

PD-AAX-641

CLASSIFICATION
PROJECT EVALUATION SUMMARY (PES) - PART I

Report Symbol U-447

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|---|--|---|--|--|
| 1. PROJECT TITLE Rural Sanitation | | | 2. PROJECT NUMBER 511-0458 | 3. MISSION/AID/W OFFICE USAID/Bolivia |
| 5. KEY PROJECT IMPLEMENTATION DATES | | | 4. EVALUATION NUMBER (Enter the number maintained by the reporting unit e.g., Country or AID/W Administrative Code, Fiscal Year, Serial No. beginning with No. 1 each FY) 87-6 | |
| A. First PRO-AG or Equivalent FY <u>77</u> | B. Final Obligation Expected FY <u>80</u> | C. Final Input Delivery FY <u>87</u> | <input checked="" type="checkbox"/> REGULAR EVALUATION <input type="checkbox"/> SPECIAL EVALUATION | |
| 6. ESTIMATED PROJECT FUNDING | | | 7. PERIOD COVERED BY EVALUATION | |
| A. Total \$ _____ | | | From (month/yr.) <u>6/84</u> | |
| B. U.S. \$ <u>4,310,000</u> | | | To (month/yr.) <u>7/87</u> | |
| | | | Date of Evaluation Review <u>9/87</u> | |

B. ACTION DECISIONS APPROVED BY MISSION OR AID/W OFFICE DIRECTOR

| A. List decisions and/or unresolved issues; cite those items needing further study. (NOTE: Mission decisions which anticipate AID/W or regional office action should specify type of document, e.g., airgram, SPAR, PIO, which will present detailed request.) | B. NAME OF OFFICER RESPONSIBLE FOR ACTION | C. DATE ACTION TO BE COMPLETED |
|--|---|--------------------------------|
| Final Evaluation | | |

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| 9. INVENTORY OF DOCUMENTS TO BE REVISED PER ABOVE DECISIONS | | | 10. ALTERNATIVE DECISIONS ON FUTURE OF PROJECT | | |
| <input type="checkbox"/> Project Paper | <input type="checkbox"/> Implementation Plan e.g., CPI Network | <input type="checkbox"/> Other (Specify) _____ | N/A | | |
| <input type="checkbox"/> Financial Plan | <input type="checkbox"/> PIO/T | <input type="checkbox"/> Other (Specify) _____ | N/A | | |
| <input type="checkbox"/> Logical Framework | <input type="checkbox"/> PIO/C | <input type="checkbox"/> Other (Specify) _____ | A. <input type="checkbox"/> Continue Project Without Change | | |
| <input type="checkbox"/> Project Agreement | <input type="checkbox"/> PIO/P | | B. <input type="checkbox"/> Change Project Design and/or <input type="checkbox"/> Change Implementation Plan | | |
| | | | C. <input type="checkbox"/> Discontinue Project | | |

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| 11. PROJECT OFFICER AND HOST COUNTRY OR OTHER RANKING PARTICIPANTS AS APPROPRIATE (Names and Titles) | | 12. Mission/AID/W Office Director Approval | |
| Rafael Indaburu, Project Coordinator Michael Hacker, Chief, Office of Health and Human Resources | | Signature <u>Reginald van Raalte</u> Mission Director | |
| | | Typed Name <u>Reginald van Raalte</u> | |
| | | Date <u>16 June 88</u> | |

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MINISTRY OF SOCIAL WELFARE AND PUBLIC HEALTH

DIVISION OF ENVIRONMENTAL SANITATION

CONTRACT Ner. 511 - 0458 - C - 00 - 7302

FINAL EVALUATION OF THE
RURAL SANITATION PROJECT

SEPTEMBER, 1987

C.A.E.M. LTDA.

GENTRO DE ASESORAMIENTO EMPRESARIAL MULTIDISCIPLINARIO

Teléfonos: 367135 - 325841

La Paz - Bolivia

Casilla Postal 6100

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FINAL EVALUATION OF THE RURAL SANITATION PROJECT

I. BACKGROUND

The Rural Sanitation Project, executed by the Direction of Environmental Sanitation (DES) of the Ministry of Social Welfare and public Health under an USAID - Bolivian Government agreement, began in september 1978. In 1980, before project activities were fully established, it was suspended. The project was reactivated in December 1983 and its implementation began in June 1984. Since then has continued uninterrupted and the Project completion Date is September 15, 1987

In July 1987, the project's evaluation third phase was concluded and culminated with a Health's impact evaluation generated by the project in the rural areas of Cochabamba and Chuquisaca. With this task fully executed by D.E.S. and coordinated with CAEM's consultants for the technical evaluation of the potable water systems, the project's achievements since 1984 up to 1987, were confirmed. Such achievements are refered to the following aspects:

- a) Good executive and technical capacity of D.E.S. to conduct Health's impact evaluations.
- b) "Robust" indicators: of Diarrhea morbidity rates obtained both in the rural areas of Cochabamba and Chuquisaca, as well as better higienic and nourishing habits observed in the people interviewed.

- c) High work implementation percentages obtained in terms of number of water systems in the rural communities, - specially in Cochabamba.
- d) In the institutional order a progressive strenghte - ning of the administrative systems was percieved in - the central and regional levels of D.E.S management.

II. OBJECTIVES OF THIS FINAL EVALUATION

The Rural Sanitation Project will be evaluated in all its components in order to make recommendations to increase the effectiveness of other USAID - funded water projects, in view of this previous experience with D.E.S.

The technical, administrative and sociological criteria emitted by this present evaluation will try to identify the virtues and defects of the Rural Sanitation Project to take decisions to continue the financial support for simi^lar projects, to improve those areas of activities which are deficiently performing and to diversify the projects being executed whit additional compatible componentes - such as the following : Sanitary education, Primary - Health care, Child survival, Food for work, etc.

Three are the specialized areas which are of the specific responsability of the consultants in this final evaluation: Technical area, Social area, and Institutional area. Each one of them has defined a work methodology to objectively evaluate the project.

In Annex 3.1 are shown the structured forms which were applied in this opportunity at all levels of D.E.S. organization, to the rural house wives, to the Potable Water Administrative Boards, to the personnel incharged of health centers or sanitary posts and finally a Community file card.

III. INSTITUTIONAL EVALUATION OF THE DIRECTION OF ENVIRONMENTAL SANITATION

3.1 D. E. S. ORGANIZATION

The organizational structure of D.E.S. was strengthened with the Rural Sanitation Project's implementation, specially at the regional offices of Cochabamba and Chuquisaca where the following Divisions are established:

- a) Administrative Division
- b) Basic Sanitation Division
- c) Operations and maintenance Division
- d) Environmental's protection and conservation Division
- e) Food and beverages control and hygiene Division

In Annex 3.2, two organigrams of regional D.E.S. offices are given, displaying the Divisions directly related with the Rural Sanitation Project. In both of them, the post of Operative Unit's Chief was eliminated since January 1987. Its functions and status were again assigned to the Chief of the Basic Sanitation Division who now coordinates directly with the district Chief sharing the administrative, technical and financial responsibilities of the project.

This change has contributed to distend the powers conflict that originated discrepancies in the project's development since that post was created in 1986, diminishing the executive functions of the District Chief.

A negative institutional aspect at D.E.S was the lack of continuity in the politically influenced post of Executive Director. Since 1985 four executives managed D.E.S, their changes affected the institutional's global policy and particularly the Rural Sanitation Project's technical, administrative and financial coordination.

Despite this fact, project's dynamic maintained itself in a good level in Cochabamba and fairly good in Chuquisaca, where in the last year a substantial recuperation in efficiency was observed. In terms of number of works executed, the project's implementation percentage was raised from 24% to 64% considering some works being finished during our visit.

The Executive Director, recently nominated judged the main factors mediating for the achievements reached by the institution as follows:

- a) Of administrative order: Regular
- b) Of technical order: Normal
- c) Of financial order: Irregular

The consultant found that there is a consensus in attributing the financial factors as irregular due to the disbursements delays of the counterpart - governmental funds and in some cases of the USAID loan funds.

Materials and funds sendings from La Paz were centralized in Cochabamba for both regional districts. For this reason, Chuquisaca confronted constant delays in getting its allowances.

However, according to the main D.E.S's executive, some institutional improvements were achieved. - through the Rural Sanitary Project, he mentioned - the credibility won in the rural area, a smooth Technical performance and a sound experience acquired in executing Basic Sanitation projects.

At the National Administrative level of D.E.S it was acknowledged that through the Project, the institution improved in the following aspects:

- a) Administrative systems implemented
- b) Infraestructure
- c) Automotive park
- d) Materials and equipment for the potable water systems

Nevertheless, in relation to the administrative - systems of control such as the M.I.S. his opinion is that this is not a totally adecuated instrument to the needs of D.E.S. because he considers it complex and that it should be simplified.

To this respect, specific comments will be made in the analysis of the regional administrative organizations of Cochabamba and Chuquisaca where diffe - rent behaviors were assesed in relation to the use of the Management Information System. recommended by the consultant and elaborated by the Admi - nistrative adviser of D.E.S. contracted by USAID/B.

Speaking of the institutional capacity in the operation and maintenance of the water systems, all of the interviewed personnel considered it adecuate to the actual needs, but it could be strengthe - ned according to future needs. Parallely, the -

promotion and sanitary education component, - would have to keep up the interest of the Administrative water systems Boards(AWSB) in doing its labor of accounting control of contributions and system's operator supervision in every community.

Hence, there was an unanimous opinion in maintaining the support to the Unit of Promotion and sanitary education to go on training the people in health practices and the AWSB, considering the good performance of the latter, so far demonstrated in those communities in which D.E.S. constructed water systems and organized their AWSB..

Yet, the consultant appraisal is that more oriented efforts should be made in that direction, - specially in Chuquisaca to reach better health levels of the rural population through the correct use of water, personal hygiene and hygienic nourishment.

On the other hand, there are good perspectives - in diversifying the service areas in which D.E.S. could apply its work experience with the communities. Almost all of the executives coincided in the following potential services:

- a) Microirrigation
- b) Housing improvement
- c) Localized projects for the agricultural production increase
- d) Primary Health attention
- e) Nutrition

Including the precedent services, a new cause would be given for the renovation of the project in the rural areas which would very well complement the previous stage of water provision.

The statements made by the D.E.S executives reveal the unquestionable progress experimented by the institution in the administrative activities. Years ago, field administrative operations were handled by an administrator physically located in each district hospital or Sanitary Unit. Procurement and accounting functions were all handled by the Ministry of Health personnel. As a result, the D.E.S regional offices had very little control over their own funds and were often not aware of the amount of funding available for construction and operations at any given time.

At the present, D.E.S image have changed drastically, an autonomous administration has been institutionalized which is progressively implementing various management systems. It is not possible yet, to assert that high efficiency levels were obtained but, overall the administrative tasks at D.E.S related to the Rural Sanitation Project were performed with better criteria and good will.

There is still a chronic problem which seems to limit a better performance, it is the low salaries paid to the administrative personnel, the production incentives did not satisfied their expectations, they are skeptical over an "institutional bonus" which is being negotiated but it has not been put into practice yet.

3.1.1 Cochabamba D.E.S district office organization

This district office in comparison with its similar of Chuquisaca has a larger number of employees in the Administrative Division (14 versus 4). Obviously, this responds to a greater volume of work directly related to the Rural Sanitation Project since 1979.

Thus, the District Chief of Cochabamba emphasized the fact that institutionally the greater contribution of the Rural Sanitation Project might have been the strengthening of the Administrative Division through the introduction of administrative systems based on logic procedures which were adopted progressively since 1985.

Therefore, the administrative personnel at Cochabamba's district office, is qualified to undertake greater responsibilities which D.E.S will face in the future related with all the Divisions mentioned in point 3.1.

However, there are some aspects which need to be analyzed in relation with the D.E.S organizational structure in Cochabamba.

Although, the Operation and Maintenance Division (O&MD) has been officially recognized by the MSW/PH, in the practice still depends functionally, and on a status basis from the Basic Sanitation Division (BSD). This limits its efficiency and development perspectives as a potential funds generator Division through services given to other public and private institutions.

