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MID-TERM EVALUATION OF

RURAL WATER SUPPLY PROJECT, UPPER VOLTA

Water Supply and Health in the
Departments of Hauts Bassins and Sud-Ouest
(No. 686-0228)

Prepared for:

Bureau for Africa
Agency for International Development
Washington, D.C. 20523

for Presentation to USAID/Ouagadougou

and

Government of Upper Volta
Ministry of Rural Development
Ministry of Public Health
Ouagadougou, Upper Volta
(Contract No. PDC-1406-I-00-2085)

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Agency and Personnel Titles and Acronyms

English	French
Ministry of Rural Development	Ministère de Developpement Rural (MDR)
Rural Engineering Service	Direction de l'Hydraulique et Equipement Rural (HER)
Ministry of Public Health	Ministère de la Santé Publique (MSP)
Public Health Service	Direction de la Santé Publique (DSP)
National School of Public Health	Ecole Nationale de Santé Publique (ENSP)
National Center for Health Education	Centre National de Education Sanitaire (CNES)
West African Center for Economic and Social Studies	Centre d' Etudes Economiques et Sociales de l' Afrique de l'Ouest (CESAO)
Women's Health Activity	Santé Activité Feminine (SAF)
Regional Development Organization	Organization Regionale pour le Developpement (ORD)
Public Health Service	Direction de la Santé Publique (DSP)
Technical Director (HER)	Directeur de Project (HER)
Technical Director (Santé)	Directeur de Project (Santé)
Health Extension Agent	Agent Itinerant (AI)
Village Health Worker	Agent de Sante Villageoise (ASV)
Village Midwife	Accouchère Villageoise (AV)
Project Sanitarian	Assistant d'Assainisement (AA)
Health Educator (Contract)	Educateur Santé (ES)
Practical Nurse	Infirmière Brevité (IB)

Preface

This mid-term evaluation, called for in the USAID/GOUV Project Agreement, was conducted by a joint U.S. - Voltaic team. It consisted of six members, three from each side. Each side was represented by three specialties, so that the entire team was composed of two economists, two hydrogeologists and two public health physicians.

U.S. Team:

Gerhard Tschannerl, Engineering Economist*
George C. Taylor, Jr., Hydrogeologist*
Dean F. Echenberg, M.D. Public Health*

Voltaic Team:

M. Tindano, Economist, Directorate of Studies and Programming, Ministry of Rural Development (MDR)

Kouate Lamine, Hydrogeologist, Directorate of Water and Rural Services (HER), (MDR)

Sondo Blaise, MD, Chief Medical Officer, Department of Centre-Ouest, Ministry of Public Health (MSP)

Already at its first meeting the entire team decided that the evaluation was to be a joint effort in investigation, in reporting, and in the authorship of the final report. Three sub-groups were focused according to the specialties represented: the two physicians working together on the health issues, the two hydrogeologists on the water issues, and the two economists working on overall issues, organization, and finance. These three groups proceeded on their own in their day-to-day work, and frequent meetings were held in the course of the evaluation to coordinate their activities.

The entire team also held several meetings with the project staff throughout the evaluation to present their provisional findings and to encourage immediate feedback and problem solving activities at the operational level.

The mission lasted for three weeks in Bobo-Dioulasso, the project headquarters, and one additional week in Ouagadougou. Several field visits were undertaken in the project area to visit the wells and the health workers, and to see the work in progress. Some of the visits were hampered by the fact that the rainy season had just begun and tracks became impassable after a rainstorm.

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Throughout its work, the team tried to maintain a professional, objective and constructive outlook and not to be diverted by trying to trace the history of the project or by personality questions. It is hoped that the critique and the recommendations made in the report will be seen in this light.

The team wishes to thank all those that helped in the evaluation: the Ministry of Public Health; the Ministry of Rural Development, USAID, and all the workers in the project for their ready participation, their openess and their hospitality.

The results of this evaluation were presented jointly, in oral session, to AID/Ouagadougou, to the Directorate of Public Health, Ministry of Public Health, and by a representative of the team to the Directorate of HER, Ministry of Rural Development.

Finally, it should be pointed out that the final report was written jointly by all six team members with the original version, partially in French and partially in English. At the end of its mission in Upper Volta the team submitted a rough draft of the report to USAID, which was then finalized and translated by ISTI in Washington. Copies of this draft were then sent to all the members of the evaluating team and to AID/Ouagadougou for comments.

The team tried to produce a report which would be useful to all three of the most interested parties: the Ministries of Rural Development and Public Health, and USAID; and for the project itself.

Nihal W. Goonewardene
Vice President, ISTI

August 1982

SUMMARY*

This report presents the results of a mid-term evaluation of the USAID/GOUV Rural Water Supply Project by a joint six-member U.S.-Voltaic team during July 1982. The project, which includes the Departments of Hauts Bassins and Sud-Ouest in southwestern Upper Volta, was initiated in July 1979 through signature of a project agreement between USAID and the GOUV. Presently scheduled for a 5-year term, the project seeks to assist the GOUV (a) in providing the rural population of Upper Volta with a potable water supply system and (b) in establishing a health education program to optimize the health benefits of the improved water system. The project is innovative from four standpoints: it is the first attempt in Upper Volta (1) to establish sanitary protected water points based on both dug and drilled wells which are capped and provided with handpumps to mitigate against water pollution; (2) to establish a health education program to optimize the health benefits inherent in a potable water system; (3) to coordinate the objectives of the National Health Plan directed by the Ministry of Public Health (MSP) with the long-term rural water development objectives of the Ministry of Rural Development (MDR); and (4) to establish a system provided for in the National Health Plan to train supervisors and teachers of Village Health Workers (ASVs).

After somewhat slow start up of about 2 years owing to delays in delivery of commodities and equipment, arrival of contract personnel and other factors both the wells and the health components of the project have achieved very good results during 1981-82 in terms of tangible outputs. Some 155 wells were completed and 60 pumps installed as of the end of the 1981-82 field season out of

*An Executive Summary, prepared in accordance with instructions in USAID Cable R 261839 Z Mar 82, Subject: Evaluation Information needed by AFR. is included in the General Annexes (G) of this report.

the end-of-project target of 620 completed wells all equipped with pumps. On the health side 22 Health Extension Agents (AIs) were in training and 107 Village Health Workers (ASVs) had been trained by contract Health Educators (ESs) as of the end of the 1981-82 field season. Here the end-of-project target is a total of 110 AIs and 550 ASVs to work in as many villages. The foregoing achievements are good indicators that the available personnel and equipment are being utilized and managed on a sound basis. Since the beginning of the project, however, the wells and health components have been operating as virtually separate entities with only occasional or intermittent coordination.

The evaluation team concludes that as of the end of the present 5-year term (July 1984) some 80% on the wells side and about 50% on the health side of the end-of-project objectives will be attained, provided the project maintains its present momentum. The most salient problem observed by the team is the lack of coordination between the wells (HER) and health (Sainté) components of the project. Several specific suggestions are offered in the report to correct existing imbalances and to integrate the two components so as to achieve project objectives. Also, there is a priority need to set in place as soon as possible a pump maintenance capability and a means for financial support of the maintenance costs. To provide sufficient time for the fulfillment of project objectives the evaluation team recommends a one-year extension of the project at no increase in funding. Also a Phase II should be considered to follow the present project as the present target of 620 wells with pumps will cover only about 40% of the needs of the rural population in the project area. Also the handpump maintenance and the health education delivery systems may not be fully operative even with a one-year extension of the project.

I. Introduction

A. Background

1. General Background

The World Health Organization estimates that about 80 percent of the world's diseases are traceable to the ingestion and/or use of inpure water, and children are especially vulnerable. In rural Upper Volta, water supplies are commonly deficient both in quantity and quality. More than 60 percent of the rural people of southwestern Upper Volta have no permanent water source of any kind within a distance of five kilometers. The distance to the water source is the paramount consideration in determining from where and how much water the persons in a household will fetch and carry. (For a documentation of this phenomenon in East Africa, see White, Bradley and White, Drawers of Water, 1972, pp. 106-107.)

Consequently, during the long dry season (seven months), most of the people of rural Upper Volta get by on about 5 liters of water per person per day. Such a low consumption is barely enough for minimal drinking and culinary use, leaving very little for household sanitation and personal hygiene. The quantity of water used increases during the rainy season (five months), but it is collected from the nearest available water point, generally irrespective of quality (Dimpex Study, 1978). Surface water tends to be contaminated by vegetal debris as well as by human and animal ordure.

Good breeding sites for the vectors of major diseases are also provided by surface water. Consequently, malaria, onchocerciasis, shigellosis, schistosomiasis, guinea worm, filariasis, amoebiasis, trypanosomiasis and hookworm are among the endemic diseases plaguing the inhabitants of rural Upper Volta. In addition, infections of childhood, such as diarrheal diseases caused by contaminated weaning foods and oral-fecal transmission, are among the largest causes of mortality in Upper Volta.

This situation is aggravated by lack of a basic understanding on the part of the rural population of the nature of water-related disease, that is, what it is and how the individual may be infected by it. The problem is further compounded by the quantitative scarcity of water, particularly during the dry season. Water is essential for human survival, and in the absence of a better source, even a dirty mudhole must sometimes serve as a water point. The present project seeks to mitigate the vicious cycle of water-related disease, described above, through provision of reliable supplies of potable water from wells, coupled with education of the rural user population in preventative health care, as well as in protection of installed potable water supplies against proximate sources of pollution.

2. Pre-Project History

The present project may be said to have had its inception in recommendations presented in the report of the West African Pre-Project Rural Water Supply and Sanitation Mission. Fielded under a USAID/Pacific Consultants, Inc. contract, the mission visited four countries (Chad, Ivory Coast, Upper Volta and Togo) during November-December 1977 to identify potential projects in rural water supply and sanitation. As a follow-up to this effort, a project design team was assembled and fielded during June-July 1978 through a USAID contract with Dimpex Associates, Inc. During their field work, the Dimpex team's chief counterpart agency was the HER in the Ministry of Rural Development. At this stage, there was apparently only limited input into the project design by the Ministry of Health (now Ministry of Public Health). The project proposed in the Dimpex report of October 1978 recommended (1) construction of a mix of capped, modern dug wells and sealed small-diameter drilled wells, both equipped with Moyo hand pumps and (2) a modest health education program directed toward teaching water users the importance of preventative health care through the use and sanitary protection of potable water supplies.

Based on the recommendations of the Dimpex report, the Project paper was prepared by the USAID/Ouagadougou staff. During this stage, it was decided to put greater weight on the health education program so as to bring it more into balance with the well construction and pump installation program. However, during project paper preparation, the Ministry of Public Health (MSP) was apparently not involved. The MSP became involved rather late just prior to the development of the terms of reference of the GOUV/ USAID Project Agreement. These developments are further discussed in the following section of this report.

3. Evolution of the Health Component of the Project

The present project originated in 1978 with a request from the GOUV Ministry of Rural Development (MDR) to USAID for a well construction project. It was suggested by USAID that if the well construction program was to have any long-term impact, it should include a health component. The GOUV agreed to this addition, and a Project Design team was organized that included a Sanitarian to develop the health component. During this design stage, most of the field work was done in cooperation with the Ministry of Rural Development and there was virtually no input from the Ministry of Health. At this stage, it was judged that AAs would be trained to go out into the villages to organize, train and work with Village Health Workers (ASVs) to educate the people on the sanitary aspects of health. A Project Paper was then prepared by USAID/Ouagadougou from the report and recommendations of the Project Design team.

The Project Paper was then given to the MSP to review. MSP felt that the health component of the Project Paper was inadequately defined and that there was a real need to develop a more polyvalent health worker at the village level, one who could carry out the health education work of the AAs as proposed by the Project Design team. MSP also felt that these workers should be able to

carry out other work, such as the delivery of primary health care at the village level, as specified in the National Health Plan, which was finalized about the same time as the Project Paper was written.

At this point, the MSP was invited by USAID to participate in drafting a Project Agreement that would help the MSP to implement the plan that it had been working on for several years--a plan that would meet the goals and the purposes of the joint USAID/GOUV village water project, but would, in addition, implement for the first time a part of the National Health Plan, that is, the training of the trainers of the Village Health Workers (ASVs). Thus, the health component proposed in the Project Paper was modified and the USAID/GOUV proposed project agreement broadly drafted to implement the National Health Plan. Dr. Kagone, the Chief of the Departement of Hauts-Bassins at Bobo Dioulasso was chosen to be the head of the health component of the project. With active support from the MSP, he took the the iniative in establishing a working office and setting the guidelines for the health side of the project.

B. Project Aims

1. The Goal

The broad aim (goal) of this project is to improve the quality of life of the rural people of southwestern Upper Volta. (USAID Project Paper, Logical Framework, June 1979)

2. The Purposes

The specific aims (purposes) are to provide the rural people of southwestern Upper Volta with (1) a potable water supply system which will meet their minimal daily requirements (10 liters per day per capita) and (2) an effective village health education program to optimize the potential health benefits inherent in an improved water system. (USAID Project Paper, June 1979)

3. Tangible Objectives (Outputs) and Means of Implementation (Inputs)

The objectives of the project as contained in the Project Agreement include two major components: (1) well construction and (2) health education. The well construction component provides for the construction of 620 wells in 550 villages in southwestern Upper Volta, using two different well construction methods: modern dug wells (put down with pick and shovel, compressors, jack hammers, dynamite, mechanical hoists and dewatering equipment, and lined with reinforced concrete), and small-diameter, drilled wells (using an air or mud rotary drilling rig) lined with PVC pipe. Some 300 dug wells and 320 drilled wells are to be constructed.

