidas perjudica o no a su terreno? Y a los terrenos vecinos? Porqué? (En el termino terreno entra el medio ambiente en su conjunto) (SONDEE).

8. RESULTADOS NO ANTICIPADOS DEL PROYECTO

- a. Hay ventajas en tener una parcela bajo riego? Cuáles son esas ventajas? (Sondee)
- b. El ingreso suyo es mayor, igual o peor antes de iniciarse el proyecto de riego que ahora? El servicio FEAT, mejoró o no sus condiciones de vida e ingresos? (Sondee).
- c. Tiene más acceso al crédito con el riego? si o no? porqué? (Sondee).
- d. Con el riego a diversificado los cultivos? (Pedir que comente su caso, ya sea por estar diversificado o no).
- e. Con su participación en el sistema de riego se le ha facilitado la comercialización de sus productos? Cómo? Con quién?
- f. Ha mejorado su calidad de vida? (Sondee y pida que comente su caso).