On the other hand, we consider that it is perfectly logic and more efficient that the Basic Sanitation Division should exercise tuition over the drilling operations which are incumbent to the water systems construction. Incidentally, we found out that the creation of a Drilling Division is under consideration with the same status as (BSD) or (O&MD). Similarly to the latter it could generate funds for the D.E.S in the future. (1)

In relation to the adoption of the administrative procedures and the Management Information System in Cochabamba, due to the following factors, adequate order and rigorosity were not observed:

- a) Constant strikes interrupted the normal work and consequently, the information accumulation did not permit the use of forms as required .
- b) There was lack of decision and demand of job fulfilment to the administrative personnel, in the regional and national responsables. Both posts had two executives in the period 1985 - 1987. The first from 1985 up to September 1986 when it was substituted and the second from 1985 up to July 1986 when his substitution occurred.
- c) The greater number of works executed comparing with those done in Chuquisaca, was the argument to justify the lack of time to fill in all the control forms designed for each administrative procedure.

(1) In general, this last analysis is also valid for Chuquisaca.

As a conclusion, the consultant considers necessary to divulge much more the operative aspects of the Management information system (MIS) and the flexibility of its use. Without no doubt, with a closer communication and follow up to the responsables of its use, better levels of implementation will be obtained and even adecuacions or modifications of this control instrument are expected to appear as a contribution for its improvement.

3.1.2 Chuquisaca's D.E.S district office organization

This office has the same organizational estructure as its similar of Cochabamba, although less - personnel is employed to perform the administrative tasks related with the Rural Sanitation Project.

In fact, Chuquisaca lacks two functionaries incharged of: the costs control and the local acquisitions. This last activity was performed by D.E.S Chief administrative himself against the regula - tions, but no action was taken at the corresponding decision levels.

Nevertheless, it can not be denied the good dis - position to observe the norms in Chuquisaca, the MIS was better used and the administrative control forms were rigorously applied.

Perhaps, the smaller number of executed works in Chuquisaca, would explain for the greater time - available to satisfy the work load, despite the - interruptions due to strikes of the Health sector employees.

The comments made in point 3.1.1 on the advantages of locating the O&MD in the same level as the other four Divisions at regional D.E.S, are valid for Chuquisaca, with identical suggestion: to transfer the Drilling Unit to the Basic Sanitation Division.

In resume, the Administrative Division in Chuquisaca fulfilled its job according to its possibilities, for greater responsibilities will have to be necessarily reinforced both in the human resources and infrastructure because this is another limitation in the actual situation. New offices are expected to be assigned to this Division in their own building to be finished soon.

Other factor which contributed to a more ordered work in Chuquisaca, was the continuity in their posts of the regional administrator and the accountant since 1985.

The institutional improvements, according to the accountant, were better internal controls, good valued and physical records of the kardex, as well as strict accounting of community contributions and D.E.S operations.

3.2

MANAGEMENT INFORMATION SYSTEM

The M.I.S designed for D.E.S was based on CAEM's recommendations contained in the report of the evaluations conducted in 1984-1985. A summary of all forms used and to be used in the different activities was edited recently by D.E.S, according to the classified information flux diagram shown in Annex 3.3.

The information system, thus conceived foresees - the inputs and outputs to the various information processing instances according to their origin.

Moreover, the data generated in the communities - was classified by discipline, such as Epidemiology, Demography, Bacteriology and the Health impact data of the beneficiary population. All this data is processed by the Unit of Exploratory studies under the Basic Sanitation Division which in turn feeds with its information to the subsequent units: Projects and designs, Constructions and Finished works.

This information is sent to the Operations and Maintenance Division which also receives general information from the communities gathered by the Administrative water systems Boards and systems operators.

All inputs and outputs are coded for their eventual computarization in the future. This set of fluxes are directed to the Administrative Division to be processed for inherent controls.

Those three Divisions are therefore united themselves by the information system, and constitute the link between the communities and the District Chief for an efficient intercommunication and decision taking.

Furthermore, this classified and processed information could be very useful to other public and private institutions such as the National Insti-

tute of Statistics, the Sanitary Units, the National Directions of Epidemiology, Health and Human Resources of the Ministry of social Welfare and Public Health.

Besides, it should be remarked that this M.I.S. has been conceived not only for the Rural Sanitation Project, it could very well be applied to any other project that the D.E.S. might undertake in the future.

We, strongly recommend that D.E.S. adopt this M.I.S. with ample and flexible criteria to improve it and adecuate it to its needs, because it constitutes a valuable control and follow up instrument of the technical and economical activities under the D.E.S. responsibility.

As a base to formalize the information system within the D.E.S., a complete manual of all administrative procedures in actual practice was elaborated with such a detail, that the incharged personnel will find it a very valuable instrument to control their technical and administrative activities. This document is the resul of a shared effort of D.E.S. functionaries and the advisor in administration based on the work experience of the last two years.

The ability to make this M.I.S. work efficiently thereafter, will be a challenge that D.E.S. should face decidedly to significantly influence the growing trend that institutionally has followed the Direction of Environmental Sanitation.

IV. TECHNICAL COMPONENT EVALUATION

4.1 INTRODUCTION

The evaluation of this component in the potable - water supply and rural sanitation Project, was done accordingly with the reference terms established for the final evaluation of the Rural Sanitation - Project.

In the first phase, the parameters to be considered during the field study, were determined for the water supply and sanitation systems. A simple form was prepared to be used in the field study which covered:

- Potable water supply system, general data, system service level, technology used, operation, maintenance and functioning of the Water Administration Board.
- Sanitation system, coverage data, type of system, technology used, cultural acceptance and community usage. (See form in Annex 4.1).

In the second phase, the communities to be studied were selected, considering the different types of water supply systems developed, aqueducts according to the construction year, the different regions - where they were implanted and the concentrations of the systems constructed in the provinces. This selection was done according to the authorities from the Division of Environmental Sanitation (DES) of Cochabamba and Chuquisaca. Considering the length of time for the field study, 13 communities in Cochabamba and 8 in Chuquisaca were selected for this study.

In the third phase, the field studies were done covering the inspection of all water supply system - components, service quality, operation, maintenance and administration of this service. A study of the excreta disposal system, its use and maintenance. The inspections were done in company of a sociologist, a D.E.S technician and members of the Water Administration Board.

After the field study, meetings were held with technicians from the different sections of DES in Cochabamba and Chuquisaca to complement the information collected during the field study.

The tabulation data after the field study, the information given by the head of the DES technicians from the two Departaments studied, the CAEM Ltda. - documents and the opinion of the users and the Administration Boards, served as a base for the preparation of this report.

4.2 FIELD EVALUATION IN COCHABAMBA

4.2.1 General Description

One of the specific objectives of the Project was - to construct 128 potable water supply systems in - the Departament of Cochabamba and sanitary latrines for all the families that have potable water service.

The DES of Cochabamba has constructed almost 100 % of the water systems proposed in the Project, till the past August and dry pit latrines for the majority of the families that have potable water service.

For the field study, 13 communities with water supply systems were selected, which represents 13% of the constructed systems in the Department; they are located in the regions of Valle Alto, Valle Central and Valle Bajo. The selected aqueducts correspond to six provinces, the size of the population that benefits from potable water service, varies from 1 500 to 290 persons in each community. See Annex 4.2 for the names of the studied communities.

During the inspection, the DES of Cochabamba had 110 constructed systems, of which 47 are pumping systems and the rest operate by gravity. There are 10 water systems with hand pumps and 10 systems which are in an advanced construction stage. (1)

In total there exists 11 722 house connections and 95 public standposts, benefiting 58,610 inhabitants in the rural communities of Arani, Ayopaya, Campero, Capinota, Carrasco Cercado, Chapare, Esteban Arze, Jordan, Punata and Quillacollo.

75% of the installed water supply systems, were done during the periods of 1985-1987, which indicates the capacity and experience acquired by the DES technicians for the carrying out of this Project.

In respect to the sanitation program, it is estimated that 85% of the dwellings have dry pit latrines installed, this service benefits 57,700 inhabitants in the rural communities of 11 provinces in the Department of Cochabamba.

1. They are expected to be finished in October, 1987

4.2.2 Field Observations

4.2.2.1 Water Supply Systems

According to the Project objectives, simple water supply systems were constructed without treatment plants.

The number of inhabitants in the selected communities is within the fixed limits of the Project. The other parameters which were considered in the selection of the communities are:

- Community contributions, availability of water source, system simplicity and cost of the system within the fixed limits of the Project.

A summary of the field observations can be found in Annex 4.3.

a) Type of Constructed Systems

In Cochabamba two types of systems have been constructed, simplified systems run by gravity and by pumping. During the study, 9 pumping and 4 systems by gravity were inspected.

The systems were designed following the criteria of the Project, using standard plans of intake works, storage tanks, pump houses and disinfection units.

b) Water Source

In the inspected systems, as a water source, two springs were used, two infiltration galleries

with a perforated pipe, eight drilled wells and an excavated well.

In respect to the water source capacity, in relation to the demand, it was observed that three sources are poor, five have a limited capacity and five have enough to furnish the demand of the communities.

During the study of the water source, the physical, chemical and bacteriological analysis were carried out. The results of these analysis fulfil the potable water requirements recommended by W.H.O, according to the report of the DES Technicians.

In relation to the sanitary protection of the water source, it was observed that three sources have good sanitary protection and ten sources are fairly well protected. In eight drilled wells, the drilling pipes are not sealed and are exposed to possible exterior contamination. Two springs do not have an adequate sanitary protection, in one of them the community cleaned it leaving the intake exposed to contamination.

c) Pumping Equipment

In eight systems, electrical submergible pumps were installed, and in another system an electrical centrifugal pump. The nine pumping equipment are operating, in four aqueducts, there were problems with the electrical automatic control panel, at present these systems are operating with manual control.

The first pumping systems that were constructed, had electrical centrifugal pumps which did not have the check valve incorporated, like the submergible pumps had.

The pump houses have an adequate design, they are simple structures with ventilation and light. During the inspection it was observed that in three communities, there was filtration in the gate valve inside the pump houses.

d) Storage Tanks

The storage tanks vary from 15 m³ to 40m³ in capacity, according to the land topography, they are either elevated tanks made of reinforced concrete or superficial made of stone masonry. The storage tanks have been constructed following the standard plans which exist in DES. The capacity of the tanks and the height in which it is located, in relation with the community, insures the water service during the peak hours, with sufficient pressure in the critical points of the distribution system.

In nine of the inspected communities, the storage tanks have a good sanitary protection, in four communities there is a need to improve the lids of the inspection chambers, to keep them shut, waterproof the walls, protect the washing and overflow pipes.

e) Distribution System

In the distribution system, PVC pipes were used, with diameters that vary from 2" to 3/4". In

eight communities the distribution system has a good cover and in five systems the cover is limited which with the growth of the communities, the network will need to be extended.

In one of the inspected communities, some blow-outs were observed in the distribution system, caused by heavy vehicles, because the PVC pipeline was not installed at the recommended depth, (minimum 0,60 mts) and they weren't careful enough in filling the trench.

PVC pipes of 1/2 inch were used for the house connections, controlled by a 1/2 inch gate valve. In the house yard a 1/2 inch faucet was installed in a galvanized iron pipe with a wooden support. In the majority of these connections, the wooden support is weak and it does not have a concrete base nor drainage with an absorbing well for the water that is wasted. In the gate valve there were filtrations because of the need of protection by a concrete chamber with a lid and the need of valve maintenance.

f) Level of the System Service

In the 13 inspected communities, the potable water systems are operating. According to the DES report, of all the systems constructed by the Project, only one system is not operating.

In five of the studied communities, the water supply is during 24 hours and it operates without interruption the whole year. In six communities,

the water supply varies in 8 to 12 service hours during the day. In two communities the water supply varies in 5 to 6 hours daily, due to the limited capacity of the water source.

In respect to the quantity of water consumed daily, by each inhabitant, it is difficult to determine an exact data, because part of the water consumption is used for irrigation.

In seven communities the water consume is from 60 to 80 lts/inhabitant/day. In six communities the water consume is from 24 to 49 lts/inhabitant/day, in this case the water supply is limited because of the low source capacity and others because of the few pumping hours.

In ten water supply systems, the water quality has improved because of the water chlorination. To improve the water quality, DES has implemented a chlorination program used every three months in all the constructed systems.

In some systems there has been constructed small houses over the storage tanks to install simple hypochlorinators by drops. This activity started in 1986 as part of the operation and maintenance program of the potable water supply systems.

g) Financing of the Water Systems

According to the information of DES Cochabamba, the community contributes 50% of the total cost of the work, which consists of unskilled

labor, local material an 10 to 15% of its contribution is in cash, The other 50% is financed by DES/USAID, and it is mainly used for the purchase of pipes, pumping equipment, reinforced concrete works and accessories.