About one-half of the dug wells involve deepening existing wells, which were first constructed without the use of dynamite, compressors or dewatering equipment and which have either gone dry entirely or tend to go dry in the dry season. The drilled wells are to be generally concentrated in areas where water tables are deep or where hard rocks make digging difficult or impossible. All the project wells are to be capped and fitted with hand pumps in an effort to prevent pollution of the well water. A pump installation and maintenance program is to be set up as an integral part of the well construction process and is to include the services of Peace Corps Volunteers (PCVs).

The project also provides for the construction of a project headquarters including an office building, a garage and a warehouse. Technical assistance in hydrogeology, administrative management, and vehicle and equipment maintenance is also to be provided. Project funds are to provide for well construction equipment and support vehicles, operating costs, pumps, local salaries of Voltaics hired for well construction crews and headquarters staff. The GOUV Rural Engineering Service (l'Hydraulique et l'Equipment Rural-HER), which is to design and implement the well construction, pump installation and maintenance component of the project, is to provide one drilling rig and most of the rig's support vehicles.

The health component of the project proposed the development and implementation of a village health education program, designed to optimize benefits to villagers from improved water supplies and to emphasize preventative health practices at the village level. However, as previously described in Section B.3, the health objectives of the project were basically changed between the release of the Project Paper (June 1979) and the signature of the USAID/GOUV Project Agreement (July 31, 1979). As stated in the Project Agreement, the project is to provide support for a preventative health program, health extension agents, the National Center for Health Education (CNES), latrine construction, U.S. participant training, expatriate technical assistance in health education, vehicles, water-testing equipment, audiovisual aides, operating costs, training of ASVs and the local salaries of the AAs.

The preventative health program, with responsibility in the Ministry of Public Health, involves close collaboration with the Ministry of Rural Development through the National Supervisory Committee, which is to provide overall guidance relating to the preventative health program. The GOUV is to constitute in each of the project's Rural Development Organizations (ORDs) a Coordinating Committee including representatives of the ORDs, USAID and regional medical officers, to supervise the program. USAID is to provide the services of two Health Educators ESs throughout the life of the project.

The health extension program is to train and support 110 Health Extension Agents (AIs) to work in the 550 project villages. These Extension Agents are to be assisted by the project Health Educators by four GOUV project Sanitarians (AAs) who are to work under the Regional Medical Officers, and by eight American Peace Corps Volunteers, two of whom are to be assigned to each ORD. Health education materials are to be provided by the National Center for Health Education (CNES). The Health Extension Agents are to be trained in preventative health

care and are to supervise Village Health Workers (ASVs) particularly in the construction and use of latrines and in the inspection of water quality. One Health Worker from each village is to receive short-term initial training and is to receive additional training each year. The Health Extension Agents are to gather baseline data on health care against which to measure the effects of the program and suggest modifications.

In the latrine construction program, the GOUV project Sanitarians are to monitor construction of latrines, including delivery of building materials, site selection and construction methods.

Some logistic support is to be provided under the project to permit the National Health Center (CNES) to execute its existing programs more effectively and to expand various health education efforts throughout Upper Volta. In this regard, the CNES is to develop and produce health materials to be used by Health Extension Agents in the project areas.

Participant training in the United States is also provided in hydrogeology for two individuals each for two years, and in health education for two individuals (Masters level) for two years each.

II. Assessment of the Project's Conceptual Feasibility

A. Validity of Project Objectives

Briefly stated, the project objectives are to assist the GOUV (1) in providing the rural population of southwestern Upper Volta with a potable water supply system, and (2) in establishing a health education program to optimize the health benefits of the improved water systems.

Given the great need for basic water supply of the rural population and the widespread prevalence of water-related diseases, the project objectives were well-formulated. The project is innovative from four standpoints: it is the first attempt in Upper Volta (1) to establish a system of sanitarily protected water points based on both dug and drilled wells which are capped and provided with hand pumps to mitigate water pollution; (2) to establish a health education program to optimize the health benefits inherent in a potable water system; (3) to coordinate the objectives of the National Health Plan directed by the Ministry of Public Health (MSP) with the long-term rural water development objectives of the Ministry of Rural Development (MDR), and (4) to establish a system provided in the National Health Plan to train supervisors and teachers of Village Health Workers (AVSs).

As previously noted (section IA2 and 3), the MSP was not actively involved in defining the objectives of the health education component of the project at either the Project Design stage or during the preparation of the Project Paper. The present objectives of the health education component of the project came into clear focus only at the time of the signing of the GOUV/USAID Project Agreement (July 1979) in whose preparation the MSP actively participated. As a result, the well constuction and pump installation component of the design stage (June 1978), has advanced more rapidly than the health education component. Also it must be pointed out that the Rural Engineering Service (HER) has had the advantage of

having a trained cadre of highly qualified technical personnel available to carry out its responsibilities in the well construction and pump installation activities. In contrast, the MPH through its Directorate of Public Health (DSP) has had to establish a new school, select candidates and arrange training for large numbers of other new personnel to carry out the objectives of the health component of the project.

Because of the disparities described above, there is a lack of synchrony between the two components of the project. This lack makes difficult the fulfillment of the health education objectives of the project as well as the broader objective of joint planning for field operations between the water-supply development and health education components of the project. The need for joint planning of project operations is discussed more fully elsewhere in this report. Thus, at the present time (July 1982), the evaluation team estimates that the evolution of the health education program is about twleve months out of phase with that of the water supply development program.

B. Validity of Linkages

1. Inputs and Outputs

a. Input Elements

(i) Personnel services (GOUV, contractor, PCV, USAID)
(ii) Training program (in-country, overseas)
(iii) Equipment and commodities
(iv) Other project expenditures

b. Output Elements - Tangible

(i) Potable water supply system in-place
(ii) Pump maintenance capability established
(iii) Training of health education delivery personnel completed
(iv) Health education delivery system in-place
(v) Latrine constructed

c. Output Elements - Intangible

(i) Enhanced Voltaic capability for inter-disciplinary planning, execution and evaluation of rural water supply and health education delivery systems

(ii) Enhanced consciousness of the rural population about public sanitation, particularly that related to all aspects of water use.

It is logical to assume that the outputs (tangible and intangible would be achieved if all the inputs according to the overall project design were provided in a synchronous time frame. However, the existing time frame is not sufficient to provide for all inputs, notably in the training program. Consequently, outputs in (1) the pump maintenance capability, (2) the training of health education delivery personnel, and (3) the health education delivery system will be significantly less than planned, unless, of course, the project completion date is extended.

2. Outputs and Objectives

It is reasonable to expect that if the project outputs are achieved, the project objectives would be realized. Given the technical inputs/outputs, the project objective of providing a part of the rural population of the Departments of Hauts-Bassins and Sud-Ouest in southwestern Upper Volta with their basic requirements of potable water should be achieved. However, in view of the compressed time frame of the training inputs/outputs, it is unlikely that the pump maintenance capability and health education delivery system will be fully realized, as proposed, unless changes are made in the implementation schedules.

3. Purposes and Goal

The achievement of the project goal does not automatically follow from the project purposes. The completion of construction of potable water points and of setting in place a health education delivery system will certainly improve the

quality of life for a segment of the rural population. However, additional measures will need to be taken at the end of this project to assure the continued viability of the water supply and health education delivery systems. The scope and nature of these measures are discussed elsewhere in this report.

Exactly to what extent the purposes of the project serve to meet the goal is difficult to define and even more difficult to measure. Several issues enter into consideration.

The first one is the relationship between water quality and health on the one side, and water quantity and health on the other. Very few reliable controlled studies have documented these relationships. For example, White, Bradley and White, Drawers of Water, 1972 concluded that a major breakthrough in water-related health benefits can only be achieved through a water tap in every household--an unrealistic goal for the rural population of developing countries at the present time.

The second issue concerns the likely re-contamination of water between the water point and the moment when it is consumed. Even if the water drawn with a handpump is safe--which is feasible as long as some standard rules in siting, constructing and maintaining the well are kept--there are many possibilities of re-contamination once the water leaves the pump.

The third issue concerns the convenience of the sanitary water point. As long as there is no other functioning water source nearer to the house, its inhabitants will normally use the pump, but in the rainy season, when other, closer sources are likely to be available, those are often used.

Thus, even though the general impact of rural water supply on health is known, its specific relationship is very poorly documented. This makes it difficult if not impossible to judge the impact and the relative importance of various

improvement measures taken in regard to health, unless a rigorous epidemiological study is undertaken.

C. Validity of Assumptions

From a global point of view, most of the assumptions identified at the project design stage are valid insofar as the water supply component of the project is concerned. The assumptions identified for the health education component cannot be validated at this time (July 1982) because the health education delivery system is still in development. Moreover, the objectives of the health education component were basically changed from those stated in the Project Paper to those stated in the GOUV/USAID Project Agreement, by integrating its design with the National Health Plan under the direction of the Ministry of Public Health. It is apparent now, however, that one broad assumption stated in the Project Agreement (p. 5) is not valid, at least at this time--namely, that the Health Extension Agents (AIs) will have the capability of gathering baseline data on health care against which to measure the effects of the program and suggest modifications. Additionally, the impact of other important assumptions on achieving project objectives have proven invalid or were left unstated.

It was assumed that an implementation schedule, as stated in the Project Paper, could be maintained for all input elements of the project. Unforeseen delays in delivery of commodities and equipment and in arrival of contract personnel have set back the proposed implementation schedule by 12 to 18 months. HER had a nearly complete structure of personnel which it could transfer into the project at the outset and, in the absence of adequate project equipment and commodity support, provided partial support by temporary diversion from other projects. Since arrival of essential commodities, equipment and contract personnel, progress in the water supply component of the project has been impressive

during the 1981-82 campaign, which has just terminated (July 1982). The MSP through the DSP has also made important progress during the past year in the development of the health education component. It must be pointed out that it is not appropriate to compare the rate of progress of the health education component with that of the water supply component. The former is basically a training and institutional development operation, whereas the latter is basically an engineering and construction operation. Also the former is inherently a slower process than the latter.

As originally conceived, the project was to cover four ORDs. The project area was later reduced by USAID/GOUV agreement to two ORDs: Hauts-Bassins (Bobo-Dioulasso) and Bougouriba (Sud-Ouest). An assumption was made at the project design stage that approximately 620 wells would be constructed in about 550 villages to serve about 40 percent of the rural population with potable water. This assumption was not correct because: (1) with a 2 percent annual growth rate in population, only about 30 percent of the population will be served by the end of the project, and (2) with a 20 percent failure rate in well drilling digging, as suggested by project history to date, some 775 holes will have to be put down to obtain 620 successful wells.

Another assumption in the project was that each well equipped with a pump should be capable of serving about 500 persons with 10 l/d/c of potable water. This means that the water point should be capable of delivering 5000 liters during a 12 hour water-use day in which the pump is operating 2/3 of the time. This means that the well should be capable of yielding at least 625 l/h during all seasons of the year. It was noted that a number of completed project wells with pumps and judged "successful" have yields less than 600 l/h.

As stated in the GOUV/USAID Project Agreement, a Coordinating Committee was to be established in each of the two Regional Development Organizations (ORDs) to

oversee coordination of the village health education and potable water supply program at ORD level. It is reported that such Committees have been formed but their coordinating function is yet to be realized. The evaluation team recommends that strong efforts be made by the Project Directors to revitalize these Committees in concert with the two ORD Directors so that the intended functions of the Committees will be carried out effectively.

III. Evaluation of Project Implementation

A. Output Performance and Overall Operation

The Rural Water Supply Project, for which the agreement was signed in July 1979, has a number of special features which makes it perhaps the most interesting rural water supply assistance project in the country:

- It has both a well construction and a health education component, executed by different ministries.
- The health component of the project carries out a part of the national health plan, the one dealing with the preventive care structure that rests on the ASVs, and in some ways pioneers the country-wide implementation of the health plan though the work that is taking place on the project.
- Likewise on the wells side, national standards for rural water supply have recently been established, and the project is the first one in which they are being applied on a large scale.
- The project is effectively run by the two Technical Directors in the field, one for well construction (HER) and the other for health (Sante), with some guidance provided by their respective ministries, on the one hand, and USAID on the other. This represents a rather advanced stage of assistance for the country, where the donor often maintains much more control over the project than is the case here.

After a somewhat slow start-up of 2 years, both the wells and the health components have achieved very good results this year in terms of the tangible outputs. Even though the output is important in itself, it is at the same time an indication that the personnel and material set-up of the project and, most important, its management is on a very sound footing. Since the beginning, however, the wells and the health components have been operating virtually as two separate projects, with only occasional coordination.

1. Well Construction and Pump Installation Activities

For the well construction component, project activities did not effectively begin until about January 1980, and most of the 1979-80 field campaign was spent in assembling personnel, commodities and equipment necessary for carrying out the wells construction pump installation.

In anticipation of delays involved in the procurement and delivery of commodities and equipment necessary for the execution of the project, the Direction of the HER had agreed to place at the disposal of the project 2 FORACO (SM 70 A) drilling rig and two completely equipped well-digging brigades until such time as commodities and equipment ordered under the project could be delivered. The two well digging brigades did not begin active construction operations in the field until mid-April 1980. Consequently, it was possible to construct only 16 dug wells before the end of the field season on July 31. Essential replacement parts for the FORACO drilling rig were not received until June-July 1980 and no drilled wells were put down in the project during the 1979-80 field season (campaign).

Well construction activities under the project picked up considerable momentum during the 1980-81 season (see Table III-A) which lasted about five months. On the well digging side, breakdowns in equipment and vehicles and lack of reinforcing steel set back progress somewhat. Nevertheless, 37 dug wells were completed this season. The well drilling program moved slowly early in the 1980-81 season with only the FORACO rig the rate of progress accelerated so that it was possible to complete 27 successful wells by the end of the 1980-81 season on July 31.