The average cost per capita for the pumping systems, is \$us. 37 and the average cost per capita for gravity systems is \$us. 31. These costs are reasonable, considering the country's conditions.

e) Operation and Maintenance

The DES of Cochabamba is executing a defined operation and maintenance Work Plan. The goals of this plan are:

1. Institutionalize an operation and maintenance program for rural potable water systems in the Departments of Cochabamba and Chuquisaca.
2. The reparation, operation and maintenance of all the constructed systems that are found in bad state and the operation and maintenance of the ones that will be constructed in the future.
3. As well as what said before, this plan will control the water quality, for which the Maintenance and Operation Divisions will establish water analysis programs for all the sources and constructed systems to later give them their respective treatment.

This proposed work plan is an important Project component, which its implementation is contributing positively to adequately operate and maintain the constructed water supply systems.

In respect to the operation and maintenance of the potable water systems inspected in Cochabamba, there is a summary in Annex 4.4 of the observations during the field study.

The operation in 12 inspected systems are adequate. The operation of the potable water system in Tuti Mayu is irregular because one of the three communities that is served by this system, the Laquiña community, does not receive water. The Water Administration Board of this community, does not pay the water fees, for this reason it doesn't benefit from this service. The other two communities consume approximately 100 lts/inhabitant/day. (Part of this water is possibly used for irrigation).

In three potable water systems, the maintenance is adequate. However, in five systems the maintenance is deficient, mainly because the operator does not have training, doesn't have tools and also he is only a volunteer, so he stays little time operating the system. The preventive maintenance is important, mainly for the pumping systems.

In five inspected systems, the community acquired essential tools for the aqueduct maintenance. The rest of the communities await orienta

tion from DES to train them in the use of tools and spare parts.

In seven inspected communities, there are trained operators. The other systems are operated by volunteers who don't have training. Many trained operators have left the systems because the Water Administration Board did not approve a reasonable monthly salary for the operator. In four inspected water systems, the operators receive a monthly salary that varies from Bs. 10 to Bs. 60, these systems have better operation and maintenance.

The DES has prepared an Operation and Maintenance Manual for operators, which is given to them during training courses.

In the 13 inspected communities, the population which benefits with potable water service, pay a monthly fee that varies from Bs. 1 to Bs. 5. 80% of the users pay regularly for the water service.

Comparing the operating and maintenance cost of the systems, and the revenues from the fees, it was observed that the 13 inspected systems are self-sufficient in terms of operation and maintenance.

The 13 Water Administration Boards are active, and were trained by DES technicians, they also received a "Guide for Formation and Operation of the Potable Water Supply Administration Boards", prepared by the National Division of

Environmental Sanitation from the Ministry of Health. They also have special forms for good accounting administration, which can be acquired by the Water Administration Boards in the DES offices.

4.2.2.2 Sanitation in Rural Communities

An important component of the Project was the construction of latrines in the communities which have potable water supply service.

According to reports, in rural communities of Cochabamba, 10,300 latrines were installed, which passes the programmed number of latrines (7,600) in this Project. In the thirteen inspected communities, 1 285 dry pit latrines were installed, a summary of the field observations can be found in Annex 4.5 :

In ten inspected communities, the latrine service is about 80 to 90%. In the other three, 50% of the dwellings have latrine service.

The implanted latrine system consists of: an excavated well of 0,80 x 0,80 mts. by 2 meters of depth, a concrete slab, an adobe house, generally without a door and the roof of local material. The constructed latrines do not have a ventilation tube to prevent bad smells. The door cost can be saved following the proposed design in the Project document.

The population regularly uses the implanted latrine. Because of carelessness, they don't place the

lid over the slab, leaving the well exposed to the flies. The latrine maintenance is inadequate, there is a need for cleanliness and protection.

The families with higher economic incomes are interested in constructing the peasant latrine privy with water seal. In respect, it is known that DES has introduced in other communities of Cochabamba, the above mentioned latrine.

4.2.3 Conclusions and Recommendations

4.2.3.1 Conclusions

DES Cochabamba has constructed almost 100% of the potable water supply systems proposed in the Project until the past August.

The quality of the inspected system constructions, is good with small deficiencies in the intake works, as well as the sanitary protection of some of the drilled wells.

In total there exists 11 722 house connections and 95 public standposts, benefiting 58 610 inhabitants in rural communities of 11 provinces in the Department. The public standposts, as well as the faucets installed in the yards of homes, need improvement in the pipe and faucet support, besides they need to have a concrete base for the recipient and drainage with an absorbing well for water that is wasted.

According to the DES report, 99% of the constructed systems are operating. In the 13 inspected communities, the water supply systems are operating. In five communities, the water service is during 24 hours, and in the rest the water supply is only during the day, due to the limited capacity of the water source. In six communities the water consume varies from 24 to 49 lts/inhabitant/day, because of the reason mentioned before.

Physical, chemical and bacteriological analysis were done during the source study, the results of these analysis fulfil W.H.O.'s recommended limits of potable water. In the water systems, chlorination is carried out irregularly, to maintain the water quality.

DES Cochabamba has prepared an Operation and Maintenance Work Plan, which at present is in the organization and implantation stage. This plan will improve the operation and maintenance of the systems, as well as the control of the water quality.

In some communities the trained operators have left the systems because they did not receive reasonable salaries, this problem should be discussed with the Water Administration Boards, as well as the need of essential tools and spare parts, for this reason DES has acquired a good amount of these for the Water Administration Boards.

The cost of the systems is within the reasonable limits of the construction costs.

In respect to the latrine program, a good job has been done, in 13 inspected communities, the latrine service is in 50 to 90% of the dwellings.

4.2.3.2 Recommendations

Improve the study of the water supply source to assure the water quantity and quality required by the inhabitants.

Implant the regular chlorination for the systems, to assure the water quality and to control the bacteriological quality.

Improve the PVC pipeline protection in the distribution system, following the indicated recommendations for this material.

Improve the design of the public standposts and the protection of the house yard taps.

Continue with the implantation of the Operation and Maintenance Work Plan, to assure the uninterrupted and efficient functioning of the constructed water supply systems.

The system operators should continue being trained and should receive a reasonable monthly salary so that they can stay operating the water system.

Improve the construction of the implanted latrines and extend the implantation of the peasant latrine privy with water seal in communities that guaranty payment.

DES Cochabamba at present counts with technical personnel who are qualified and who have experience to continue executing similar projects.

4.3. FIELD EVALUATION IN CHUQUISACA

4.3.1 General Description

The specific objective of the Project in Chuquisaca was to construct drinking water supply systems in 50 rural communities in many of the north and southeast provinces of the Department and sanitary letrine-privies for all the families benefited with drinking - water service.

DES Chuquisaca has constructed 32 drinking - water supply systems up to the past month of August which accounts for 60% of the aqueduct systems proposed in the Project. The range of population benefited by each water system varies between 83 inhabitants and 890 inhabitants.

For the field study, six communities were selected with water supply systems constructed by DES which accounts for 19% of the systems introduced in the Department. Also, two systems constructed with the aid of CARE were visited. See in the Annex 4.6 the rural communities selected for the study.

Out of 32 water systems constructed in the Department, 14 systems function by gravity and 6 are pumping systems. In total there exists 720 house connections, that benefit 5 400 inhabitants with

water service, mainly in the northern provinces of the Department.

The major part of the water systems were constructed in the years 1986 and 1987. The first years the Project has not progressed due to the lack of technical - trained personnel, lack of - transportation, materials and equipment.

The sanitation programme in Chuquisaca is in the initial stage of its implantation, few communities count with letrine - privies services.

4.3.2 Field Observations

4.3.2.1 Water Supply Systems

According to the Project's objectives, in Chuquisaca simple water supply systems have been constructed, by gravity and pumping.

The selected communities have a population of - less than 310 inhabitants and more than 130 inhabitants. Most part of the water systems constructed by DES benefit villages with less than 600 inhabitants.

The contribution of the benefited community, in - most of the cases does not reach 30% of the total cost of the system, which is given in terms of local material and unqualified labour.

See Annex 4.7 for the summary of field observations of the systems visited.

a) Type of systems constructed.

During the field study, three gravity water systems and three pumping water systems have been visited. The systems were designed following the established criteria in the Project and using typical designs of water intake, storage tanks of different capacities and pumping station.

b) Water source

In the systems visited, an infiltration gallery, two springs, one excavated well and two drilled wells have been used. The drilled well in La Palca has poor capacity, in the Molle Molle Communities, Fosario and La Cienega the water source has a limited capacity and in the Punilla and Huasa Nujchu communities the source capacity is good.

During the water source study for the design, physical, chemical and bacteriological analysis of the water were taken, according to DES technicians' report, the results of the analysis are within drinking water limits recommended by the World Health Organization.

In reference to sanitary protection of the sources, the drilled well of La Palca and the excavated well of La Cienega need to improve their protection in order to avoid external contamination,

c) Pumping equipment

In the communities of Huasa Ñujchu and La Palca electrical sumersible pumps were installed. The pump in Huasa Ñujchu functions normally, in La Palca the pumping period functions three times for one hour, due to the limited capacity of the source, which after each pumping - needs three hours in order to recover the initial statical level in the well. In the water system of La Cienega an electrical centrifugal pump was installed, the capacity of this equipment is deficient in forcing the water up to - the storage tank which has been installed much too high in relation to the community. This - problem could be resolved using the railroad's storage tank of rock masonry which presently - is not in use.

d) Storage tank

The capacity of the storage tanks vary from -- 5 m³ to 20m³, they are superficial tanks, partially - buried, constructed with stone concrete. In the La Cienega community the storage - tank has been located much too high in rela - tion to the community due to the lack of an - adequate study, because of this error the tank is not used, but the water is pumped directly to the distribution system. In Puasa Ñujchu, the surroundings near the tank need more protection in order to avoid external contamina - tion.

e) Distribution system

In the distribution system PVC pipelines have been used, with diameters that vary from 1 1/2 inches to 3/4 inches. In five communities the covering of the net is sufficient and in the La Palca system the net is limited, because the water source is not sufficient enough to cover the demand of the entire present population. In two communities, Huasa Ñujchu and La Palca, the PVC pipeline has not been installed in the recommended depth (minimum 0,60 mts.) in parts of the distribution system, in order to avoid burstings it would be necessary to improve the protection.

PVC pipeline of 1/2 an inch has been utilized for the house connections, controlled by a gate valve of 1/2 an inch. In the dwelling house patio a faucet has been installed of 1/2 an inch in GI pipeline with wooden support, in some cases the pipelines are not well secured, moreover, it does not have a concrete bed and drainage with an absorbent well for the water that is wasted. The gate valves must be protected by means of a small concrete chamber with a cover.

f) Service level of the systems

In five visited communities, the water supply systems are working. La Cienega's water system is working irregularly because the storage tank has been constructed much too high - and the pump's capacity is sufficient enough to force the water directly to the distribution system. According to DES report, of the 32 systems constructed by the Project, only two systems are not working.

In four communities that were visited, the water supply is 24 hours and with sufficient pressure in the net. In La Palca the service is for three hours, two times a week.

In reference to the quantity of water that is consumed by each inhabitant per day. In three communities the consumption varies between 60 and 66 lts/inhabitant/day. In the Rosario community 40 lts/inhabitant/day is consumed. In the La Palca system the average consumption is of 14 lts/inhabitant/day.

In reference to the quality of the water. The results of the laboratory analysis carried out during the desing indicated the quality to be acceptable, nevertheless, the bacteriological quality of the water can be improved by means of a chlorination programme. Due to the lack of hypochlorite of Ca or another similar product, the disinfecting of the water systems constructed has not been carried out.

g) Cost per capita.

According to data provided by DES Chuquisaca, the cost per capita of the systems varies between a maximum of US\$63 and a minimum of US\$39. The greater costs correspond to water systems that function by gravity, due to the fact that the water source is situated very distant from the community, enhancing the cost of the adduction pipeline.

h) Operation and Maintenance

The operation and maintenance programme in Chuquisaca is in an initial stage of organization.

In reference to the operation and maintenance of the systems that were visited, a summary of the observations found can be seen in the Annex 4.8 . It is necessary to clarify that only three systems visited have been working for more than a year, the rest have been constructed during the year of 1987.

The operation of four systems that were visited is adequate and in two systems the operation is deficient, mainly due to the lack of training of the operator.

In reference to the maintenance of the three systems functioning more than a year. In the communities of La Palca and La Cienega the maintenance is deficient because the operator does not have a clear idea of the maintenance

of the different parts of the system, they do not have tools and furthermore they have not been trained to carry out this work. In the Molle Molle system the maintenance is adequate.

In four systems the operators do not have training, in the Molle Molle system the operator is trained and in the Rosario system the operator has not been selected yet. In The Huasa Ñujchu system the operator receives a monthly salary of Bs.24, in the rest of the systems the operators are volunteers.