The 1981-82 season is the first in which all parts of the well construction program have been fully equipped and manned to carry out their planned functions. As a result, it is estimated that as of the end of the 1981-82 field season about 65 successful drilled wells will have been completed. At the same time but 15 well deepenings and 55 dug wells will have been completed. The first delivery of the Moyno hand pumps was received in the latter part of the 1980-81 season, during which 16 were installed. During the 1981-82 season it is estimated that pump installations will rise to a total of about 60. The status of the project as of April, 1982 is shown in Table III-A.

Table III-A

Wells Completed and Pumps Installed
in the Three Campaigns
as of April 1, 1982

	1979-80 Campaign			1980-81 Campaign			1981-82 Campaign*		
	Completions		Pumps	Completions		Pumps	Completions		Pumps
	Positive**	Negative	Installed	Positive	Negative	Installed	Positive	Negative	Installed
Drilled Wells	0	0	0	27	4	14	46	11	20
Dug Wells	16	0	0	37	0	2	27	0	16
Deepening of Old Wells	0	0	0	10	0	0	8	0	8
TOTAL	16	0	0	74	4	16	81	11	44

* As of April 1, 1982 there were a total of 73 successful drilled wells (forages) completed and 15 others were abandoned as failures. There were a total of 80 new dug wells completed and 18 deepenings completed of old dug wells. There were a 60 Moyo pumps installed of which 34 were installed on drilled wells; 18 on new dug wells and 8 on old dug well which have been deepened.

** A yield of about 500 l/h is considered to be the lower limit of a successful drilled well. Thus the current rate of failure of drilled wells in the project is about 20%.

Although well construction and pump installation are now proceeding at an impressive rate, it is unlikely that the project objectives of 620 successful wells, each with an installed pump, can be met as of the scheduled project completion date (July 1984). About 500 completed water points is the best that can be expected, assuming that the same rate of progress is maintained during the 1982-83 and 1983-84 field seasons and no serious breakdowns occur in drilling or well digging equipment. This is equivalent to about 80% of the project target.

The evaluation team recommends not to try accelerating the present rate of contruction of wells with available equipment and personnel, as the quality of the wells, that is the problem of assuring their long-term viability, is likely to suffer. (Wells which are poorly constructed and inadequately developed are likely to fail sooner than those which are carefully constructed and developed.)

The new project headquarters building, the garage and storage warehouse which are being constructed under the project were also visited by the evaluation team. The headquarters building is virtually complete except for the plumbing and electrical systems. The shall of the warehouse is also complete and awaits emplacement of racks and bays for storage of equipment and supplies. The shall of the garage is also under construction.

By now the personnel on all levels have gained enough experience so that the large number of inter-related working units are operating smoothly and effectively. The equipment appears to be deployed with a high utilization factor, supported by a well-run vehicle repair shop. Standard procedures and standard designs for the wells are now used as a matter of routine, even though there is some room for improvement (see sections III.B and IV.B and Well Construction and Development Exhibits 2, 4 and 5).

The U.S. specialists on the wells side plan an important role in their technical or administrative capacities and are now well integrated into the organization under the supervision of the Technical Director, (HER). Only two PCVs are left on the wells side, and it is unlikely that they will be replaced with others, since trained local technicians exist who can take over their jobs.

The response to the project in the villages has been largely favorable. Most people who are approached agreed to dig their well through self-help labour and seemed in general satisfied with the results. People continue to undervalue the improvement in the water quality at the pump which comes with a new well and continue to fetch water from unimproved sources nearer to the house, particularly during the rainy season.

2. Health Activities

There have been two major components of the health side of the program, both of which have been arranged and coordinated by Dr. Kagone. The first of these components is the training of the Agents Itinerants (AI) at the Ecole de Sante' Publique (EDSP) at Bobo-Dioulasso. These are the individuals who will eventually supervise and train the Village Health Worker, that is the Agents de Sante' Villageoise (ASV). In 1981 twenty-two AIs had to be recruited according to government regulations. Criteria were developed, tests given, 400 persons applied for the 22 positions. A curriculum to be developed for the traning program and the school building and offices were made ready. (See Health Education Exhibits 1, 3, 4). The 22 AIs started their classes in March 1982 and after 9 months of training will be ready for field placement in January 1983. A major contributor to their training has been CESAO.

The second major component of the health side has been the activities at the village level. This is the actual training of the Village Health Workers (ASV). This is the part of the project in which Project Sanitarians, that is the Assistants d' Assainisement (AA), the Peace Corps Volunteers (PCV) and the USAID contract Health Educators, that is the Educateurs Sante' (ES), have been active. During the past year they have visited 122 and selected 104 villages in which 107 ASVs were trained. In carrying out their work, the ESs, the AAs and the PCVs, first organized the village health committees to select the ASVs according to criteria. (See Health Exhibits 5, 6, and 7). At the same time studies of the villages were made to determine local practices and needs. Examples of the studies which have been completed can be found in Health Exhibit 10. Once the ASVs were chosen, they were sent to the nearest local dispensary for a three-week training period with the Practical Nurse, Infirmier Brevite' (IB). Then some time after they had decided on this practicum with the IB, the ASVs were given a 3 week didactic course that was designed and developed by the project ESs. These procedures are found in Health Education Exhibits 6, 7, and 8.

As of July 1982 the project health team is supporting the ASVs who have been trained and is supervising their work, such as latrine digging. The project team plans to organize meetings of the new ASVs to study common problems. In addition, plans are being made to deal with certain problems that have appeared in the current procedure while awaiting the first class of AIs that will be ready for field placement in January 1983. In the meantime the AAs, PCVs and the ESs are supporting the 107 ASVs they have trained. This is thus a special case because in the future the AIs will be performing this support work. The process is now underway to recruit 30 more AIs to begin training at the beginning of 1983. Thirty more will graduate each year.

Therefore, the following gives a projected output of the AIs. The number of ASVs will vary from 5 to 10 per AI.

Projection of AIs

Period Ending	Additional	Cumulative
July 1982	--	--
January 1983	22	22
January 1984	30	52
January 1985	30	82
January 1986	30	112

A detailed report of all the activities can be found in Dr. Kagone's detailed technical report. (See Health Education Exhibit 1) In addition to the above statistics and reporting he states that 99 villages receive drug kits, 70 received educational lectures, 15 latrines were dug and completed, while 44 other latrines were started.

CNES activities have been minimal and are further discussed in detail elsewhere in the report. The main problems cited are the difficulties in getting village support, logistical constraints, and the problem of renewal of drug supplies.

The project health team is not consolidating during the rainy seasons as they deal with the problems that developed during the last campaign, which is further discussed in other sections of this report.

B. Well Construction

This fundamental component of the project which was examined by the evaluation team includes:

- the selection of sites for wells in the villages;
- the digging or drilling of the wells;
- the developing and testing of wells; and

- the construction of superstructures at wells and the installation of hand pumps of Moyno (Robbins and Myers) type.

1. Well Site Selection

On the wells side of the project, the selection of sites for well construction is the responsibility of the Hydrogeologist of the project aided by the Technical Director (HER) and the Brigade Chiefs. At the beginning of each field season a list of villages in which wells are to be constructed is prepared by the Coordinating Committee of each of the two Departments involved in the project.

The applied selection process begins with general study of topographic maps of Upper Volta (scale 1:100,000) and of geologic maps (scale 1:1,000,000 for the entire country and 1:200,000 for the southwestern region). It continues with a photogeologic analysis of the village area itself on aerial photographs, scale 1:50,000, taken in 1955-56. These studies permit preliminary selection of sites which can be verified and pinpointed during visits in the field. The definitive choice of the site takes into account the advice of the Customary Chief of the village with a view to avoiding sacred places, cemeteries, waste dumps, latrines, etc.

At present geophysical equipment is not used in the site selection process, although purchase of geophysical equipment is provided for in the project budget. It would be appropriate to acquire a complete set of electrical resistivity equipment for use in site selection--particular in localities judged difficult from a hydrogeologic point of view that represent about 10 to 15% of the total. From the hydrogeologic point of view the project includes three major terrains:

- the sedimentary terrain on the plateau to the west formed of hard sandstones, shales and dolomites with some dolerite intrusions;
- the Birrimanian metamorphic terrain of schists, greenstones and other rocks; and
- the granite gneiss and migmatite terrain.

It should be noted that in past field seasons some difficulties have been encountered notably in the choice of villages to be provided with wells and pumps. Because of the initial lack of an up-to-date inventory of real needs, it later became evident that some villages in the program had very small populations while other non-programmed but important villages had serious water shortages. Thus, in order to plan more realistically for forthcoming well construction campaigns, a village inventory team was set up in the HER in October 1981 for the project area.

The choice of the site for the construction of a water point (well and pump) is an important step in the overall construction program which conditions the level of satisfaction of the real needs of the beneficiary villages. Thus particular attention should be given to the recommendations formulated in the National Workshop of May 1982 on the International Drinking Water Decade (DIEPA) which point out that:

- in order to attain the objective of 10 l/d/c between now and 1985 one water point should be able to serve about 1,000 persons in the rural environment. For villages of about 500 inhabitants the water point would provide 20 l/d/c.
- the distance a water user must walk to fetch water should not exceed 500 m.

2. Construction of Wells

Two types of wells are being constructed in the project: large-diameter dug wells and small-diameter drilled wells.

The pilot hole for a dug well is commonly put down with the participation of the recipient village. The project construction brigades are charged with installing the well curbing (buses) and construction of the superstructure including the surface ring (margelle) and the surrounding apron (trottoir or antibourbier). Most wells tap ground water entering from the sides through openings between curbing rings or from the bottom. In some cases dynamite is

used to advance digging operations especially when the rock becomes too hard for penetration by jack hammers. Wells dug in thick zones of altered rock (alterites) may encounter problems with heaving saturated clay (boue fluente). In such wells an inner curbing is sunk by understoping with a sinking shoe.

The technical norms defined by the DHER are generally followed in project dug well construction. In some cases, however, poor sanitary conditions were noted near the wells and poor locations had been selected for watering troughs (abreuvoirs).

The drilled wells are put down by air or mud rotary in softer rocks and by down-the-hole air hammer using water and foam in hard rocks.

Two drilling rigs complete with ancillary equipment were available to the project during the 1982-83 season: one Ingersoll-Rand TH-60 top head rig and one FORACO SM-70-R rig. The holes are first drilled in diameters of 6 to 7 5/8 inches and then lined wth 4 1/2 inch PVC casing. Slotted PVC pipe is placed opposite water-bearing zones in the rock. A gravel packing is placed in the annulus between the hole wall and the slotted pipe to form a filter. The gravel used for the packing is crushed fresh granite and that used on the project is not always properly sorted or sized. Consequently, in some cases poor gravel packing may adversely affect the yields of the wells. It is recommended that this aspect of the construction of the wells be given more careful attention in order to assure a longer well life. Some wells which tap water-bearing zones in indurated rocks are not cased all the way to the bottom. The hole is left open, that is, uncased because it is not considered necessary to case in hard rocks.

3. Well Development and Yield Tests

All wells are developed by air-lift pumping until clear water is obtained, free of all suspended material. It is at this time that an estimate of the

yield of the well is made by a project well-development team equipped for this purpose. Full scale pumping tests are not made of most wells, but are particularly important where larger yields (say 5 m3/h or more) are obtained. (See Appendix T-4. Well Construction and Development.)

No confirmatory chemical or bacteriological examinations are currently made on the project at the time of well completion to assure that the well water is free of pollutants that may have been introduced into the aquifer from latrines, waste dumps, cemeteries, etc. One case in point was noted at the village of Sara-Kongo. Here the water of the drilled well (forage) contains material in suspension that after the water stands about 24 hours gives it a nauseous odor. Analyses could be made in the DHER laboratory (Ouagadougou) until such time as a portable field laboratory becomes available.

4. Construction of Superstructures and Installation of Pumps

These activities are carried out entirely by project teams. The surface structures at wells generally conform to the norms established by the DHER. (See Annex T-1, Well Superstructure and Surroundings). However, sufficient attention is not always given to the provision of good surface drainage in the vicinity of the wells. Consequently, mudholes which are favorable sites for the breeding of disease vectors develop around the wells.

The two-piece cover (dalle) currently used to cap dug wells is not always properly fitted. Often a gap exists which permits spillage or debris to fall directly into the well. Also the contact between the cover and the surface ring (margelle) is not always flush so that snakes, lizards and other vermin may easily enter the well. Sealing of the two pieces of the cover and also the contact of the cover with the surface ring (Annex T-1) is recommended.

The villagers are not involved with the building of superstructures at wells nor with the installation of pumps. This absence of participation does not

favor the maintenance of the waterpoint. This phase of the work could be better utilized to sensitize the villagers on the importance of the sanitary protection of the water point and the need to keep the area around the well clean.

5. Inventory of the Ground Water Resources

In general the hydrogeologic data which have been thus far collected on the project have not yet been put in a form appropriate for their synthesis. The crude data are collected by the project hydrogeologist who lacks sufficient time for their compilation and analysis. However, an important task has been undertaken by the hydrogeologist, namely the determination by a programmable calculator of the geographc coordinates of all villages included in the well construction program. (This system is applicable to the GOUV's Inventory of Resources throughout the country.) The programmable calculator is being used for the determination of the hydraulic constants, T and S, from pumping tests.

However, the raw hydrogeologic data have not yet been transferred to the village schedules (fiches) nor to the schedules for individual water points (wells). The schedules for drilled wells (forages) have not been completed nor indeed even utilized on the project.

Existing campaign reports consist very largely of a tabulation of the construction details of the wells completed and equipped and materials utilized but no information on the nature of the aquifer tapped by the well. Future tabulations should include a column on "type of aquifer". Also the accent of the future campaign reports should be on estimates of costs by meter drilled or dug as a basis of cost comparisons (by campaign, by type of well, by depth, etc.) for economic analysis.

6. Conclusion

The execution of the present rural water-supply project forms part of the GOUV's national program for providing potable water to the rural population. The project area, previously poorly served, will be covered with about 40% of its full needs after completion of the targeted 620 water points. Even now at the mid-project stage, the water points already completed have effected some improvement for the recipient villages even if their realization has not always been carried out under optimal conditions. Recommendations for improvements are discussed more completely in Annexes T-1 through T-4.

C. Health

The health subgroup of the evaluation team examined the functioning of the health side of the project. The report of Dr. Kagone on what has thus far been accomplished in health activities is to be found in Health Education Exhibit 1. A description of the National Health Plan is to be found in Section III D 6.

Starting from scratch and without precise experience in the needs of primary health, those working on the health side of the project have succeeded in accomplishing the following during the past 15 months:

- setting up a working office;
- acquisition of medical and paramedical administrative personnel;
- recruitment of candidates and setting up of a training program for the AIs;
- recruitment and training of 107 ASVs;
- construction of 15 demonstration latrines;

In spite of the efforts of those working on the health side of the project, there remain numerous constraints. It is desirable to identify and analyze these and to propose adequate solutions with a view to improving the health

activities. These are the objectives of the health subgroup assigned to the present mission.

1. Identification of Constraints

First, among these is the absence of qualified personnel in the field-notably the AIs. The AIs are those who are charged with guiding preventative health education in the field, with recruiting, assisting the training and supervising the ASVs in the villages. At the present the AIs are still in the process of being trained. Their tasks are being carried out for the time being by AAs, the contract ESs, the PCVs and the IBs. The ASVs are still too few in number and their training is not uniform, that is, different from one dispensary to another. Also the IBs, who are responsible for part of the training of the ASVs, have received no preparation in this area of their responsibility.

Second, the participation of the CNES is presently very small (See section on Health Institution Building for further discussion of the CNES.) Because of all the reasons previously cited and also the recent start up in health activities it is not now possible to evaluate the impact of the project on the life and health of the rural population. As a consequence the evaluation team has directed its efforts toward the ways and means of removing those obstacles which it has identified in its analysis of the health activities already existing.

2. Analysis of Constraints

First, the concern of the evaluation team is not to propose a national program for the training of the AIs still less to modify that now existing. (That task is not in its mission.) The team has sought simply to seek out and observe, in the different training activities, the existing difficulties that retard the graduation of the AIs and those that the trainors have encountered in the training of the AIs. In this regard the evaluation team met successively

with the Director, ENSP, Division of Nurses and Practical Nurses (IBs) where the AIs are trained; the Director, CESAO and its SAF; the contract Health Educators (ESs); the Sanitarians (AAs); the IBs; the dispensary chiefs; the Minister of Public Health; the chief of the CNES; and USAID officials in charge of the project. From these meetings the following points evolved:

- A program propectus for the training of AIs to respond to the needs of the project has not yet been fully crystallized.

- This prospectus would respond to the job profile of the AIs described in the project. It is essentially based on measures for preventative health education and a large place is assigned to the stages in the project area and precautions to be taken to reduce the tendency of the AIs to become village nurses.

- An extensive coordination effort is being undertaken between different training entities (ENSP-CESAO) both at the school level as well as with the AAs and the IBs in the field in order to IBs synchronize, improve and assure the continuity of the theoretical and practical training of the students. Nevertheless, this coordination is in its beginning stages and suffers from imperfections. This lack of rigorous coordination of trainors has led to a disparity in the activities of the ASVs and in the long run if it is not corrected, will lead to an incoherence of the AIs' field activities.

Second, for the moment the involvement of the CNES is limited. It rests with them to study, in the near future, the possibilities of a larger participation in the project in collaboration with the AAs of the project. In this regard the CNES is planning to open a branch office in Bobo-Dioulasso. This will be staffed by an AA who is already a working member of the project. Also included will be a projectionist, two designers and a state nurse. It is now time for the CNES to plan a long-term public health education program and to become more active in the project.

Third, in order to better understand the activities of the ASVs the evaluation team made several visits to the villages in the project to meet with ASVs and to obtain opinions directly from villagers. These field evaluations brought out the following problems:

- The problem of training the ASVs is tied to the absence, for the moment, of a national program for training of ASVs, to the limited teaching competence of dispensary chiefs (IBs) in the training of ASVs and also to the great impact of classical medicine on the lives of the rural population, medicine essentially based on the curative. Also the recruitment method and the content and nature of the training given to the ASVs differs among the trainors.

- In general there is no difficulty in identifying ASV candidates from among village populations. However, the community participation in the form of encouragement to the designated AVS is virtually non-existent in most of the villages visited. Nevertheless, in spite of all, the ASVs generally remain available and interested in their activities, at least for the moment.

- In general the village health committees function quite well. Also the demand for medicines and even the expansion of village medicine chests (drug kits) is observed everywhere. The conversion of the mentality of village populations to the need for primary health care ought to be perceived as a long-term effort. This task is very difficult and it is necessary to know how to direct it effectively. As of the present time, 40 village health committees have been formed.

- Medicine chests have been distributed in 96 villages. However, there is a serious problem in the absence of a sure source for replenishment of these chests. This is a very troubling aspect of the program. The evaluation team can see that this drug kit (medicine chest) is fast becoming the focus of the entire program at the village level. A great amount of effort is being directed this way, much more than the total goals of this project justify.

- Among the villagers the project is welcomed in its entirety. The first concern of the villagers is to have water. (Majority of the responses in the villages.) In this regard greater advantage should be taken of the need for water by sensitizing the village before the water point is installed. Thus the training can focus around public health education and sanitation. It was also noted that the health side of the project has not been taken into account in the siting of wells in the villages, in the timing of their implantation, or in the sanitary aspects of their construction. The second concern of the villagers is health and usually follows after that of water supply. But the curative activities of the ASVs are more in demand than their preventative activities. For example, during the past year after the ASVs were required they were first trained for three weeks in the dispensary by the IBs. In some cases it was not until many months later that the ASVs were given their first public health training. It is this that explains how available funds are diverted to renewal and even for expanding medicine chests. But funds are also needed for elimination of the principal endemo-epidemic diseases of the villages by prevention. (They listen to counsel on hygiene, they construct latrines, they cover stored water in pots and containers, and they remove useless stagnant waters from village compounds.) We noted that all the villagers have unanimously rejected the construction of latrines during the rainy season. The different problems raised by the villagers show

how important it is to strengthen the coordination between the HER (wells and water points) and the Sante (health) components of the project-the one being able to be the object of the sensitization of the rural population by the other.

Fourth, the human resources on the health side of the project include the following:

1 Doctor (M.D.)
4 Sanitarians (AAs)
2 Health Educators (ES), U.S. contract
2 Peace Corps Volunteers (PCVs)
1 Bookeeper
1 Typist
3 Drivers
1 Caretaker
107 Village Health Workers (ASVs)
in 104 villages
Health Extension Agents (AIs) not yet available for deployment on the project are now being trained.

The following are to be noted:

- There are an insufficient number of personnel available for the project. Four AAs, 2 ESs, and 2 PCVs are insufficient to cover the two departments in the project and staffing problems are likely to develop with the deployment of the newly trained AIs next year. Without long-term integrated geographic and personnel planning this problem may become more acute as new aspects of the project come into play, such as the retraining of the dispensary chiefs (IBs).

- There is an absence of a precise definition of the tasks of the 2 ESs and the 2 PCVs. According to the Project Agreement (Annex 1 p. 5) they should, in the same way as the AAs, help the AIs. However, while the agreement defined the tasks of the AAs it says nothing about the tasks of the ESs and the PCVs.

- There are no Voltaian counterparts (homologues) for the PCVs. In effect all Voltaian personnel involved in the assistance and deployment of the AIs are specialized. (The AAs and IBs receive a minimum of two years' training.) In contrast the PCVs arrive unqualified and must first be trained on site (CNES, CESAO) before being assigned field responsibilities. However, it must be noted that activities at the village level this past year were a special case and were being carried out for the first time in Upper Volta by the AAs, the ESs and the PCVs together. Much if not most of this work will be taken over by the AIs when they graduate and are deployed in the field. Thus even though the enthusiasm and motivation of the PCVs, once they were trained, has made them very useful, the Voltaians working on the project will have much more relevant experience. Thus in the future generalists will not be helpful and indeed may be a burden to the project.

- The organigram of the project does not correspond to reality in the field. It places the PCVs as homologues of the AAs and puts the ESs above the regional chiefs. However the agreement puts them below these chiefs. The agreement does not classify the chief nurses of the dispensaries, who even though not paid from project funds, are important links in the training of the ASVs and the supervision of the AIs.

Fifth, the material resources of the health component of the project include the following:

Local headquarters for the health component of the project including 3 large offices and 2 small offices
10 padded chairs
3 padded arch-chairs
4 storage cabinets
2 Cherokee vans used by the ESs
6 motorbicyles for AAs

The following are to be noted:

- There is no functioning vehicle for the Technical Director (Sante). A vehicle was first provided but then later judged inappropriate and withdrawn. He has no vehicle at present. However, USAID has informed the evaluation team that a pickup has been requested and will be available for the Technical Director soon after the present evaluation is completed.

- There is no utility vehicle available for the AAs who are charged with the construction of latrines including the delivery of necessary materials to the latrine sites. (Project Agreement, Annex 1, p. 5) It is clear that the motorbicycles cannot be used for this purpose. USAID informed that 2 utility vehicles (CJ-8) been ordered for this purpose. One vehicle for the AA in each department should be available within 2 months. In any event there are presently vehicles sometimes available for field work on the wells (HER) side of the project. These could be used on the health side, from time to time, if there is an acute need as in the case of breakdowns. This situation again demonstrates the need for more collaboration and integral planning between the health and the wells sides of the project. (See section on Health Organization Management and Planning).

- There is no vehicle available for transporting student AAs (now receiving theoretical training at the ENSP) to villages in the two departments for practical field training. Such a transport vehicle is absolutely necessary for the health side of the project. It appears that if the Technical Director (Sante) is not provided with adequate vehicles present project objectives will not be attained. The USAID project manager has indicated that the pickup being sent to the Technical Director can be used for the transport of personnel.

Sixth, with respect to financial resources it is noted that the health side of the project was apparently perceived as a "poor cousin" of the wells side of

the project, even when the project was first conceived. This observation is borne out by all that has been stated above as well as by the meager budget that is provided for health activities. In summary the health activities are moving along with considerable momentum in spite of numerous remaining difficulties. However, with adjustment in the means available and improvements in oranization these difficulties can be overcome. To attain final project objectives and taking into account the delays in initiation of health activities, an extension of the project is necessary.

D. Project Organization, Operational Planning and Manpower Development

The original project organization, as laid down in the organogram, Attachment B of the Project Agreement, called for the involvement of two ministries on the different levels of the organization chart, the Ministry of Rural Development (MDR), and the Ministry of Public Health (MSP). Both Ministries initially provided a project manager each on the national level, who supervised their respective Technical Directors at the project headquarters (Bobo-Dioulasso). The Directors, in turn, were put in charge of the field operations, each assisted by U.S. counterparts provided by the contractor. Coordination between the wells and the health side was originally to take place on the ministerial level by the National Supervisory Committee, and on the project level by a coordinating committee for each of the two ORD's in the project.

This organizational arrangement gradually changed as the project progressed. More decision making power in the project was assumed by the two Technical Directors, and the function of a project manager on the national level has by now almost completely disappeared. Likewise the U.S. contract personnel are working in effect under the direction of each of the two Technical Directors and not as counterparts. A revised organization chart, representing the current organizational relationships of the personnel at different levels, is shown in the General Annexes (G).

1. Coordination and Operational Planning

One of the most serious constraints to the more rapid advancement of the project is the very weak cooperation that exists on virtually all levels between the wells component and the health component of the project, and between them and the various levels of the ORD structure that exists in the project area. This most seriously affects the health component of the project, but has repercussions also on the wells side. Rather than try to enumerate the causes of this condition, which go beyond the project itself, the team limited itself to the listing of some examples of its consequences and then propose some concrete steps to remedy the situation.

Some examples of how the work on both sides is affected:

- The coordinating committee for the project, constituted differently for each ORD, meets at most twice a year and deals almost exclusively with the choice of villages for the next campaign. Questions and answers are posed in a formal manner, more like the way in which a legislative assembly operates.

- The siting of wells, that is their specific location in a village, is done usually without the presence of health and ORD personnel. Had they been involved in the process, some of the problems with well siting encountered by the team during their field visits could perhaps have been avoided: locating a well too close to an old latrine, no slope in the terrain to allow for drainage of the waste water from the well, locations too far removed from the main part of the village, etc.

- There exists no plan for coordinating the digging and drilling of wells with the health component. This makes it impossible to include a meaningful water-related health component into the training and into the list of tasks of the ASVs. Some of the ASVs trained to date came from villages that had already received a well through the project before the ASV was selected, others came from villages without a modern well, and a few from places where the project had done some well construction work but had abandoned it or left it incomplete.

- From the perspective of the villagers, the fact that the wells and the health component operate in the village independently of each other is likely to reinforce their perception of health as primarily a matter of supplying them with medicines. Among all the different functions that an ASV is supposed to carry out, the restocking of the village medicine chest (drug kit) has turned out to be by far the one most in demand.

- The mobilization of the villagers for well digging appears to have been done so far almost entirely by HER technical personnel notably the Brigade Chiefs; while there exist personnel in the ORD specialized in carrying out these tasks. It is therefore hardly surprising that through its own efforts alone, HER has so far not been able to spend the time on mobilizing the villages to appoint a "water minder" in charge of regulating the use of the water point, a village mechanic to carry out simple maintenance jobs on the pump, and to organize a system of collecting funds on the village level to contribute to the any pump repairs that may be necessary in the future.

- The team found poor sanitary conditions around a considerabley number of stagnant pools, mudholes, and undrained cattle troughs. These are signs that no village maintenance scheme is operative.