In three systems monthly rates are paid which vary Bs. 1,00 to Bs. 2,50, these systems could be self-sufficient in terms of operation and maintenance, if the community would make a compromise of continuing to pay a reasonable rate. In the other three communities the water rates still have to be set according to the guidance of the DES technicians.

4.3.2.2 Sanitation in Rural Communities

In the communities that were visited, the latrine - privies programme is in an initial stage. In Huasa Ñujchu, two public letrina - privies were installed, one for men and one for women, which presently are not in use.

In Punilla some families are excavating pits for latrine privies. DES does not have information on the number of letrina - privies constructed in the communities with drinking-water service.

The desing of the latrine - privy and the mate - rial used are similar to the sanitary systems im - planted in Cochabamba.

4.3.2.3 Drinking water Systems implanted with the aid of CARE

In Oropeza province, close to the drinking - wa - ter systems constructed by DES/USAID two water - supply systems implanted with the aid of CARE were visited in the rural communities of Ñujchu and Mosoj Llajta.

The water system in the community of Ñujchu is functioning at half its capacity. The main - source that feeds the storage tank has a flow of zero, the tank is completely dry.

In the adduction line, in the parts of the gorge (narrow passage), PVC pipelines were installed - without any protection, in these parts of the li - ne GI pipelines should have been utilized.

The second source, is supplying water to the - lower part of the population.

The water system that supplies for the communi - ties of Mosoj Llajta and Villa Carmen, provides water for the communities every three days for 30 minutes, according to information given by the consumers.

During the visit to the storage tank near Villa

El Carmen, we observed that the inled pipeline was dry and that tank did not have water. This water system possibly functions better during the rainy season.

In the systems of Ñujchu and Məsoj Llajta operation and maintenance deficiency was observed. Possibly the operators are not trained.

In theses communities a latrine - privy and sanitary education programme has not been developed.

4.3.3 Conclusions and Recommendations

4.3.3.1 Conclusions

DES Chuquisaca has constructed 64% of the aqueduct systems proposed in the Project. The quality of the constructed systems that were visited is in general good, desing errors exist as is the case of the water system in La Cienega.

Deficiencies were found in the study of the water source, related with the production capacity, moreover they need to improve its sanitary protection.

DES has constructed 32 water supply systems, with 720 houses connections, thus benefiting 5 400 rural inhabitants in 5 provinces of the Department.

The public standposts as well as the house fau -

cets, need to improve the support of the pipeline, need a concrete bed for the container and drainage with an absorbent well for the water wasted.

According to the DES report only 2 water systems are not functioning, all other constructed systems are in normal operation.

In four communities that were visited, the water provision is through out the 24 hours and with sufficient pressure.

In five communities water consumption varies between 40 and 66 lts/inhabitant/day. In La Palca's system the average consumption is 14 lts/inhabitant/day, due to the fact that the capacity of the perforated well is deficient.

Physical, chemical and bacteriological analysis were taken during the study of the source, according to DES report, the results of the analysis obey the required limits of drinking water recommended by the World Health Organization. In the constructed water system no desinfection or chlorination of the water has been carried out.

The operation and maintenance programme in Chuquisaca is at the inicial stage of organization. The operators of the system are not trained and they lack tools and accesories.

In the communities that were visited the latrine-privies programme is at an initial stage. DES does not have any information on the number of

latrine - privies constructed in the communities.

4.3.3.2 Recommendations

Improve the study on the water supply source so as to assure the quantity and quality of water - required by the population.

Make the water supply system of La Cienega function utilizing the railroad's storage tank, properly protected against possible external contamination.

Continue the disinfection and chlorination of - the systems so as to assure the quality of the - water as well as control its bacteriological quality.

Improve the design of the public and house standposts, including drainage and absorbent well.

Continue with the operation and maintenance programme so as to assure the continuous and efficient functioning of the water systems constructed. Intensify the operators training programme in the community.

Select communities with a larger number of inhabitants so as to reduce the cost per capita of - the water systems.

Improve the latrine - privies construction and - study the possibility of introducing peasant latrine - privies with water - seal in communities

with greater economical resources.

DES Chuquisaca has constructed various water systems during these past months, at the moment it has the capacity to continue with similar projects.

4.4 GENERAL RECOMMENDATIONS

The goals of the Project have been fulfilled and exceeded in some cases, specially in Cochabamba - besides it at the moment counts with capable technical personnel and with experience. It is necessary to continue with similar projects in Cochabamba and also in Chuquisaca; as long as Chuquisaca is reinforced with capable technical personnel.

Assure in the systems a minimum amount of water of 60 lts/inhabitant/day, and a continuous service of water supply for 24 hours daily.

Implant the periodic disinfection and chlorination of the systems, so as to assure the quality of the water and control its bacteriological quality.

It is essential to maintain a closer coordination between the planification and implantation division persons responsible in order to improve the sanitary works developed by this Project.

In Chuquisaca there exists many institutions developing rural water supply systems, without interinstitutional coordination. In one same area, 2 or 3 institutions are working with different technical points of view, forms of financing and

communitary participation. It is necessary that DES coordinate and determine the geographical area where these institutions should work. In the same way, it should give the technical directrix for the water supply and sanitation systems. This activity should develop in coordination with the Regional Corporation of Chuquisaca.

The operation and maintenance programme of the constructed water systems should continue, so as to assure the continued and efficient functioning of the systems. The DES technical supervision of the water systems should be regular and programmed, furthermore, it should have sufficient economical resources, for traveling expenses, transportation, tools and equipment.

DES should orientate the communities in establishing the monthly rates resulting from water consumption which is determined based on the system's operation and maintenance cost, also, considering the community's debt, as well as the purchasing of accesories and pumping equipment to substitute in the water system.

It is necessary that the operator of the water system be trained, moreover, he should receive a reasonable monthly salary.

The sanitary education programme developed should be reinforced, for the adequate use of the water services and sanitation implanted by the Project, specially in the schools and health centers.

The Water and Sanitation Project should develop together with a programme for the improvement of house dwellings, nutrition, infant health care, education, irrigation and rural development works. A multi - sectorial project should be created in which sanitation would play an important role.

The percent of rural population with water supply and sanitation does not reach 15% in the country. Similar projects of water supply and sanitation should continue to develop in Cochabamba, Chuquisaca and other Departments in the country so that health in the rural population can improve.

V. SOCIAL EVALUATION

5.1 GENERAL CONSIDERATIONS

The means to collect data in order to enable the evaluation to provide references of the impact generated by the Project were similar to those utilized in previous evaluations. In synthesis, for the field work specific questionnaires were applied to the following persons:

- a) Relevant community members, to have a feeling of the socio - economic contextual conditions, in which the Rural Sanitation projects are immersed.
- b) Responsible member of the Administrative Water Systems Boards, to obtain an approach on the achieved organization and their operation and maintenance effective mechanisms.
- c) Housewives, as direct beneficiaries of the project in relation to health, to detect the socio cultural factors which are influencing the attitudes changes searched. (1)
- d) Health responsables, as a mean to obtain sta. -

(1) The originality of this technic, is to have given greater importance to the women as object of the interview as main responsible of the family's health.

tistical data on morbidity and mortality, to be able to measure the Health's impact on a sound basis.

These data compilation technics were complemented with the participant observation technic to get -
cualitative information.

In each case, the instruments used were the structured forms and the field notebook with a same the -
matic guide.

The sample criteria responded basically to distances and access to the communities, water supply -
systems existence, (implemented by DES and also -
CARE) and priorities of technical order.

In a 16 days field work, thirteen communities were visited in Cochabamba and eight in Chuquisaca, where the research technics were applied. Those communities were the following:

COCHABAMBA

- | | |
|-----------------|-------------------|
| 1. Banda Arriba | 9. Tuti Mayu |
| 2. Carcaje I | 10. San Jorge |
| 3. Chinguri | 11. Mallco Chapi |
| 4. Paracaya | 12. Mallco Rancho |
| 5. Pampamanata | 13. Paucarpata. |
| 6. Villa Carmen | |
| 7. Melga | |
| 8. Vinto Chico | |

CHUQUISACA

- | | |
|-------------------------|------------------------|
| 1. Huasaj Nujchu | 5. Mosoj Llajta (CARE) |
| 2. Chimpa Nujchu (CARE) | 6. La Palca |
| 3. El Rosario | 7. La Cienega |
| 4. Molle Molle | 8. Punilla |

The results found in these communities are of interest of the subsequent chapter.

5.2 SPECIFIC RESULTS

5.2.1 EVALUATION OF THE ACHIEVEMENTS REACHED BY THE PROJECT IN THE HEALTH AREA REDUCING INFANT AND CHILD MORTALITY AND MORBIDITY RATES.

The Health impact evaluation was difficult due to the absence of regular statistical health data collecting systems, neither the MSW/PH nor the DES information systems worked efficiently in this respect.

It is well known that longer periods of time between evaluations are required to determine significant rates of health impact as it was demonstrated in similar studies conducted abroad.

However, the information obtained through the forms, the health responsables and the housewives, made possible to prove that diseases of hidric origin such as diarrhea, are still present even in communities with potable water supply systems where good operative and maintenance practices are observed.

This, leads to think in the multicausality of those diseases related with non sanitary habits, which in turn depend on socio - cultural and - socio - economical factors which influence them directly.

In respect to those factors, it can be affirmed that communities with deteriorated socio - economic conditions are in turn holders of cultural factors of traditional kind, and consequently, it is foreseen that higher infant morbidity and mortality rates are probable to be registered, than in other communities with better - economic basis.

Thus, communities in Cochabamba such as Inga, - Tuti Mayu, Mallico Rancho and San Jorge with relatively better socio-economic conditions to - the rest visited, permit them to gradually overcome reticent cultural factors, because they adopt social patterns and life behaviors of civilized character (they care more about being - clean, having the house well kept and a bathroom, etc) that obviously, redound in benefit of their family's health.

Therefore, as a conclusion, the introduction of water supply systems in an isolated fashion, - not as part of an integrated development program, has limited possibilities to obtain significant impact in health and even more, if - it is not accompanied of an efficient and active task of promotion and sanitary education to the community. Incidentally, this activity at

DES did not attained the wanted effectivity to obtain a better health impact.

Despite this fact, through the interviews to the housewives and the Health responsables, a relative improvement has been noticed in the health conditions of communities visited, specially in Cochabamba. This situation could be explained by the continuous availability of potable water, which fosters attitude changes in personal hygiene and domestic consumption of water.

5.2.2 THE ACTUAL LEVEL OF AVAILABLE SERVICES, EDUCATION AND COMMUNITY ORGANIZATION

Almost all of the visited communities, with exception of a few in Chuquisaca, show adequate endowment of services in general (schools, sanitary posts, electric energy, potable water, roads, etc). When one of them does not exist, it is due to the closeness to a secondary city where they resort eventually.

Thus, the educational services are extensive to almost all of the visited communities in both departaments. The panorama is not so homogeneous respect to the organization, given the diversity of situations and levels of communal organizations in Cochabamba and Chuquisaca.

Nevertheless, in certain ways, the organizations and communal structures in Cochabamba are of higher level, which is peculiar to their own regional development.

Conversely; it appears that communities visited in Chuquisaca present greater weaknesses in their organizations associated with their communal participation, cohesion and dynamics. This has to deal with the still not gratifying currents registered lately, which seem to be originating an incipient process of communal dissociation.

An example of what was said, is that in various communities visited in Chuquisaca with water supply systems, the Administrative Boards were not adequately structured. Some systems were not yet inaugurated due to the lassitude of their AWSB.

5.2.3 LONG TERM EFFECTIVENESS OF THE ADMINISTRATIVE WATER SYSTEMS BOARDS

In respect to the efficiency of the A.W.S.B., they acquired certain efficiency degrees which could be improved with a closer coordination between DES and the A.W.S.B.

Control, advise, training and working materials supply (forms, hand books, cards, etc) must be permanent on DES behalf.

The A.W.S.B. of the visited communities in Cochabamba are performing relatively well. Their capacity in operation, maintenance and sanitary control is done with selected and trained personnel, who know about their duties. The beneficiaries pay their contributions regularly and

the administrations are well established. San Jorge is an outstanding case where the A.W.S.B. has its own office to attend the beneficiaries.

Conversely, the A.W.S.B. of Chuquisaca have less capacity in operation and maintenance of their systems. In most of the communities visited the sanitary control is something that it is beginning to be practiced, maybe because the systems visited were recently constructed in the last year. However, this denotes insufficient work in the promotion and sanitary education and technical support of DES.