2. Village Mobilization

Two independent village mobilization efforts have taken place in the project so far, one for the well digging by the villagers and the other to select and support a Village Health Worker. (ASV) One of the recommendations of the health specialists on the evaluation team is to either carry out the health mobilization component ahead of the wells component in a village, or both at the same time. This would not only insure the coordination between the two sides of the project on the village level, but would also provide a mutual stimulation, since water supply and health are the most frequently demanded communal improvements in Upper Volta (as well as in many other African countries), and are closely related to each other.

On the water supply project, wells can provide the pivot for the successful introduction of community health care ideas and practices in a village. Also potential health benefits from a capped well are obtained through measures such as sanitary well protection, better handling of the water between the moment it leaves the pump and the moment it is consumed, sanitary disposal of feces, etc.

Another element requiring village mobilization, dealing with the maintenance of the handpump, has so far not been covered by the project. The national policy on the maintenance of village level services, as laid down by HER, is that they

must be paid for or provided by the villages themselves. There is no provision in the national budget for covering these costs, except for a small transitional contribution in the form of, for example, personnel or vehicles. Since the handpumps require maintenance, the project must find ways in which this can be done in accordance with the national plan.

The national scheme worked out by HER calls for the selection of a "water minder" (responsable du puit) when a modern water point is installed in a village, who may also serve as the village handpump mechanic. Because of the nature of the Moyno pump, the village mechanic will only be able to carry out very light maintenance work (for a fuller discussion see Technical Annex T-5, (Assessment of the Moyno Handpump).

The national scheme also calls for the creation of village-level system of cash collection, set at FCFA 100 per capita per year, to be put into a village reserve fund for the payment, if needed, of pump maintenance costs, including spare parts.

Thus, there are three quite different mobilization components that have to be carried out in each village covered by the project: well construction, sanitation, and pump maintenance. Each has its own specific goals. Apart from the fact already mentioned above the carrying them out jointly could provide some mutual stimulation, it might not even be practical--and interfere with each other's tasks--to carry out each component separately. This complex situation requires the preparation of an operational plan which integrates the work of the three organizational entities involved (HER, MSP, and the ORD) around the joint execution of the three components of the mobilization (well construction, sanitation, and pump maintenance). The operational plan would consist of:

- a statement of objectives of each of the three components of the village mobilization,

- the specific tasks involved in the pursuit of each objective (separately at first), and which organism can be involved at each stage,
- the integration of these task statements into a plan, showing the tasks, the time sequence, and who is to carry them out at each step,
- a follow-up mechanism on the village level to provide support and encouragement for what has already been put in place, and to provide feedback for the improvement of the mobilization system.

Because of the complexity of the task, it is recommended that a consultant be engaged to examine both the sensitization process in the overall and to help develop those processes that are missing within each of the components. This consultant must be well experienced in animation and mobilization. The local CESAO organization is well versed in all of these activities and has worked with all of the components separately in the past and would be an ideal choice to help plan, integrate and coordinate the process.

3. Extension of the Contract Period

For the first 2 years of operation, the project made little headway insofar as the tangible outputs are concerned on both the wells and the health side. It has only been this year that the project has come up to a level of operation which would have brought the number of wells installed and the number of AIs and ASVs trained at the end of the contract period near those stipulated in the Project Agreement, provided the initial start-up phase had lasted only one year. As it was, one could say that the start-up phase lasted nearly 2 years, and that therefore the project is "one year behind schedule."

The reasons for this slow start-up are discussed in various parts of this report, and touch on many factors, such as the late arrival of equipment from U.S.; staffing problems on the Voltaic--and to some extent on the contract personnel--side; problems with getting accounting, budgeting and reporting procedures worked out which meet AID requirements; etc.

As has been stressed elsewhere in the report, these have now all been overcome and there is no reason, in the opinion of the evaluation team, why the present rate of output can not be maintained also in the future. At this rate only about 500 wells (80% of the target) will have been completed and fitted with a pump by the end of the contract period in July 1984, if no major technical problems develop (See section III.A). Another 120 successful wells, will be required to meet the target of 620 wells, which could be done during the campaign season 1984-85 at the current rate of output.

On the health side, as has been shown in section III.A, the projected output by July 1984 will be far short of the target: 52 AIs trained (47% of the target) and another 30 half-way through their one-year training, and about 300 ASVs trained (50% of the target).

If the contract period is extended by one year to July 1985, it is likely that all the 620 wells will be dug and drilled, but that a few of them wil not yet be sealed and fitted with a handpump because the annual well construction campaign ends only on July 31. At the same time, 82 AIs (75% of the target) and another 30 half-way through their one-year training, and about 300 ASVs trained (50% of the target).

Thus with a one-year extension the wells target is likely to be met, but there will be a shortfall of roughly 20% of the training target on the health side. It is therefore recommended that the present contract period be extended by one year, provided the total fund stipulated in the Project Agreement is not exceeded. On the health side, a special consideration should be given to the fact that an additional 30 AIs will be just half-way through their training in July 1985, and should be permitted to finish their course. This can easily be done if the team's recommendation of a Phase II to the project is accepted. (See below)

It is reasonable to assume that an extension of one year within the presumably allocated funds is feasible. First, even though nearly 3 of the 5 years of the present project period have elapsed, only a small part of the total allocated funds have been spent. This is in addition to the fact that virtually all the heavy equipment for the project has already been purchased. Second, the exchange rate of the dollar against the F CFA is now about 70% higher that it was at the time the Project Agreement was signed, thereby significantly increasing the in-country value of the funds even when vetted for inflation.

The team recommends that the extension be made subject to the implementaton of the principal recommendations made in this report, provided they are acceptable to both USAID and the Technical Directors (and their Ministries).

4. Phase II

It is recommended that a Phase II be considered to follow the present phase with the broad outlines of the project maintained on the wells side, but with the possibility of a modified program on the health side. The reasons for having a Phase II would be as follows:

The present well contruction target of 620 wells covered only about 40% of the population of the two Departments of Haunts Bassins and Sud-Quest at the time the project was conceived. With population growth and inimmigration into the area; this proportion will be down to 30% by the time the project is completed. The large majority of the remaining population in the two Departments is also urgently in need of water.

The handpump maintenance scheme will not yet be fully operative at the end of the current project period. One of the important remaining tasks will be to finish training the village mechanics. The procurement and distribution of

spareparts for the Moyno pumps will require some US assistance even after the end of the current project.

The health education target will not have been fully met in the current project even with a one-year extension. Furthermore, the then existing AIs and ASVs will need guidance and follow-up because of the nature of their work. By that time the structure will be in place which will permit the effective launch of some public health campaigns with the help of radio broadcasts, etc. hopefully with the help of CNES.

Some of the wells dug or drilled in the current project, particularly those constructed in the early period, may run dry or need structural repair. A Phase II would also ensure that these get deepened and improved so that investment now being made will not be partly lost.

5. Wells Component (HER)

An additional contract person has been provided on the wells side as an Administrative Assistant to the Technical Director (HER), a post which was necessitated by the increasing complexity of the operations on the wells side and by the stringency placed financial reporting procedures by USAID. No major changes have taken place on the wells side of the organization chart on the lower levels of the organization, except for the departure without replacement to date of several PCVs. Their role is further discussed below.

As far as tne organizational provisions on the wells side made in the Project Paper as well as the Project Agreement, there was a serious underestimation of the advance work and follow-up work requied. The list of villages : the project area and the number of inhabitants in each was long out of date and seriously deficient. There was also very little information on existing water supply conditions in these villages, which would have been an essential piece of information for the choice of high-priority villages for wells construction. Consequently,

it was impossible to base the choice of villages during the first two campaigns of the project on the consistent application of rational criteria. It was found, for example, that some villages chosen by the coordinating committee had, in fact, a very small population, others too large a population to depend on only one well. As another example, the visiting team came across one village (Bozen Bobo in Dano Sous-Prefecture) which was by-passed by the project because it already has a modern open well, dug and lined during a previous campaign. According to the villagers, however, this well never contained water for more than 5 days after a rain and yielded absolutely no water in the rainy season.

The need for an inventory team to collect basic information on villages was recognized early on, but it was not until the end of last year that such a team was added to the office the expatriate hydrogeologist.

The absence of another kind of advance team on the wells side is only now becoming apparent with the increased demand for a feasible plan to cover the maintenance charges for the pumps. In accordance with national policy regarding services for the rural population, the villagers themselves will have to contribute in the future the main part of pump maintenance costs. According to the recent experience gained in this regard in other parts of the country (a FED-financed water project), a certain portion of the villages were willing and able to collect the funds necessary to reimbuse the HER for part of the repair costs when they had been sufficiently prepared for this in advance. It is questionable whether such preparation can effectively take place after a well has already been installed in a village.

The questions of the role of the inventory team, the choice of villages and the choice of specific well sites all relate to the function of the hydrogeologist, because, according to the organigram, he is the main technical person responsible

for the location of wells. In this work he cooperates closely with the Brigade Chiefs who, in their turn, have many other tasks to perform besides the siting of wells.

It is therefore recommended that the office of the hydrogeologist be expanded to include permanently (1) a field team, which does inventory work, advance siting, assist in the taking of geological samples from the drilling operation, and work together with health and ORD advance teams in the villages, and (2) a counterpart or, at least, an assistant to work on all aspects of geological record keeping: analysis, classification, recording, and storage of geological samples and liaison with the hydrogeological division of HER, as well as photointerpretation. This also calls for the supply of some basic equipment to the hydrogeologist's office.

Also in the interests of reducing the number of unsuccessful drilled wells (forages), the use of geophysical surveys should be considered on the project, where difficult hydrogeological conditions are encountered. The HER hydrogeological office in Ouagadougou has access to a trained geophysical team which can carry out such work on request.

It is also recommended that the scheduling of well drilling and well development be re-examined. The more thorough testing and development procedures that seem to be called for in the project might require the creation of a second drilled well-development brigade to keep up with the high-capacity TH 60, rigs even after the Foraco rig has been returned to HER headquarters. Well drilling for a village supply with the TH 60 rig takes only 2 to 3 hours if no difficulties are encountered, while well testing and development should take much longer if it is carefully done. (See Section III.B and Annex T)

The team also agrees with the Technical Director (HER) about the advisability of dividing the present responsibilties of the Brigade Chief for the drilled

wells into two parts and under the charge of two Brigade Chiefs, one for drilling and developing, and the other for masonry work, pump installation and maintenance.

6. Health Organization and Implementation Planning

The health component of the project is in accordance with the broad directions given in the Project Agreement. This document was drafted in accordance with the National Health Plan of Upper Volta. Thus, at the project level, all decisions are made in accordance with these two documents. The National Health Plan has been drawn up with an emphasis on primary care. At the village level, there are two health workers, the Agent de Sante Villageois (ASV) and the Accouchere Villageois (AV). The current project is only concerned with the training of the former. Their job descriptions according to the National Health Plan can be found in the Health Exhibit 2.

Supervision and training and support of the ASV will be accomplished at the dispensary level by the Agent Itinerant d' Sante (AI). These AIs are the persons currently (July 1982) being trained by the project at the Ecole d'Sante Publique, Division de Premier Linge in Bobo Dioulasso.

Because there are currently no AIs in the field to work with the ASV, the other project workers such as the Peace Corps Volunteers (PCVs), the Sanitarians, that is, the Assistants d' Assainisement (AAs), and the U.S. contract Health Educators, that is, the Educateurs Sante (ESs), have been performing the task of training and supervising the ASVs this year (1982). This second part of the health component of the project, that is, the training of ASVs, has been for the most part organized separately from the training of the AIs.

Thus during the past year (1981-82) in the health component, there were two separate parts, although both of which were coordinated and organized by the project director. It is only in the field training of the ASVs that the U.S. contract Health Educators have been active. This is also true for the AAs and

the PCVs. This work that has been done this year at the village level must be viewed as a special case, because next year, it will be taken over by the AIs. Integration of the two parts of the health component of the project will occur in the future. Actually, operational planning concerning certain problems that have presented themselves in this area is now being done.

For example, another person at the dispensary level who will take part in the training of the ASVs is the Infirmiere Brevit (IB). But the difficulty is that they have not received much training in community health. Their main tasks will be to train the ASV in certain curative procedures, so another problem is that they have not recieved any training in how to teach.

At the project level, plans are being made to retraining the IBs. Decisions have not yet been made as to priorities for this retraining. Should it be done first in the area where the 107 ASV have already been trained this year by the project, and part of the first class of 22 AIs will be assigned, or should the retraining be done in the area where there is as yet no training of ASV and another part of the new AIs will be assigned in January 1983. It should be noted that because there are only less than 22 dispensaries where the current 107 ASV are located, there will be an excess number of AIs for January 1983. This can be seen as a desirable situation because they can then be sent to certain areas where they will actually train ASVs in accordance with their job description in the National Health Plan.

There is a further question as to the retraining of the IBs that will take place in the next few months, and the next year, that is, who will be doing it. CESAO has expressed an interest in setting up a program. They have a great deal of expertise in motivation and animation training. There use should be encouraged. It could be done in conjunction with the AA and the ES who have had so much field experience in the past year.

At the national level, consideration is being given to changing the curriculum of the IBs to include more public health and more training in teaching. This is highly recommended. Indeed, some have suggested that a new specialized class of IBs in public and community health be formed to operate at the dispensary level to supervise the AI.

Thus, in summary, the project operations are currently in accord with the National Health Plan for the most part. Because the plan is given in such broad strokes, and because certain phases of it are being implemented before others, problems have arisen and will continue to arise as to how the lacunae are to be delt with and in what order. The current approach is to deal with the problems as they arise through feedback mechanisms that are in place. However, the project grows, more complex, broader and more specific approach to organization and planning will be necessary.

For example, during the next few months, decisions must be made as to the areas in which the IBs are to be retrained. It must also be decided who is going to do it. In addition, there is the task of supervising the ASV who are already formed. In January 1983, 22 AIs will have newly arrived in the field. Where will they go? Their placement will have to be coordinated with the activities of the newly formed subcommittees that will be planning where the wells are going to be constructed. All of this will become even more complex in the following years, when 30 more AIs graduate each year.

Therefore, it is suggested in the future no ASVs be trained until the normal mechanisms are in place for their supervision by the AIs. This does not mean that the AAs and ESs can not continue to organize villages to begin the long sensitization process that proceeds the actual choosing of the ASV. But when he is chosen, he should immediately begin his training in the public health aspects of his job, rather than being imprinted by the curative process at the dispensary.

But as to the more important problem of long-range integral planning both that within the health aspect of the project and the coordination of the timing of opening areas with HER, outside help will, at this point, by necessary. It will be important to specify what kind of help is needed. The person selected should be a planner who will assist the Technical Directors implement, coordinate and integrate those tasks that have already been programmed. It should be emphasized that the new primary health care system may be fragile and what is definitely not needed is a restructuring of the present program. Help should be sought from someone who is competent in the area of PERT (Programmed Evaluation Research Techniques) or similarly integral planning methodology.

The involvement of the Sanitarians (AAs) also raises some questions that are currently being dealt with. They will be assigned in the future at the Department. level. There has been talk in the National Plan of another lower level sanitarian who is to work at the dispensary level who will actually supervise the ASVs. He is called the AA. It is not yet clear when these agents will be ready for the field since they are not currently being trained. Indeed, it is not clear whether he will actually be part of the plan because he is not mentioned in it. Because of this, there exists some confusion in the field as to the actual tasks and manpower that will be available at the dispensary level to supervise the AIs. For the project this must be clarified and specific tasks and, especially, priorities laid out in more detail than can exist in the National Health Plan.

In the meantime, a problem has developed in the training of other AAs. Only 13 have been trained so far and this has been done in Abidjan. But recently, GOUV stopped sending people there for training because the entry level in the Ivory Coast for these persons has been raised to the level of Infirmie d'Etate. This is the level of personnel would have to be sent. Decisions are currently pending to determine if this will be done or if other less trained personnel will be sent to another school in Senegal.

7. Support for Voltaic Health Institutions

There are a number of Voltaic institutions that are being supported, expanded and created by the project. All of these institutions are a part of the general National Health Plan of Upper Volta and range from the creation and support of village health committees, to the support and expansion of the National Center for Health Education (CNES).

The logistical support provided to CNES is to permit them to more effectively execute its existing program and to expand its varous health education ventures throughout the country. This past year, a project vehicle was purchased to allow the showing of educational films in the villages, although it has not yet been effectively utilized. During the first year, there was not a great deal of active participation in the project by CNES, but because of certain changes currently planned, this should soon change.

CNES is going to open an extension office in Bobo Dioulasso to work closer with the project. A sanitarian who is working with the project will also be assigned to the office. It will also be staffed by a projectionist, a designer and a state nurse who will act as a consultant on their projects. They plan to expand their activities such as the local productions of educational films, wall posters, radio program and newspapers articles. The project should expand its support of this area by seeking short-term consultants and to help plan the campaigns and so advise on state-of-the-art materials in radio and other media.

The CNES is also the institution that actively uses the sanitarians in Upper Volta and thus is the home of much support of public health programs. Further support for its activities will be accomplished when the Director of CNES chooses the two Voltaics who are to receive post-graduate training in health education at an American school of public health. The Director has stated that one slot will be for a physician and one slot will be for a sanitarian; therefore, training at

the M.P.H. level would be appropriate. These choices should be made as soon as possible so that they can begin classes in September 1983 and take advantage of the contract provisions. Applications must be completed this year.

A second major Voltaic institution that is being supported and expanded by the project is the Ecole Nationale de Sante' Publique, Division de Premier Ligne. This is the school that will train the AIs, those who will eventually train and supervise the ASVs. During the first year, the project refurnished and supplied the buildings and the offices that are used to train the AIs. Twenty-two were recruited, a curriculum was developed and teaching begun. The first class will be ready for field placement in January 1983. The project is paying the salaries of these AIs and will continue to do so for the life of the project. After project completion, since they are employees of the GOUV, they will be paid by the GOUV.

Another Voltaic institution that is playing a role in the project is the Centre d'Etudes Economiques et Sociales de l'Afrique de l'Ouest (CESAO). This is a private organization that has a great deal of local experience in training trainors. They work in the area of organization, motivation, and animation at the village level. They are currently being used by the Ecole Nationale de Sante' Publique (ENSP) to train the AIs in the area of public health.

There is a great deal of important fall out from the use of CESAO in the project. They are also helping to train the teachers of the AIs at the school in certain animation procedures. Since the school also teaches practical nurses (IBs), their teachers are also being trained in animation techniques which are based on work at the village level.

Discussions are currently taking place to coordinate and integrate CESAO with the other project workers in the recycling of the IB. CESAO is an important counterweight to the natural tendency of the program to develop more focus on the

individual than on the community approach. It is foreseen that when the teachers at the school have been fully trained in the methods used by CESAI, then the role played by the latter will diminish.

E. Finance

1. Financial Overview and Unit Costs

A detailed financial evaluation of the project is not included in terms of reference for this evaluation. Financial control and guidance has been provided to the project by the AID Mission in Ouagadougou ever since the project began, and several audits had been carried out. As part of this effort, the terms of the US contractor had recently been amended to include the posting of an Administrative Assistant from the U.S. to help the Technical Director (HER) with accounting and administrative tasks. The accounting personnel of the project also recently attended a regional course sponsored by AID on sound financial planning and accounting techniques. Another AID evaluating team whose task it was to assess the results from this course--in terms of implementation of the practices that had been suggested--was in Upper Volta at the same time as our team.

Some remarks on the finances of the project to the extent that they relate to the project's performance are, however, in order. It has already been mentioned elsewhere in this report that funding is not a serious constraint, not at the present and not until the end of the present project period, as far as can be foreseen. There has been some complaint by the Technical Directors that the disbursement of funds was too slow in the beginning of the project, resulting in long delays in the arrival of equipment, which might be partly responsible for slow start. There is also some feeling that the AID Mission in Ouagadougou still exerts too much detailed budgetary control over line items, which at this time--since the Technical Directors had already proven their ability in sound financial management--should better be left to them. The Technical Directors

request specifically that the Letter of Execution be prepared jointly by them and the AID Mission.

There is also the fact that the health component of the project is budgeted at only around 27% of the total available funds for the next two years, which might well be insufficient to adequately carry out the health activities. Considering, however, that annual expenditures of HER (actual and projected from FY 1980 to 1983) have been falling sharply with decreasing payments for capital equipment (including the headquarters building), the annual expenditures for the health component have remained stable during the past three years after a low expenditure level in the first year of the project.

One important area of financial and operational planning that has so far been neglected by the wells component of the project is the computation of unit costs for different operations. The calculations that have so far been made, on the cost for example, of drilling one meter of borehole, of installing a pump, or of maintaining one well and handpump have only included the recurrent costs (labor, fuels, expendable materials, etc.), but not the amortized equipment costs. This gives very distorted picture, particularly if one wants to use these unit costs figures for comparing the cost effectiveness of different techniques for carrying out the same task.

The reasons for this omission can be ascribed to a general lack of appreciation for the role that unit cost figures can play in planning future operations of the project and in assessing the replicability of the project to other parts of Upper Volta, as well as specifically to a lack of appreciation of the role of equipment costs. Furthermore, due to the fact that all imported equipment was paid for directly from the AID Mission in Ouagadougou, only PIO/C totals were readily available to the Technical Director (HER). The lack of data on the individual cost items in the PIO/Cs made the inclusion of an item for equipment

in the unit costs difficult. It is recommended that the unit cost of all the major operations of the wells component of the project be carried out with the inclusion of the amortized equipment cost and under the guidance of an economist.

2. Recurrent Costs

The problem of recurrent costs virtually always exists in the developing countries, notably in the least developed countries (LDCs). Not being in a position to guarantee from their own resources the costs of operation and maintenance of project acquisitions of which they are the beneficiaries, they must even in the best situations seek contributions from bilateral or mulilateral donors.

With respect to the specific case of the present Rural Water Supply Project in spite of high recurrent costs (some 43 million FCFA annually for the well construction component and 172 million FCFA for the health component), there is no need for concern, because there exist provisions in principle in the national policy for meeting these costs. What remains is the need to take firm and directed measures to put these plans into effect. For the water-supply component of the project the beneficiary populations must be inculcated, through animation (extension) and sensitization of the need for taking over responsibility for the protection and maintenance of the village water points (wells and pumps).

Reference is made to a document prepared in the Rural Engineering Service entitled "Organization of Rural Water Supply Projects". Item (paragraph) 1.3 stipulates that the adminstrative organization of rural water supply projects of the Rural Engineering Service (HER) with external financing be as follows:

Project Chief
One general services team
One or more well digging brigades and/or One or more well drilling brigades
One well servicing (development and testing) team
One pump installation and well maintenance team
One animation (extension) or sensitization team

On the Yatenga and Comoe Project being financed by FED an animation team is already active and the results attained thus far are being examined. In the regional Development Organizations (ORDs) animation and sensitization activities are also currently in progress.

The general approach to animation and sensitization, described above, is feasible, practicable and applicable to virtually all village water-supply projects in the country. This project is no exception and it would be highly desirable to begin essential animation and sensitization activities as soon as possible. The approach will serve to put in place the necessary infrastructure for the water-point maintenance system. It would also provide a means for the collection and management of the funds necessary for the purchase of replacement parts for hand pumps and for the payment of village maintenance mechanics.

Assuming one water point for a village of 500 inhabitants the collection, for example, of 50,000 FCFA per year and per pump would require the contribution of only 100 FCFA per water user. Moreover, it is necessary to point out that the decentralization of the Rural Engineering Service (HER) is now underway with the objective of setting up a Maintenance Brigade in each Department. Each brigade would include one or more teams equipped for maintenance work exeeding the capabilities of village mechanics and would be financed in the national budget.

It should also be pointed out the creation of a National Water Fund is now under study that would provide for the financing of temporary personnel such as drivers, hand pump mechanics and laborers.

Thus the approach to the solution of the problem of recurring costs would include the following steps:

- decentralization of the Rural Engineering Service;

- creation of a National Water Fund; and above all, the organization of a means of animation and sensitization of the beneficiaries of the water points.

In addition, Upper Volta also has in place a National Sanitation program for the decade, 1980-1990, based on the furtherance of primary health care needs. The health component of this project provides a certain level of support to this program. Plans and possible operations are also under study for overcoming the thorny problems of recurrent costs for this component of the project. These deal with measures taken at GOUV level to take over responsibility for the costs of the Health Extension Agents (AIs) at the end of the project. The project infrastructure and offices will continue to be used by the Public Health Service (DSP) and the training of the AIs will be continued without difficulty by the GOUV as will that of the Practical Nurses (IBs) trained at Bobo Dioulasso and the Sanitarians (AAs) trained at the National School of Public Heath.

The specific proposal made by the wells components of the project for covering the recurrent costs of the estimated 43 million FCFA needed annually are as follows:

- From the villages:

  100 FCFA per person x 500 people average per well x 620 wells = FCFA 31 million

- From HER:

Contribution in the form of salaries, etc. (Maximum permissible under current policy)		5 million
- Remaining		7 million
Total	FCFA	43 million

Apart from the FCFA 7 million which remain to be covered annually, a sizable portion of the FCFA 31 million to be contributed by the villages will not be forthcoming, at least not during the next few years. It is therefore certain

that either HER must increase its contribution -- which is impossible under current national policy on maintenance, we were told -- or that funds for maintenance must be sought from external sources. In view of the unsuitability of the Moyno pump for maintenance by a village mechanic (with a large cost saving to HER), and in order to safeguard the investment made so far under the assistance project, the evaluation team recommends that the delivery of spareparts for the pump be included under the current project, and that an item for pump spares be added to the budget of the recommended Phase II.

IV. Conclusions and Recommendations

A. Overall, Organizational and Financial

The evaluation team has examined both the broad overall, organizational and financial problems of the project as well as the more specific aspects of well construction and health activities. Conclusions and recommendations with respect to the former are discussed in the following:

1. Coordination and Operational Planning

Perhaps the most serious constraint to the more rapid advancement of the project is the weak coordination and cooperation that exists between the wells (HER) and health (Sante) components of the project. The following concrete measures are recommended to further a closer cooperation between the wells and health sides of the project as well as the two URDSs involved:

- create one Sub-Committee to the existing two Coordinating Committee that would include the two Technical Directors for HER and Sante, the Brigade Chiefs and any other staff members the Technical Directors may wish to include on the Sub-Committee. It should meet at least once a month and be charged with both the preparatory work needed for the deliberations of the Coordinating Committee and with preparing a detailed workplan on how to carry out the decisions taken by the Coordinating Committee.

- review in the higher levels of the Ministry of Rural Development (MDR) of the roles the ORDs should play in the project since both the HER and the national system of ORUs are under the same Ministry.

- prepare an operational plan which integrates the various tasks to be carried out by the two sides of the project at village level. This is a rather complex task that requires integration of what at present are largely independent or non-existent parts of the project. It is recommended that a consultant such as CESAO, be engaged to carry out this planning task.

2. Organization of the Wells Component of the Project

The water-supply (wells) component of the project with its autonomous direction forms an integral part of the overall rural water-supply program of the GOUV. The objectives of this program follow the general objectives of the

International Decade for Potable Drinking Water (DIEPA 1981-1990) proclaimed at the Mar de Plata conference in 1970.

The Ministry of Rural Development, in this regard, has set up a type organizational structure for rural water projects throughout the country (Arrete No. 387/DR/HER du Decembre 1981). The present USAID project should be able to conform to this structure for a better execution of work tasks, notably those concerning the maintenance of pumps by the beneficiaries themselves. The project direction needs to make provision for an animation team charged with establishing at the village level a capability for successful maintenance of water points (well with pumps).