5.2.4 . ANALYSIS OF THE SOCIO - CULTURAL FACTORS AFFECTING OPTIMAL WATER USAGE BY BENEFICIARIES

Education, is the fundamental variable affecting the deficient situation occupied by the woman in the rural life context, who still depends on traditional socio - cultural factors deeply established. The low level of education is determinant in the adequate use of water.

Precisely, the fact that women not only participate in the production activities but also in their children nursing, playing a leading role in their family health care; plainly justifies that they should get a more oriented education towards those familiar responsibilities assigned to her. Unfortunately, it happens that high rates of illiteracy among women is the main cause for low levels of health and poor habits of correct use of water, specially in Chuquisaca.

In terms of the non formal education occurs that women are practically margined from courses, film projections and talks given by DES technicians on sanitary matters because they are oriented with preference to the men, the hole population but not specifically to the woman; this contributes to a gradual deterioration of her situation and obstructs the attitudes change purpose.

The scarce or defficient education of women, is a limitant in the general sanitary conditions of the communities, where the lack of precaution and neatness are justified due to the poor economic conditions which sometimes determine attitudes of resignation in front of illness and death.

5.2.5 LEVEL OF UNDERSTANDING / COMMUNICATION OF THE RELATIONSHIP AMONG POTABLE WATER, SANITARY DISPOSAL AND HEALTH:

In general, the level of understanding of this trilogy is relatively low in the community, specially among women interviewed who have received orientation respect its importance.

Thus, it is evident, that both men and women, have a superficial understanding respect the importance of each one of the elements independently, but not of their interdependence.

Something that should be highlighted is the fact that it is almost general, that the environment in which they live do not permit then to acquire plain conscience of that interdependence; in other words they do not adopt it, so as to overcome values or behaviors traditionally affecting the desired change of attitudes.

If to this lack of conscience taking, we add - the low communitary education level, both formal and informal, and the deteriorated life conditions which are not precisely good for citi - fied "demonstrative effects", it becomes self explanatory the existance of communities such as Huasaj Ñujchu, Chimpa Ñujchu and Molle Molle - in Chuquisaca striving painfully to elliminate the promiscuity which is a cause of diarrea prevalence.

5.3 RECOMMENDATIONS

5.3.1 Practical recommendations

It would be positive to complement the Rural Sa nitation Project with other projects through interinstitutional coordination or by own adminis tration, such as micro-irrigation, housing im - provements, store up centers, productive pro - jects, nutrition and the kind; to help meaning - fully to their life conditions and consequently to reach better health impacts.

In this sense, the Administrative Water Systems Boards, could be the chosen organizations for - the excution and management of those complementa ry projects and the water supply system could be the generation core of the communal develop - ment.

D.E.S. should take the exclusive responsibility to supervise the operation, maintenance and sanitary control of the water supply systems, even of those constructed by other institutions. (In the long run, the damages caused by those institutions of similar activity reflects back in the D.E.S. image).

Consequently, it is necessary to reinforce D.E.S. at all levels (human, economic and financial resources, as well as logistic support, etc) - to cope with the original goals of the project, initially centered in Cochabamba and Chuquisaca but with a national projection in the future.

In the eventual strengthening process, the promotion, training and sanitary education of the communities should merit a preferential treatment with specialized personnel. This component is important, it constitutes the initial catalyst and the permanent guide of every development project. In the D.E.S. case, it is vital to perform the initial socio - economic studies, induct their implementation and watch over their conservation.

Research should be constructed to qualified professionals, because exploratory studies should serve to preview behaviors or future facts related with the project; as an example : the water supply benefits scarcely to health if previously habitat problems are not solved such as those observed in Chuquisaca (Huasaj Ñujchu, Puni-lla).

Both, research, promotion and education should be oriented preferently to the women taking into account all what was expressed precedently.

5.3.2 Technical Recommendations

The Ministry of Social Welfare and Public Health should implement a sound information system to collect statistical data to measure periodically morbidity and mortality rates of hidric origin diseases in the rural areas. Parallely, the D.E.S. technicians, and health responsables in the communities should be trained in elemental statistical technics to know what is being looked for and comprehend its processing.

The MSW/PH should perform periodic transversal evaluations of Health impact to have an accurate follow up of the project's progress.

D.E.S. should train to all personnel through courses, job - shop seminars, regulary planed to actualized them continuously.

D.F.S. should hire specialized personnel in research, promotion and communal education to perform an effective work in the field. This will necessarily improve this component left behind at the present.

D.E.S. should prepare courses and talks for the women with preference, to continually improve their education levels to try behavioral changes. Audiovisual means should be preferently used to attain good feedback from the participants.

A N N E X E S

A - X E X O 3.1

FORMULARIO DE EVALUACION FINAL DEL PROYECTO SANFAMIENTO RURAL DSA/USAID

Fecha:

Entrevistado:

Cargo:

Ciudad:

1. En su opinión, el rol de implementación de la D.S.A. en el Proyecto de Saneamiento Rural ha llegado a cumplir con los propósitos inicialmente establecidos?

- a) En un 100% b) En un 90% c) En un 80% d) Entre 60 y 70%

2. Podría indicar que factores han intervenido para que se haya logrado el nivel señalado en la pregunta anterior?

- a) De Orden Administrativo
- b) De orden técnico
- c) De orden financiero
- d) Otros

3. Considera usted que a través de las actividades del Proyecto de Saneamiento Rural, la D.S.A. ha logrado mejoras institucionales?

- a) Si b) Algunas c) Muy pocas d) Ninguna

4. En caso positivo, podría mencionar las mejoras logradas institucionalmente que más contribuyeron a cambiar la imagen de la D.S.A. en los últimos 2 años?

.....

.....

.....;

5. Las tareas de supervisión y administración de la D.S.A en el Proyecto de Saneamiento Rural, han sido eficientemente ejecutadas?

- a) Bien b) Regularmente c) Con deficiencias

6. Considera usted que el nuevo Sistema de Información de la D.S.A. servirá para una mejor comunicación de los problemas que se originan en el campo y exigen decisiones rápidas en los niveles correspondientes?
- a) Si b) Tal vez c) No conozco el sistema
7. Cree usted que la capacidad institucional de la D.S.A. en la operación y mantenimiento de Sistemas de agua potable es:
- a) Adecuada a las necesidades Cochabamba Sucre
- b) No responde a las necesidades
- c) Podría ser fortalecida a mayores necesidades
- d) Necesitará de un apoyo permanente del Componente de Promoción y Educación Sanitaria en la Comunidad?
- (Señale las respuestas que considere necesarias)
8. Consecuentemente, el entrenamiento en operación y mantenimiento de los operadores en cada comunidad, así como la difusión de las mejoras en el uso del agua y prácticas higiénicas de la comunidad debería ser:
- a) Fortalecido por la D.S.A.
- b) Coordinado con la Dirección Nacional de Educación del Ministerio de Previsión Social y Salud Pública?
9. Si el Proyecto amplía su plazo, que áreas considera usted que podrían ser aceptadas por las comunidades para ampliar el programa de actividades de la D.S.A.:
1. Programas básicos de salud
 2. Microriego
 3. Nutrición
 4. Mejoramiento de las viviendas
 5. Incremento de la producción agropecuaria
 6. Otros

3

FORMULARIO PARA AMAS DE CASA COMUNALES

Fecha Comunidad Dpto.
Nombre

I. FORMAS DE CONSUMO DE AGUA POTABLE:

1. En qué utiliza el agua potable?

1. Aseo personal 2. Alimentación 3. Bebida
4. Riego (Huerto familiar) 5. Otros

2. Qué hace con el agua antes de beberla?

1. La toma directamente 2. La hierve y la toma
3. La filtra y la toma 4. La purifica y la toma 5. Otros

3. El agua destinada a la alimentación de la familia:

1. La almacena en un recipiente con protección
2. La almacena en un recipiente sin protección
3. No almacena el agua y consume directamente

4. Qué sabor de agua prefiere:

1. De pozo 2. De acequia 3. De río 4. Agua Potable
5. Otros

II. NIVELES DE EDUCACION EN MATERIA DE SALUD:

5. Qué grado tiene cursado en educación formal?

1. Nivel Básico curso 2. Nivel Intermedio curso
3. Nivel Medio curso

6. Ha recibido explicaciones del técnico de saneamiento u otro funcionario sobre las ventajas de:

1. a) El consumo de agua potable
b) La disposición sanitaria de excretas
c) La eliminación de aguas servidas y de basura
d) La higiene de la vivienda y el manejo de alimentos
e) El no tener animales en casa

2. En materia de salud cuáles son las más importantes
Señale 3 letras según orden de importancia.

7. Ud. considera que la calidad del agua es importante para no tener
diarrea?

1. Si 2. No 3. No sabe

8. Ud. considera que para el contagio de la diarrea son importantes
los malos hábitos higiénicos y alimenticios?

1. Si 2. No 3. No sabe

III. HIGIENE EN LA VIVIENDA Y EL AMBIENTE

9. Barre y despolva la casa ...

1. Cada día 2. Cada dos días 3. Dos veces a la semana
4. Semanalmente 5. De vez en cuando 6. No lo hace

10. Cómo elimina las aguas servidas?

1. Cámara séptica 2. Letrina ("pozo ciego")
3. A ras del suelo 4. Fondo de la casa (huerta)
5. Otros

11. Qué hace con la basura?

1. La almacena en la casa 2. La bota al campo
3. La bota al río 4. La dá a los animales
5. La quema 6. La entierra 7. Otros

12. Existen muchos insectos en la casa, tales como:

1. Mosquitos 4. Garrapatas 7. Pulgas
2. Moscas 5. Vinchucas 8. Piojos
3. Jejenes 6. Cucarachas 9. Otros

IV. HIGIENE EN EL MANEJO DE ALIMENTOS:

13. Se lava las manos cuando se dispone a cocinar?

1. Siempre 2. A veces 3. No lo hace

14. Se lava las manos después de haber ido al baño?

1. Siempre 2. A veces 3. No lo hace

15. Lava el menaje y la vajilla de cocina y con qué?

1. Sólo agua potable 2. Agua hervida 3. Agua servida

4. Con jabón 5. Con detergente 6. Otros

16. Las frutas y verduras...

1. Las lava 2. Las desinfecta 3. Las cocin

4. Las cocina directamente 5. Las come directamente

17. Cómo almacena los alimentos perecibles?

1. A cubierto 2. A descubierto 3. Con refrigeración

4. Sin refrigeración 5. Otros

V. EXISTENCIA Y USO DE LETRINAS

18. Existe letrina en su casa?

1. Si 2. No 3. No responde

19. Uso que hace la familia de la letrina:

1. Habitualmente 2. Ocasionalmente 3. No usa

20. Qué hacen después de usar la letrina?

1. Sólo tapan la letrina 2. Echan agua en la letrina

3. Echan agua y la tapan 4. No echan agua y no tapan

5. No la tapan

VI. EXISTENCIA DE ANIMALES DOMESTICOS EN LA VIVIENDA

21. Crían animales domésticos en la casa, tales como:

a) Perros b) Gatos c) Conejos d) Loros

e) Monos f) Gallinas g) Ovejas h) Cerdos

22. Algunos de esos animales duermen en el cuarto de Uds?
1. Si 2. No 3. No responde 4. Cuáles? (Señale las letras).
23. Tuvieron en los últimos 15 días enfermedades (diarreas-fiebres) sus animales? Si No Cuales:
1. Permanentemente 2. De vez en cuando 3. Nunca

VII: PREVALENCIA DE ENFERMEDADES DIARREICAS Y PARASITARIAS

24. En la familia han tenido diarreas?
1. (Ultimos 15 días) Si No No recuerda
A. Niños
B. Adolescentes
C. Adultos
2. Qué cree las produjo?
-
25. En la familia han eliminado gusanos?
1. (Ultimos 15 días)
Si No No recuerda
A.
B.
C.
26. Cómo se curan las diarreas? Señalar prescripción y uso sobres URO
1. Consultas Médicas 2. Consultas Curanderos 3. Remedios Caseros
.....
.....
.....

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FORMULARIO PARA LOS COMITES Y/O JUNTAS DE ADMINISTRACION DE AGUA POTABLE

Fecha Comunidad..... Dpto.