3. Extension of Contract Period

For the first 2 years of operation of the project relatively little progress was made for various reasons which are discussed elsewhere in the report. Most of the delaying constraints have now been overcome and it is now evident that the bulk of project goals can be attained if a project extension is granted. Consequently the evaluation team recommends a one year extension of the project to July 1985 with no increase in funds.

4. Phase II

It is also recommended that a Phase II of the present project be considered with the broad outlines of the wells side of the project remaining essentially the same but with the possibility of a modified program on the health side. The reasons for this recommendation are discussed more fully in Section III D6. Additionally, it is recommended that an item for pump spares be added to the budget of Phase II.

5. Recurrent Costs

The possibilities for coping with the thorny problem of recurrent costs have been discussed in some detail in Seciton III E for both the wells and health components of the project. The evaluation team recommends that firm and directed measures for putting into effect existing operational plans for collecting necessary funds to meet recurring costs be taken as soon as possible.

6. Unit Costs

It is recommended that the unit cost of all the major operations of the wells component of the project be carried out with the inclusion of the amortized equipment cost and under the guidance of an economist.

B. Well Construction and Pump Installation

Having observed all phases of well construction and pump installation activities, the evaluation team wishes to commend the Technical Director (HER) and his Brigade Chiefs for their diligence and dynamic approach in carrying out project objectives in spite of the many obstacles along the way. However, in the interest of improving project operations the team makes the following recommendations.

1. Drilling and Well Construction

With the TH-60 drilling rig it is possible to drill a 50 to 60 m 6 to 7 7/8-inch hole, set the 4 1/2-inch ID PVC casing, and install the gravel pack in a matter of a few hours. The well development and pumping test of the well is necessarily a more time-consuming process. At present most wells in the project are not developed for a sufficient length of time to attain full cleaning of the gravel pack and the borehole walls (usually only 6 to 10 hours). Thus the full potential yield particularly of lower yield wells is not always fully attained. For this reason it is recommended that all drilled wells be pumped for at least

12 hours and preferably longer for full development. Also a pumping test that includes an 18-hour pumping cycle should be conducted on each drilled well that produces an air-lift yield of 5 m3/hr or more. In order to provide for longer development and pumping tests the team recommends that an additional completely equipped well-development and pump testing team (equipe) be added to the existing team now in place.

A problem encountered in the construction of a considerable number of large diameter dug wells (puits) is in the presence of a heaving clay layer (boue fluent) generally under the laterite-particularly in granite terrains. Whereas this problem may delay the rate of progress and successful completion of such wells, it can generally be controlled by sinking a small gravel packed inner curbing (captage) equipped with a sinking shoe (trousse coupante) the team recommends that this type of work is best pursued toward the end of the dry season when the heaving clay is at least partly dewatered by drainage into the underlying fractured zone.

With the retirement of the FORACO drilling rig from the project at the end of the 1981-82 campaign the TH-60 rig will become the only operating drilling rig on the project. Thus the success of the rest of the drilling program during the 1982-83 and 1983-84 campaigns will depend entirely on the continuing operation of this rig. During the 1982, 1983 and 1984 "down seasons" the team recommends that the rig be given complete preventative maintenance at project headquarters to forestall mechanical problems that may develop later during field operations.

2. Well Superstructure and Surroundings

The sanitary protection of the surface superstructure of both dug and drilled wells and of the immediate surroundings has been more fully discussed in Annex T-1. The recommendations included in this annex concern:

- The need for a wider apron (trottoir or antebourbier) around the margelle;
- The need for good drainage;
- The need for an effectively sealed cover (dalle) on large-diameter wells; and
- The need to protect the area around the well from proximate sources of pollution including waste dumps, animal enclosures, dense concentrations of habitations and, particularly, nearby latrines.

3. Hydrogeological Considerations

With the realm of regional hydrogeologic problems is the presence on the plateau of an extensive belt of shales, slates and thin sandstones and dolomites known as the "Etage schisto-greso-dolomitique" (ESGD). Experience to date suggests that the rocks of this group generally contain only weak aquifers and in places such as Dinderosso, drilled wells have been virtually dry holes. On the other hand shallow large diameter wells such as those at Banankildara and Sourboudougou, because of their large volume of "in well" storage, have been successful in developing enough water to sustain a hand pump. The evaluation team recommends that in this belt of rocks preference be given to large-diameter dug wells rather than drilled wells-particularly where the dry-season position of the water table is less than 25 m below land surface.

4. Well Site Selection

The evaluation team noted that about 20% of the wells drilled on the project have been failures in the sense that they yielded considerably less than 500 l/h which the theoretical "success-failure" threshold. Most of these failures have occurred in the crystalline and metamorphic rock terrain of the shield (socle). In this terrain a more precise siting of drilled wells could be made, in areas or zones known from past experience to be unfavorable, by geophysical surveys--particularly by the electrical resistivity method. (Equipment and expertise for

this work is available on request from HER headquarters in Ouagadougou.) It is recommended that such surveys be made in problem areas in an effort to locate larger vertical or sub-vertical fractures which may contain important water-bearing zones. All other factors being equal where weak aquifers prevail and the dry-season water table is less than 25 m below land surface, it is recommended that large-diameter dug wells rather than drilled wells (forages) be constructed. Here again the "in-well" storage factor is the paramount consideration.

5. Water Quality

The team notes that very little attention has yet been given to water quality from either the chemical or bacteriological points of view. The team recommends that a minimum of 20 water samples be collected for chemical analysis from a representative suite of completed and operating drilled and dug wells widely scattered over the project area. The samples should be given complete analysis for all common onions and cations as well as pH, specific conductivity, silica, fluoride and total dissolved solids. The objective would be to determine the regional and hydrogeological characteristics of water quality and to identify any problem areas.

The importance of routine sampling of wells for bacteriological quality and pollution monitoring is discussed elsewhere in this report.

There is also another consideration. At present no attempt is made to chlorinate wells prior to the installation of the hand pumps. It is recommended that this be done routinely to detroy any harmful bacteria that may have entered the well during construction.

6. Pump Maintenance

One of the most critical problems in the project is the long-term maintenance of installed pumps. Although a beginning has been made in the training of

maintenance crews, little has been yet been done to develop local mechanics at the village level who can effect simple repairs such as tightening loose bolts on the pump stand or the base. The team recommends that such training be taken up at an early date as a step toward the ultimate transfer of responsibility for pump maintenance at the village level.

7. Training

With respect to overseas long-term training it is recommended that two individuals, preferably one with an engineering background and the other with a hyrogeological background, be selected for training in the United States in water-well technology. Both individuals would require at least 3 months intensive English language instruction prior to the beginning of training.

It is recommended that both individuals be trained at Wright State University in Ohio where a special one-year program designed for foreign participants is offered in water-well technology. For further details it is suggested that AID/Ouagadougou contact Mr. Stuart Smith of the National Water Well Association; 500 West Wilson Bridge Road; Worthington, Ohio 43085.

8. Technical Aspects of the Project

Because the execution of the project offers a unique opportunity to increase the hydrogeologic knowledge of the Departments of Hauts-Bassins and Bougouriba it is recommended that efforts should be made:

- to strenthen the hydrogeologic teams so that it can do a better job of well-site selection and data collection.
- to furnish the team with the personnel and equipment necessary for carrying out well site selection, following the progress of well drilling and digging operations, and gathering data in the field.
- to establish in the hydrogeology office a section concerned with the compilation and filing of well schedules (fiches) of dug and drilled wells, of information on villages, and systematic periodic measurements of water levels in observation wells. (See Annex T-2, Hydrogeologic Data Collection and Analysis).

To carry out the tasks above would require the recruitment of a hydrogeologic assistant or a well-data compiler or even temporary personnel from a hydraulic engineering school to carry out routine work and free professional personnel for more demanding work.

Equipment required to carry out the tasks should be acquired as soon as possible and would include the following:

Electrical water-level tapes
Programmable calculator (calculatrice)
Electrical resistivity equipment
(This work could also be done under agreement with HER, Ouagadougou)
Specific Conductivity Meter
pH Meter, etc.
(See Annex T-2. Hydrogeologic Data Collection and Analysis)

In order to be able to observe the effects of the annual replenishment of the ground-water reservoir by recharge from rainfall and its subsequent depletion by evapotranspiration during the dry season, the drilled wells (forages) considered negative should be finished as piezometers (observation wells). These would be used for periodic measurements of water levels and would be integrated the national network of observation wells which is now being established.

C. Health

The evaluation team notes that in spite of numerous constraints and difficulties the Technical Director (Sante') and his staff have given proof of the courage and perserverance needed to achieve a number of significant objectives in the health sector of the project. In the interest of helping to attain the overall objectives of the project the evaluation team makes the following recommendations.

1. Training of the Health Extension Agents (AIs)

The evaluation team recommends setting up as soon as possible a complete program for the training of the AIs. Nevertheless, it is important that the program remain flexible during the next few years. In this regard it is important

to plan for a feedback mechanism so that what is learned in the field concerning the training of the AIs can be corrected at the school. A strengthening of the coordination between the teachers of the AIs (ENSP, CESAO) on the one hand and the AAs and IBS on the other would permit the students to draw out the maximum benefit from both the theoretical and practical phases of their training. From this point of view the team recommends a retraining during the "down" (rainy) season of the IBs to strengthen their role in the training of the ASVs. This recycling is desirable on two accounts. The IBs are responsible at the dispensary level for supervising the activities of the AIs even in the area of public health as described in the National Plan. (See Health Education Exhibit 8 which describes their duties.) Yet the IBs have no preparation for this task. In addition they are responsible for training of the ASVs. Nor have they been trained for this work.

The retrained process will obviously have to continue throughout the years of the project and beyond. It will be important when the future AIs are placed in the field when attempts should be made to put them in areas where the IBs have already been retrained. Next year 22 AIs will graduate. Some 107 ASV have already been trained at 11 dispensaries. Thus 11 of the 22 AIs will be placed there which will leave 11 AIs to be placed in areas where the ASVs have not yet been trained. Here again, long-term personnel placement planning in conjunction with the HER activities will be necessary.

2. Strengthening of the National Center for Health Education (CNES)

In order to play a fuller role in the project the CNES branch at Bobo Dioulasso needs to be strengthened. Technical materials, particularly audio-visual need to be prepared with the participation of the AAs assigned to the project and directed toward the requirements of the recipient village populations. The

materials would be prepared for the utilization by the AIs. To assist the CNES to carry out its tasks more effectively, the project could provide technical assistance in the form of short-term consultants and more materials. The consultants would advise the chief of CNES of what materials and plans are needed to develop and manage a public health education program using state-of-the art methods appropriate for the project area. Included would be planning for radio campaigns, films and poster production.

The emphasis of the radio campaigns should be directed toward encouraging a community approach to treatment and prevention of disease rather an individual approach. Attention should be given to the more common causes of high mortality rates in the project area such as diarrheal disease in infants. The campaigns can be coordinated with the sensitization of the villages and focus on areas important in training the ASVs. Only consultants experienced in the planning of this type of program in the least development countries (LDCs) should be used.

3. Training of the Village Health Workers (ASVs)

In order to standardize the training of the ASVs and to avoid their transformation into village nurses, the evaluation team proposes that the MSP develop as soon as possible a training program especially designed for the ASVs. The ASV is a volunteer worker who in carrying out the work entrusted to him (her) must also take into account his own family responsibilities. Only the joint solidarity among those villagers who have freely designated the ASV, can encourage him (her) to perserve and perfect himself (herself) in the activities directed toward the general well being of the village for which he (she) is responsible. The evaluation team recommends a greater sensitization of the villagers before, during, and after the selection of the ASVs with a view to resolving the important problem of continuing village support of the ASV. During the past year, because it was the first active year of the program, the ASVs had to be selected and

trained before their regular supervisors (the AIs) were in place. Because the initial period of supervision and motivation is so important, it is recommended that no new ASVs be trained until the nomimal supervisors (AIs) are in place.

One of the most pressing problems that is currently being addressed by the project is the approach to motivating the ASVs. Also involved is the problem of their reimbursement vis-a-vis their normal familial resonsibilities. An important consideration is adequate supervision by the AI and another is the mobilization of village support. There are no easy solutions to these important problems. However, one suggstion is to focus the training and priorities of action of the ASVs during the first few years on one or two major issues together with other parts of the program, such as a CNES campaign, rather than to attempt too broad a program in which the ASV fails to develop a sense of competence in any particular area. Too much must not be attempted too soon. The evaluation team recommends that a priority area of unification and focus be concentrated on the treatment of infantile diarrheas and malarial fevers in children. Both these maladies need a simple preventative-cum-curative approach which is effective and an impact which can be seen appreciated by villagers with the span of a few years.

Another problem to be address is the periodic replenishment of village medicine chests (drug kits). The evaluation team considers that without an accessible and sure source of supply, their replenishment is impossible. The team recommends that village pharmacies be established as soon as possible. The entire problem of the current emphasis on medicine (drug) use and its resupply in the project must be reconsidered. Currently, the ASV are being inculcated with the medicinal cures as being more important than the preventative health goals of this project. For example, the training of the ASV at the dispensary by the IB should come only after his (her) public health training and the IB

must emphasize the hazards and side effects of drug use. "First of all, do no harm." It has been said that the complexity of the drug-supply problem is the result of national and international forces being felt at the village level. There is no reason to belive that a solution to this problem will be found in the near future. Thus it is to be feared that the AIs will be pressured to spend too much time in this sector. Substitutes must be found. The team recommends that priorities be set up for the newly trained ASVs perhaps by concentrating on the prevention and cure of the effects of diarrheal diseases of children due to common viral and bacterial infections.