1. El agua potable que se consume es:
1. Purificada y Desinfectada 2. Analizada 3. No es tratada
2. Con que frecuencia se realizan los anteriores tratamientos
1. Habitualmente 2. Ocasionalmente 3. No sabe 4. No responde
3. Hace cuánto tiempo existe el servicio de agua potable?
1. Más de un año 2. De 6 meses a 1 año 3. Menos de 6 meses
4. Hace cuánto tiempo que funciona el comité o junta de agua potable?
1. Mas de un año 2. De 6 meses a 1 año 3. Menos de 6 meses
5. Es contínuo el servicio de agua potable?
1. Si 2. Mas o menos 3. No 4. No sabe 5. No responde
6. Cómo funciona el comité o junta de agua potable?
1. Bien 2. Regular 3. Mal 4. No funciona
Por qué?
.....
7. Cómo han sido elegidos los miembros del Comité o de la Junta?
1. Por la Comunidad 2. Por las Autoridades 3. Por las instituciones
4. Voluntariamente 5. Otros
8. Cuánto dura su gestión?
1. Menos de 6 meses 2. 6 meses 3. 1 año 4. 2 años
5. Más de 2 años
9. Cumplen con las funciones establecidas por el Comité o las Juntas de Administración?
1. Todos 2. Algunos 3. Ninguno
10. La comunidad cambia a los Miembros del Comité o la Junta?
1. Siempre 2. A veces 3. No los cambia 4. No sabe
Por qué?
.....
11. Reciben los Comités o Juntas apoyo de la Comunidad?
1. Total 2. Parcial 3. No reciben apoyo 4. No sabe
12. Los Comunarios por el servicio de agua potable...
1. Pagan 2. No pagan 3. No sabe 4. No responde
13. Cree Ud que la tarifa es correcta y alcanza para el mantenimiento?
1. Si 2. No 3. Monto correcto Bs:

14. Este Comité o Junta usa los formularios elaborados por la D.S.A. para la administración de Agua Potable?

1. Si 2. No Por qué?
-

15. La comunidad estaría interesada en ampliar el Programa a otros rubros, tales como (señale por orden de importancia)

1. Micro-riego 2. Incremento de la producción agropecuaria
3. Saneamiento Ambiental 4. Educación en Salud
5. Nutrición 6. Mejora de las Viviendas 7. Otros

FORMULARIOS PARA RESPONSABLES FN SALUD

Fecha Comunidad Dpto.

Nombre

I. ASPECTOS DE MORBI-MORTALIDAD COMUNALES

1. Causas de muerte en la Comunidad en el último año:

| 1. <u>ENFERMEDAD</u> | 2. <u>CANTIDAD O %</u> | 3. <u>MESES DECESO*</u> (1,2,3,4,5,6,7,8) | 4. <u>TRAMOS DE EDAD</u> (A,B,C) ** |
|--|------------------------|--|--|
| a. Diarrea <input type="checkbox"/> | | | |
| b. Resfrio(Tos) <input type="checkbox"/> | | | |
| c. Accidente <input type="checkbox"/> | | | |
| d. Otros <input type="checkbox"/> | | | |

(*) Señala los números correspondientes a los meses.

(**) A: Niños B: Adolescentes C: Adultos. Señale de acuerdo y según importancia.

2. Internaciones por enfermedad en Centros Médicos o Postas Sanitarias (último año).

| 1. <u>MES</u> | 2. <u>CANTIDAD TOTAL</u> | 3. <u>CANT. ENF. DIARREA</u> |
|----------------------------|--------------------------|------------------------------|
| 1 <input type="checkbox"/> | | |
| 2 <input type="checkbox"/> | | |
| 3 <input type="checkbox"/> | | |
| 4 <input type="checkbox"/> | | |
| 5 <input type="checkbox"/> | | |
| 6 <input type="checkbox"/> | | |
| 7 <input type="checkbox"/> | | |
| 8 <input type="checkbox"/> | | |

3. Causas de la diarrea (señale según orden de importancia):

- 1. a) Infecciones Intestinales (Marcar Números s/g importancia)
- b) Intoxicaciones Químicas
- c) Envenenamientos tóxicos
- d) Deficiencias Nutricionales

4. Registros de Mortalidad General

| Nº | Sexo | Edad | Ocupación | Procedencia | Lugar | Fecha | Diagnostico Muerte |
|----|------|------|-----------|-------------|-------|-------|--------------------|
| | | | | | | | |

5. Registros de Morbilidad General

| Nº | Sexo | Edad | Ocupación | Procedencia | Lugar | Fecha | Diagnóstico Muerte |
|----|------|------|-----------|-------------|-------|-------|--------------------|
| | | | | | | | |

FICHA DE COMUNIDAD

Comunidad: Cantón:

Provincia: Departamento:

I. CARACTERISTICAS FISICO-GEOGRAFICAS

1. Ubicación y Peculiaridades de la Comunidad

1. Extensión en Km² o Has:

2. Límites: N: S: E: O:

3. Caminos: Permanente Acceso Ocasional Acc. No. Acc. Carretero

4. Distancia a los centros poblados importantes (en Km)

Ciudad Principal _____ Km. Ciudad cercana _____ Km.
 _____ "
 _____ "

2. Recursos Hídricos

| NOMBRE DE RIOS LAGUNAS O VERTIENTES | DISTANCIA A LA COMUNIDAD | TIPO DE CORRIENTE (PERM.O TEMPORAL) | CAUDAL APROXIMADO LTS/SEG. |
|--|-----------------------------|--|-------------------------------|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |

II. ASPECTOS DEMOGRAFICOS:

1. Población

2. Número de Familias: _____

1.

| POB. TOTAL | | POB. MASC. | | POB. FEM. | |
|------------|-----|------------|-----|-----------|-----|
| C.A | C.R | C.A | C.R | C.A | C.R |
| | | | | | |

C.A = Cifras absolutas C.R = Cifras relativas

2. Movimientos Migratorios

1. Número de personas que salieron de la Comunidad en el último año:
 Temporalmente _____ Definitivamente _____ No salieron _____

2. Número de personas que entraron en la Comunidad en el último año:
 Temporalmente _____ Definitivamente _____ No entraron _____

III. ASPECTOS ECONOMICOS

- 2 -

1. Actividades a las que se dedican:

| PRINCIPAL ACTIVIDAD | Nº DE FAMILIAS | % POBLACION |
|---------------------|----------------|-------------|
| Agrícola | | |
| Ganadera | | |
| Agric-Ganadera | | |
| Otros () | | |

2. Uso de la tierra (en hectáreas)

| CULTIVABLES | | PASTOREO | INCULTIVABLES | TOTAL |
|-------------|---------------|----------|---------------|-------|
| Cultivadas | No cultivadas | | | |
| | | | | |

3. Destino de la Producción (en %):

| RESUMEN PROD. AGRICOLA | DESTINO DE LA PRODUCCION | |
|------------------------|--------------------------|-------|
| | Consumo | Venta |
| 100% | | |

IV. ASPECTOS SOCIALES:

1. Formas de Organización:

| TIPO DE ORGANIZACIONES | NUMERO | Nº AFILIADOS | FRECUENCIA DE (*) REUNIONES |
|------------------------|--------|--------------|-----------------------------|
| Sindicatos | | | |
| Cooperativas | | | |
| Juntas Aux. Escolares | | | |
| Comités de Desarrollo | | | |
| Clubs de Madres | | | |
| Clubs Deportivos | | | |
| Otros () | | | |

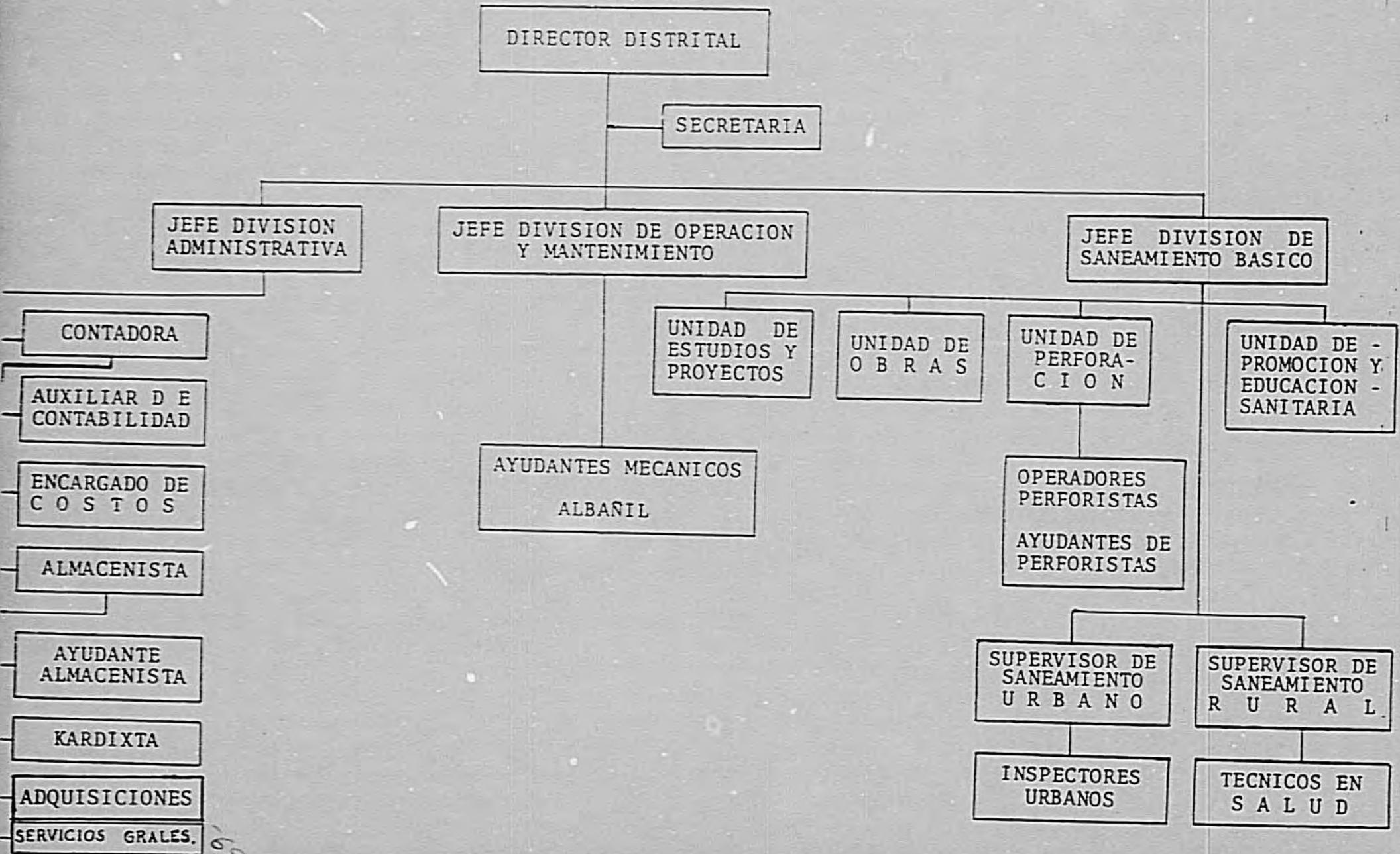
(*) Habitualmente, ocasionalmente no se reúnen

2. Existencia de Servicios Básicos

| TIPO DE SERVICIOS | NUMERO | FUNCIONAMIENTO | OBSERVACIONES |
|-------------------|--------|----------------|---------------|
| Escuelas | | | |
| Colegios | | | |
| Postas Sanitarias | | | |
| Centros Médicos | | | |
| Bancos de Crédito | | | |
| Energía eléctrica | | | |
| Correo-Telégrafo | | | |
| Agencias Públicas | | | |

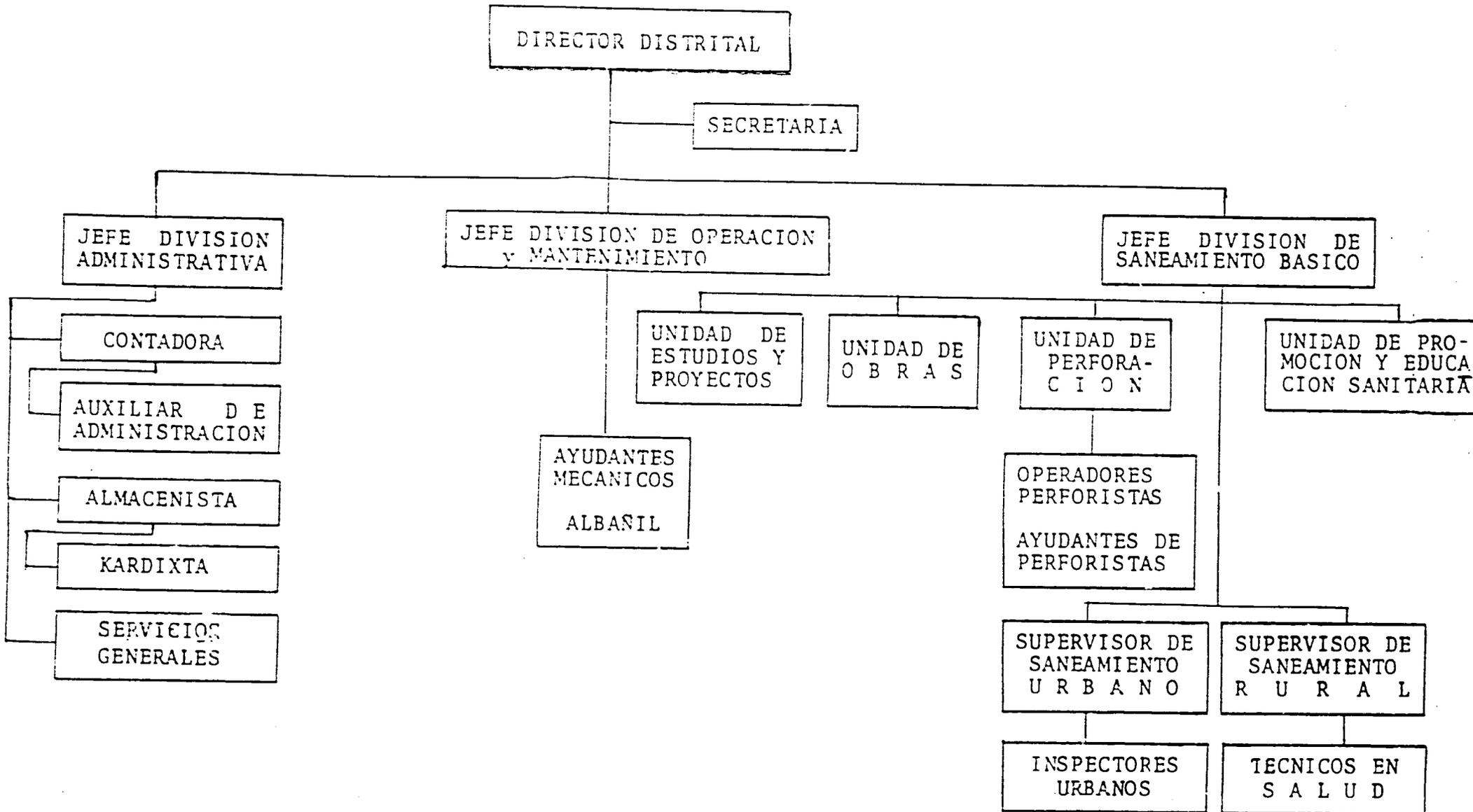
62

ANEXO 3.2.a ORGANIGRAMA DE LA D.S.A. - DISTRITO DE COCHABAMBA
 PROYECTO DE SANEAMIENTO RURAL



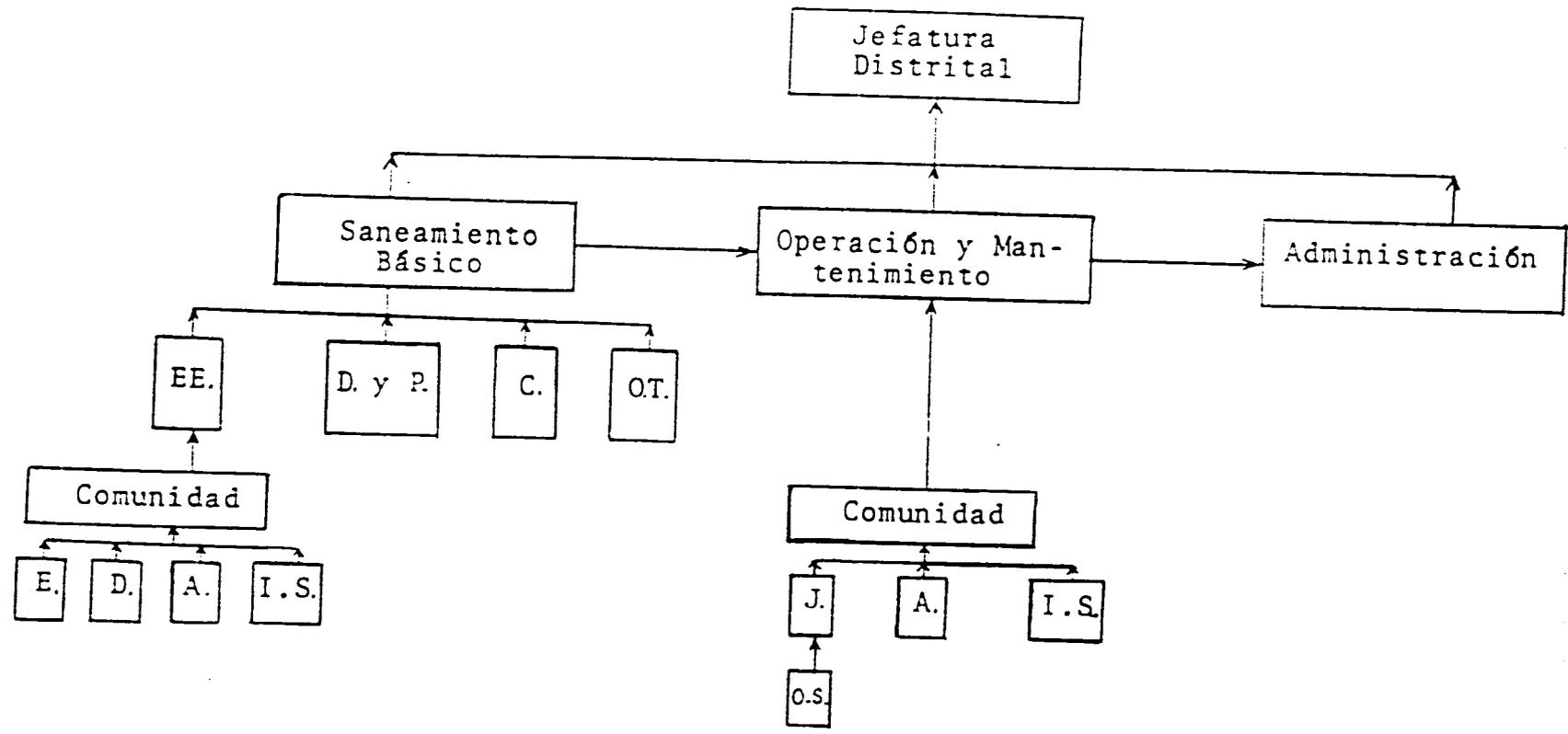
ANEXO 3.2.b ORGANIGRAMA DE LA D.S.A. - DISTRITO DE CHUQUISACA

PROYECTO DE SANEAMIENTO RURAL



A N E X O 3.3

DIAGRAMA DE FLUJO DE LA INFORMACION GERENCIAL CLASIFICADA



REFERENCIAS:

| | |
|------|------------------------|
| EE: | Estudios Exploratorios |
| DyP: | Diseños y Proyectos |
| C: | Construcciones |
| O T: | Obras Terminadas |

| | |
|------|---------------------|
| E: | Epidemiología |
| D: | Demografía |
| A: | Análisis de agua |
| I S: | Impacto en la Salud |

| | |
|-------|------------------------|
| J : | JASAPS |
| O S : | Operadores de Sistemas |

11

ABASTECIMIENTO DE AGUA Y SANEAMIENTO RURAL

FORMULARIO DE ENCUESTA PARA EVALUACION TECNICA

Localidad:.....Provincia:.....
 Población Actual:.....
 Encuestado por:..... Fecha:.....

I. SISTEMA DE ABASTECIMIENTO DE AGUA POTABLE

1. Datos Generales

- 1.1. Tipo del sistema: GST BST
 1.2. Población servida:.....No.Conexiones Dom:.....
 1.3. Costo Sistema:Bs.....No.Piletas Públicas:.....
 1.4. Sistema de abastecimiento agua en operación: Si No
 1.5. Proyecto coordinado con otros servicios de salud: Si No

2. Nivel de Servicio del Sistema

- 2.1. Calidad de agua de acuerdo a normas nacionales: Si No
 2.2. Cantidad de agua de acuerdo a normas nacionales: Si No
 2.3. Comodidad de uso es adecuado: Si No
 2.4. Suministro de agua es durante todo el día y año: Si No

3. Tecnología Utilizada

- 3.1. Criterio de diseño es adecuado: Si No
 3.2. Calidad de la construcción: Bueno Regular Malo
 3.3. El uso del material local es adecuado: Si No
 3.4. Uso de equipo es adecuado: Si No
 3.5. Acueducto tiene sistema de desinfección: Si No
 3.6. Que parte del sistema es inadecuado o deficiente ?

- | | |
|---|---|
| <input type="checkbox"/> Captación | <input type="checkbox"/> Red de distribución |
| <input type="checkbox"/> Aducción | <input type="checkbox"/> Pileta pública |
| <input type="checkbox"/> Almacenamiento | <input type="checkbox"/> Sistema desinfección |

4. Operación y Mantenimiento

- 4.1. La operación del sistema es adecuada? Si No
 4.2. El mantenimiento del sistema es adecuado? Si No
 4.3. Existen repuestos y herramienta? Si No

- 4.4. El operador fué adiestrado? Si No
- 4.5. La Junta Administradora está funcionando? Si No
- 4.6. Existe supervisión regular de DSA ? Si No
- 4.7. Número de contribuyentes.....Tarifa mensual: Bs.....
- 4.3. Ingreso mensual: Bs..... Gasto mensual: Bs.....

II SISTEMA DE SANEAMIENTO

1. Cobertura

- 1.1. Número de sistemas.....Tipo.....
- 1.2. Población servida.....habitantes

2. Tecnología Utilizada

- 2.1. El diseño es adecuado? Si No
- 2.2. El uso de material local es adecuado ? Si No
- 2.3. Calidad de construcción es: Bueno Regular Malo

3. Aceptabilidad Cultural y Uso

- 3.1. Es culturalmente aceptable el sistema propuesto ? Si No
- 3.2. El sistema es regularmente usado ? Si No
- 3.3. El mantenimiento es adecuado ? Si No
- 3.4. Se dispone de asesoramiento de un técnico de saneamiento ? Si No

III OBSERVACIONES

.....

.....

.....

.....

.....

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.....

.....

ANEXO 4.2

POBLACIONES SELECCIONADAS PARA EL ESTUDIO EN EL DEPARTAMENTO DE COCHABAMBA

| Nombre | Provincia. | Año puesto en servicio | Nº de Conexiones. | Pob. Ser-vida. | Tipo Sistema |
|----------------------|---------------|------------------------|-------------------|----------------|--------------|
| <u>VALLE ALTO</u> | | | | | |
| 1. Banda Arriba | Jordan | 1981 | 44 | 314 | BST |
| 2. Carcaje I | Jordan | 1986 | 115 | 575 | GST |
| 3. Villa El Carmen | Jordan | 1986 | 135 | 1 050 | BST |
| 4. Paracaya | Punata | 1985 | 85 | 500 | BST |
| 5. Chinguri | Arani | 1981 | 50 | 290 | GST |
| 6. Pampamanata | Esteban Arze. | 1986 | 74 | 500 | BST |
| <u>VALLE CENTRAL</u> | | | | | |
| 1. Melga | Chapare | 1981 | 315 | 1 225 | GST |
| 2. Tuti Mayu | Chapare | 1984 | 260 | 1 300 | GST |
| <u>VALLE BAJO</u> | | | | | |
| 1. Vinto Chico | Quilla-collo. | 1985 | 107 | 650 | BST |
| 2. San Jorge | Quilla-collo. | 1986 | 180 | 900 | BST |
| 3. Malleo Chapi | Quilla-collo. | 1984 | 124 | 600 | BST |
| 4. Paukar Pata | Quilla-collo. | 1985 | 84 | 320 | BST |
| 5. Malleo Rancho | Quilla-collo. | 1981 | 146 | 1 000 | BST |

REFERENCIAS:

BST : Bombeo sin tratamiento

GST : Gravedad sin tratamiento

FUENTE: Investigación de campo, Agosto, 1987

ELABORACION : CAFM Consultores.

ANEXO 4.3 : C O C H A B A M B A : SISTEMAS DE AGUA POTABLE, VISITADOS

| UBICACION | | Tipo Siste. | No. Conex. | Pob. Serv. | NIVEL SERVICIO DEL SISTEMA | | | | | FUENTE | | ALMACENAM. | | DISTRIBUC. | |
|---------------|--------------|-------------|------------|------------|----------------------------|--------------|------------------|--------|---------|--------|-----------------|------------|-----------------|------------|-----------------|
| LOCALIDAD | PROVINCIA | | | | Sist. Operac | Horas Servic | Cant. agua L/H/D | Calid. | Resinf. | Capac | Protec. Contam. | Capac. | Protec. Contam. | Capac. | Protec. Contam. |
| anda arriba | Jordán | BST | 44 | 314 | Si | 24 | 119 | Buena | No | Buena | Regul. | Buena | Buena | Buena | Buena |
| arcaje I | Jordán | GST | 115 | 575 | Si | 10 | 49 | Buena | Ocas. | Pobre | Buena | Buena | Buena | Buena | Buena |
| Villa El Carm | Jordán | BST | 135 | 1 050 | Si | 6 | 24 | Buena | Ocas. | Pobre | Regul. | Buena | Buena | Buena | Buena |
| aracaya | Punata | BST | 85 | 500 | Si | 24 | 60 | Buena | Ocas. | Buena | Regul. | Buena | Buena | Buena | Buena |
| hinguri | Arani | GST | 50 | 290 | Si | 24 | 148 | Buena | Ocas. | Buena | Buena | Buena | Regul. | Limit. | Buena |
| ampamanata | Estevan Arze | BST | 74 | 500 | Si | 24 | 40 | Buena | Ocas. | Limit. | Buena | Buena | Buena | Buena | Buena |
| elga | Chapare | GST | 315 | 1 225 | Si | 24 | 70 | Buena | Ocas. | Buena | Regul. | Buena | Regul. | Buena | Buena |
| uti Mayu | Chapare | GST | 260 | 1 300 | Si | 10 | 110* | Buena | No. | Limit. | Regul. | Buena | Regul. | Limit. | Buena |
| into Chico | Quillacollo | BST | 107 | 650 | Si | 8 | 33 | Buena | Ocas. | Pobre | Regul. | Buena | Buena | Limit. | Buena |
| an Jorge | Quillacollo | BST | 180 | 900 | Si | 5 | 46 | Buena | Ocas. | Limit. | Regul. | Buena | Buena | Limit. | Buena |
| alico Chapi | Quillacollo | BST | 124 | 600 | Si | 8 | 66 | Buena | No. | Limit. | Regul. | Buena | Regul. | Buena | Buena |
| Paukar Pata | Quillacollo | BST | 84 | 320 | Si | 10 | 35 | Buena | Ocas. | Limit. | Regul. | Buena | Buena | Limit. | Buena |
| alico Rancho | Quillacollo | BST | 146 | 1 000 | Si | 12 | 80 | Buena | Ocas. | Buena | Regul. | Buena | Buena | Buena | Buena |

E : Investigación de campo, Agosto, 1987

RACION : CAEM Consultores

ENCIAS:

Observación: Laquifia no tiene agua en el sistema ,por desinteligencias entre Juntas de Administración del Sistema de agua compartida.

ANEXO 4.4 : C O C H A B A M B A : SISTEMAS DE AGUA POTABLE, VISITADOS

| UBICACION | | Tipo Sistem. | No. de Conex. | Poblac. Servid. | OPERAC Y MANTEN. | | | OPERADOR . | | Función J. Adm.A. Adecuado | RECUPROS | |
|-----------------|--------------|-----------------|------------------|--------------------|------------------|------------------|------------------------|------------|--------------------|----------------------------------|------------------|-----------------------------|
| LOCALIDAD | PROVINCIA | | | | Operac Adecua | Manten Adecua | Existe Her y Mat | Entrena. | Salario Mes-Bs. | | Tarifa Mes Bs | Autosufic. Costo C. Y M. |
| Banda arriba | Jordán | BST | 44 | 314 | Si | No | No | Si | Voluntar. | Si | 2,- | Si |
| Carcaje I | Jordán | GST | 115 | 575 | Si | Si | Si | Si | Voluntar. | Si | 2,5 | Si |
| Villa El Carmen | Jordán | BST | 135 | 1 050 | Si | No | No | No | 60,- | Si | 2,5 | Si |
| Paracaya | Punata | BST | 85 | 500 | Si | No | No | Si | Voluntar. | Si | 5,0 | Si |
| Chinguri | Arani | GST | 50 | 290 | Si | No | No | No | Voluntar. | Si | 1,0 | Si |
| Pampamanata | Estevan Arza | BST | 74 | 500 | Si | Si | Si | Si | Voluntar. | Si | 1,0 | Si |
| Melga | Chapare | GST | 315 | 1 225 | Si | No | Si | No | Voluntar. | Si | 2,0 | Si |
| Tuti Mayu | Chapare | GST | 260 | 1 300 | No | No | No | No | Voluntar. | Si | 2,0 | Si |
| Vinto Chico | Quillacollo | BST | 107 | 650 | Si | No | No | No | Voluntar. | Si | 2,0 | Si |
| San Jorge | Quillacollo | BST | 180 | 900 | Si | Si | No | Si | 50.- | Si | 3,5 | Si |
| Mallco Chapi | Quillacollo | BST | 124 | 600 | Si | No | Si | No | Voluntar. | Si | 2,0 | Si |
| Paukar Pata | Quillacollo | BST | 84 | 320 | Si | No | No | Si | 20.- | Si | 2,0 | Si |
| Mallco Rancho | Quillacollo | BST | 146 | 1 000 | Si | No | Si | Si | 10.- | Si | 2.0 | Si |

ENTE : Investigación de campo, Agosto, 1987

ABCPACION : CAFM Consultores.

ANEXO 4.5 : C O C H A B A M B A : SANIAMIENTO DE COMUNIDADES RURALES

| UBICACION | | Tipo Siste. | No Sis- temas Const. | Pob. Servid. | TECNOLOGIA | | USO Y MANTENIMIEN. | | TECNICO DSA ASESORIA | OBSERVACION | |
|-----------|----------------|----------------|----------------------------|-----------------|--------------------|----------------------|--------------------|---------------------|----------------------------|-------------|---|
| LOCALIDAD | PROVINCIA | | | | Diseño Adecuado | Calidad Construc. | Uso Regular | Manten. Adecuad. | | | |
| 1 | Banda arriba | Jordán | LFS | 48 | 90 | Si | Regular | Si | No | Si | Sin puerta |
| 2 | Carcaje I | Jordán | LFS | 58 | 50 | Si | Regular | Si | No | Si | Sin puerta |
| 3 | Villa El Carm. | Jordán | LFS | 121 | 90 | Si | Regular | Si | No | Si | Sin puerta |
| 4 | Paracaya | Punata | LFS | 76 | 90 | Si | Regular | Si | No | Si | Sin puerta |
| 5 | Chinguri | Arani | LFS | 40 | 80 | Si | Regular | Si | No | Si | Sin puerta |
| 6 | Pampa manata | Estevan Arze | LFS | 72 | 90 | Si | Regular | Si | No | Si | Sin puerta |
| 7 | Melga | Chapare | LFS | 255 | 80 | Si | Regular | Si | No | Si | Solicitan letrina con arras- tre de agua |
| 8 | Túti Mayu | Chapare | LFS | 130 | 50 | Si | Regular | Si | No | Si | |
| 9 | Vinto Chico | Quillacollo | LFS | 95 | 90 | Si | Regular | Si | No | Si | Sin puerta |
| 10 | San Jorge | Quillacollo | LFS | 43 | 30 | Si | Regular | Si | No | Si | Sin puerta |
| 11 | Mallico Chapi | Quillacollo | LFS | 111 | 90 | Si | Regular | Si | No | Si | Sin puerta |
| 12 | Paukar Pata | Quillacollo | LFS | 74 | 80 | Si | Regular | Si | No | Si | Sin puerta |
| 13 | Mallico Rancho | Quillacollo | LFS | 160 | 80 | Si | Regular | Si | No | Si | Sin puerta |

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REFERENCIAS:

FS: Letrina Fosa Se ca.

FUENTE: Investigación de campo, Agosto., 1987

LABORACION : CAEM Consultores

ANEXO 4.6

POBLACIONES SELECCIONADAS PARA EL ESTUDIO EN EL DEPARTAMENTO DE
CHUQUISACA

| <u>Nombre</u> | <u>Provincia</u> | Año construc. | Tipo sistema | Poblac. servida |
|------------------------|------------------|------------------|-----------------|--------------------|
| 1..La ciénega | Yamparaez | 1984 | BST | 250 |
| 2..Punilla | Oropeza | 1987 | GST | 130 |
| 3. Molle Molle | Oropeza | 1986 | GST | 180 |
| 4. La palca | Oropeza | 1984 | BST | 310 |
| 5. Huasanujchu | Oropeza | 1987 | BST | 210 |
| 6. Rosario | Oropeza | 1987 | GST | 130 |
| 7. Nosoj Llajta (CARE) | Oropeza | 1979 | GST | 450 |
| 8. Nujchu (CARE) | Oropeza | 1983 | GST | 310 |

DEFINICIONES:

BST : Sistema bombeo sin tratamiento

GST : Sistema gravedad sin tratamiento

FUENTE: Investigación de campo, Septiembre, 1987

ELABORACION: : CAIM Consultores

ANEXO 4.7 : CHUQUISACA : SISTEMAS DE AGUA POTABLE, VISITADOS

| UBICACION | | Tipo | No. | Poblac. | NIVEL SERVICIO DEL SISTEMA . | | | | | FUENTE | | ALMACENAM. | | DISTRIBUCION | |
|--------------|-----------|-------|--------|---------|------------------------------|-------------------|------------------------|---------|--------|--------|------------------|------------|--------------------|--------------|-------------------|
| LOCALIDAD | PROVINCIA | Sist. | Conex. | Servi. | Sist en Operac | Horas Servc. | Cant. agua L/H/D | Calidad | Desinf | Capac. | Protec Contam | Capac. | Protec. Contam. | Capac. | Protec. Contam |
| La Ciénega | Yamparaez | BST | 35 | 250 | No | - | - | - | - | Limit. | Regul. | Defic. | Defic. | Buena | Buena |
| Punilla | Oropeza | GST | 18 | 130 | Si | 24 | 60 | Buena | No | Buena | Buena | Buena | Buena | Buena | Buena |
| Molle Molle | Oropeza | GST | 21 | 180 | Si | 24 | 60 | Buena | No | Limit. | Buena | Buena | Buena | Buena | Buena |
| La Palca | Oropeza | BST | 62 | 310 | Si | 2 vec. por sem | 14 | Buena | No | Pobre | Regul. | Buena | Buena | Limit. | Regul. |
| Huasa Nujchu | Oropeza | BST | 30 | 210 | Si | 24 | 66 | Buena | No | Buena | Buena | Buena | Regul. | Buena | Regul. |
| Rosario | Oropeza | GST | 23 | 130 | Si | 24 | 40 | Buena | No | Limit. | Buena | Buena | Buena | Buena | Buena |

ENTE : Investigación de campo, Septiembre, 1987

LABORACION : CAEM Consultores

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ANEXO 4.8 : C P U Q U I S A C A : , SISTEMAS DE AGUA POTABLE, VISITADOS *

| UBICACION | | Tipo Siste- ma | No. Conex. | Pobla Servi. | OPFRAC: Y MANTEN, | | | OPFRADOR. | | Función J. Adm. A. Adecuad. | PFCURSOS | |
|--------------|-----------|----------------------|---------------|-----------------|--------------------|-------------------|--------------------------|-----------|----------------|-----------------------------------|-------------------|-----------------------------|
| LOCALIDAD | PROVINCIA | | | | Operac. Adecua. | Mante. Adecua. | Existe Herr y Mat. | Fntren. | Salario Ps. | | Tarifa Mes Bs. | Autosufic. Costo O. Y M. |
| La Ciénega | Yamparnez | BST | 35 | 250 | No | No | No | No | Volunta. | Si | 2,5 | Si |
| Punilla | Oropeza | GST | 18 | 130 | Si | Si | No | No | Volntar. | Si | - | - |
| Molle Molle | Oropeza | GST | 21 | 180 | Si | Si | No | Si | Voluntar. | Si | - | - |
| La Palca | Oropeza | BST | 62 | 310 | No | No | No | No | Voluntar | No | 2,0 | Si |
| Huasa Nujchu | Oropeza | BST | 30 | 210 | Si | Si | No | No | 24 | Si | 1,0 | Si |
| Rcsario | Oropeza | GST | 23 | 130 | Si | Si | No | - | - | Si | - | - |

ENTE : Investigación de campo, Septiembre 1987

ABORACION ; CAEM Consultores

No se incluyen los dos sistemas construidos por CAPE, visitados