4. Coordination between the Wells (HER) and Health (Sante) Activities

Based on the experience of project personnel in both the wells and health sides of the project and the visits of the evaluation team to the field it is evident that coordination between the two sides is indispensable. The first need expressed by the villagers was for reliable water supplies and the second was for health education which goes with the sensitization of the villagers by the selection of an ASV and his (her) long-term activities. As these necessarily continue long after the process of well site selection and construction, the evaluation team recommends that the work of the health (Sante) side precede that of the wells (HER) side in the field. In order to do this it is recommended that a Coordinating Sub-Committee composed of the two Technical Directors of the project and their staffs be set up to plan and prepare their activities before the meetings of the two Coordinating Committee. The Technical Directors can then carry out the decisions of the Coordinating Committees in a synchronized manner. The coordinated activities will avoid present discordances such as health activity in a village without any planned water point and vice-versa. The Coordinating Sub-Committee could meet every month or more frequently when

necessary. The sub-committee would include the two Technical Directors, the AAs, the Brigade Chiefs, and others such as the Hydrogeologist, the ESs and PCVs may attend as necessary.

Another useful function of this sub-committee will be to examine the sanitary aspects of well site selection and well construction water-quality control from the pathogenic point of view and the coordination of village sensitization both on the health and wells sides.

In the future, village sensitization and the commencement of ASV training should precede the siting and construction of wells in the targeted village. This approach will present a problem of coordination which must be dealt with in the sub-committee. Because the wells side of the project is so far ahead of the health side it would be difficult for it to catch up to the wells side. Therefore it is suggested that while the health side is sensitizing and training in new areas, the well side work in areas where ASVs may have already been trained either by this project or earlier projects. Also there is much work to be done in developing the pump maintenance program.

5. Coordination among Health Trainors

Presently with the absence of AIS on the ground their activities have been assumed and a temporary basis by the AAs, the ESs, the IBs,and the PCVs (with or without relevant competence). It is for this reason that it is not appropriate to blame the mixed results of the activities on the ASVs the nurses along who have had responsibility for the training of the ASVs. It is fairer to attribute the mixed results to the collective activities of the AAs, ESs and PCVs. It is for this reason that the evaluation team recommends a definition and a distribution of tasks of all training agents by USAID and the GOUV. In this regard the team recommends that the PCVs assigned to health activities should be trained at least to the level of the IBs. That is to say they should be specialists

well trained in public health education or sanitarians. The team recommends also, taking into account the different training agents working in the field, a revision of the organigram of the project. In this regard the evlauation team submits a suggested revised project organigram. (See Health Exibit 11.)

During the next few months and years the work and the integration of these personnel will become more complex. Some 22 AIs will be graduating in January 1983 and then 30 more each year thereafter. The AIs will need supervision, and in additional there is a need to recycle the IBs. Therefore, even though the description of the duties and the priority of the actions of the AIs must be drawn up during these early stages of the project, room for feedback and flexibility must be maintained.

6. Vehicle Needs

The evaluation team recommends.

- the acquisition as soon as possible of a working vehicle for the Technical Director (Sante'), that is, a vehicle appropriate for his working needs.
- the acquisition of vehicles for the AAs in lieu of motorbicycles for reasons previously cited.
- the acquisition of a mini-bus for collective transportation of student AIs for reasons previsously cited.
- the acqusition of mobylettes for the AIs who will be graduating very soon so that they carry out effectively the work of supervision and training of the ASVs.

7. Evaluation

By the end of 1983 the 22 AIS's will have been in the field for one full year. In addition the subcommittee will be functioning for the same period. Therefore, at this time, in December 1983 or January 1984 an evaluation should be made. This evaluation should look at the functioning of the health side of the program, its planning, management and integration with the HER side, the

pump maintenance program, and the sanitary aspects of the water program. There is no need to reevaluate the techniques of well construction and completion.

8. Short Term Technical Aid

Short-term technical aid will be useful in two specific areas. The evauation team wishes to emphasize that the project already includes most of the aspects necessary for the implementation of the project in accordance with the national plan. The technical aid required is in the area of operational methods.

a. Audio Visual Consultant

The needs of CNES have been extensively discussed in other parts of this evaluation. (See section above on Health Institution Building). The consultant should advise the director of CNES and the Bobo-Dioulass sub-office on a operational plan for radio and other audio visual techniques necessary to institute a public health campaign that emphasizes community approach to treatment and prevention and counters the current emphasis on drugs and individual treatment. The consultant should be well experience in working on campaigns of this kind in countries similar to Upper Volta. The consultant should also advise on the materials for a poster campaign, etc., emphasizing the use of local resources, but nevertheless suggesting how the project can supply other state of the art materials. Other suggestions for an appropriate campaign can be given. If it is impossible to find a consultant experienced in both radio and visual campaign, two may be needed.

b. Operational Planning Consultant

A consultant is needed to provide methodology used in long term operational planning. He will help to institute, coordinate and integrate the present broad ongoing program that has already been developed by the two sides of the project, health and HER in accordance with the national plan.

This consultant is needed to both provide better coordination between Sante' and HER, and within the health side itself in the face of the increasing complexity of the program. For example, there is the need to coordinate well siting (implantation) and construction with previous village sensitization; the need to recycle IB's in different areas; etc. etc. The consultant will also help the Sub-Committee develop techniques necessary for the work it has to do as suggested in other parts of this evaluation. In this regard the consultant should investigate the possibility of closer cooperation with the existing ORD structure. It is specifically noted that a consultant is not needed to design a new program because the program is currently designed in accordance with the MSP's national health plan.

9. Post Graduate Education

The project agreement provides for 2 years of post graduate training for 2 persons in the health sector. These two persons should be chosen this year so that they can begin their M.P.H. training in health education in the fall of 1983. Preparations must be completed by December 1982 or earlier when application deadlines for many American schools close. It is important to begin on this task immediately to insure that the school of public health that the candidates attend is one that concentrates on the problems of public health education relevant to countries like Upper Volta.

Other short term post-graduate education possibilities should be considered for the project members, this might include visits to other functioning programs in areas similar to Upper Volta to exchange ideas.

10. Future Evaluation of Impact

During the design of this project it was assumed that the AIs and the ASV's would be capable of collecting the morbidity and mortality data needed to evlauate

the impact of this project on the changes in the health status of the affected population. This is not the case. Although AIs and the ASVs should be trained in the methods of obtaining basic statistics, such as birth an death rates, during the project period they will not have the training to obtain valid results. This is especially true of the base-line data.

An epidemiological study can be designed in conjunction with the Centre Muraz to evaluate the health impact of the water and primary case system. They have expressed an interest in doing studies on diarrheal disease and other projects in community epidemiology. A project like this would help them work in important community and primary care issues. This proposed study would also serve to provide technical aid in epidemiology and survey methods. In addition it would focus attention on the more important causes of mortality in the region and would emphasize a community approach to their diagnosis and intervention.

Thus, if a valid statistical impact study on mortality and morbidity is required to evaluate the results of this project, it must be attached to the project. It is suggested that additional funding be sought through the USAID evaluation office.

11. The Individual versus the Community Approach

A tendency has been noted in most primary care projects for them subtley move towards an emphasis in the individual curative approach to health care. A full discussion of this problem as pertains to this project and specific recommendation are found in Annex S-1 entitled "The Need to Safequard the Community Approach to Health Care."

12. Summary

The health evaluation team considers that the project is off to an excellent start and although many suggestions have been given for improvements the team

feels that in view of the initial problems and the late start, the project should certainly be extended so that the original goals can be achieved. Throughout this evaluation the team has tried to maintain a unified approach. That is to give suggestion that attempts to join all the separate parts of the project together so that they can be focused on a conjoint effort to increase the health use of the water aspects of the program and to increase the motivation and impacts of all concerned. For example, the World Health Organization's guidelines for the training of Village Health Workers (ASVs) provides a long list of things to be done. It would be impossible to try and teach all of these at once to the ASVs and so priorities must be selected so as not to overwhelm them. It is recommended that a few simple areas be chosen initially that would give the ASV's a feeling of confidence, that would coordinate with other areas of the project, and that would also be effective. These areas might focus on the treatment of malarial fevers in children or the treatment of infantile diarrheal diseases. Both of these diseases constitute the largest contributors to overall mortality in the project area.

This approach would provide a means of tying together initial village sensitization, and ASVs' education with the water project because of the connection of the cause, effect and treatment of these diseases with water. This would also serve to move some of the current attention of the project away from its heavy emphasis on drug use. At the same time, since these kinds of interventions have been shown to be very effective in similar circumstances in other countries, lives could be saved. Using local resources to establish oral rehydration programs, impact could be seen at the village level and would help to mobilize village support.

This program of community and individual treatment and prevention would work with the water implantation teams at the village level. In addition it would coordinate well with the other recommendations of this project evaluation. For

example, there would be an associated and integrated campaign mounted by the CNES on the same issues that the AIs and the ASVs are working on at the village level, that is the provision of potable water and the treatment and prevention of infantile diarrhea. At the same time the adjoint epidemiological study could focus on similar issues while examining the overall effects of these actions. These studies would reinforce the importance of concentrating on these issues by showing their contribution to high overall mortality rates and perhaps be able to suggest further methods of intervention and thus further unifying the entire project.

In this way, by concentrating the program in the beginning on the few most important areas, not only will the impact be maximized but in the process the foundation will be laid for a unified and effective primary health care system.

V

A. General Annexes (G)

G-1. Recurrent costs during the last two years of the Project (Wells and Pumps Component)

G-2. Recurrent cost during the last two years of the Project (Health Component)

G-3. Organigram of the Project (Health Component)

G-4. Organigram of the Project (Wells and Pumps Component)

G-5. Organigram of the Ministry of Public Health (MSP)

G-6. Organigram of the Ministry of Rural Development (MDR)

G-7. Actual Disbursements under the Project (not including those made directly by (USAID) for the Wells and Pumps (HER) and Health (Sante) Components of the Project.)

G-8. Decrees relating to the Administration and financing of projects of the Ministry of Rural Development

G-9. Executive Summary (in accordance with instructions in US AID Cable R 261839 Z March 82, Subject: Evaluation Information Needed by AFR.)

Recurrent Costs during the last two years of the Project
(Wells and Pumps Components)*

	Period 1982-83	Period 1983-84
I. Costs (financed by the project)		
A. Personnel:		
Salaries and Indemnities (Two maintenance teams)	5,400,000	5,400,000
Indemnities (Two Brigade Chiefs) (50,000 x 12 x 2)	1,200,000	1,200,000
B. Operations:		
Fuel and Lubricants	6,000,000	6,000,000
Spare Parts, Vehicles	4,800,000	4,800,000
Supplies and Materials	2,700,000	2,700,000
Spare Parts, Pumps	15,000,000	15,000,000
Deplacement of Defective Pumps	2,500,000	2,500,000
Cement and Construction Materials	750,000	750,000
Other Costs	1,500,000	1,500,000
Labor	2,400,000	2,400,000
Contribution in kind of the village	1,500,000	500,000
	43,750,000	43,750,000
II. Revenues (financed by the GOUV)		
A. Personnel:		
Salaries (Two Brigade Chiefs) (66,500 x 12 x 2)	1,596,000	1,596,000
Maintenance Team ***	(3,172,000)	(3,172,000)

* All costs in francs CFA.

*** Maintenance team expenses would be taken over by the GOUV commencing as of the end of the Project.

	Period	
	1982-83	1983-84
B. Operations:		
Lodging in the Sub-prefectures by the maintenance team	120,000	120,000
Depreciation of HER materials for maintenance	850,000	850,000
Contribution in kind of the village	1,500,000	1,500,000
	4,066,000	4,066,000
III. Summary		
Total Costs	43,750,000	43,750,000
Total Revenues	4,066,000	4,066,000
Difference	39,684,000	39,684,000

Recurrent costs during the last two years of the Project
(Health Component)*

	Period	
	1982-83	1983-84
I. Costs (financed by the project)		
A. Personnel:		
Project supervision at Ouagadougou	253,325	253,325
Project Chief at Bobo Dioulasso	1,303,950	1,200,000
Bookeeper	991,275	991,275
Secretary	653,050	653,050
Project Sanitarious	1,041,500	1,041,500
Drivers	1,953,700	1,953,700
Laborers	350,473	350,473
Health Extension Agents	45,678,875	45,678,875
	52,226,088	52,226,088
Total Personnel	104,452,176	
B. Operations:		
Office Equipment	1,470,000	1,470,000
Fuel	16,500,000	16,500,000
Educational Materials	760,000	760,000
Latrines	5,625,000	5,625,000
Training of ASVs	9,000,000	9,000,000
Training of AISs	4,273,000	4,273,000
Other Costs (Replacement of Logistic Materials)	4,841,250	4,841,250
Trousse ASVs	11,250,000	11,250,000
	53,719,210	53,719,210
Total Operations	107,438,500	

* All costs on francs CFA.

	Period	
	1982-83	1983-84
II. Revenues (financed by the GOUV)		
A. Personnel:		
Village Support of the ASVs	(in kind)	(in kind)
Contributions of the MSP 1 Doctor 4 Sanitarions	4,877,750	4,877,750
Total Personnel	9,755,500	
B. Operations:		
Contribution of the MSP to the backstopping of the ASVs (33,846 x 450)	7,615,350	7,615,350
Project Chief's Vehicle	4,240,000	4,240,000
Logistic Contributions of the MSP (water, electricity, telephone)	2,062,500	2,062,500
Housing of the Doctor	1,375,000	1,375,000
Housing of the PCVs	1,125,000	1,125,000
Offices of the Project	1,125,000	1,125,000
	17,542,850	17,542,850

Total Costs 30,845,700

Total Revenues 9,755,500 + 30,845,700 = 40,601,200

Difference:

(104,452,176 + 107,438,500) - (9,755 + 30,845,700) = 171,289,476

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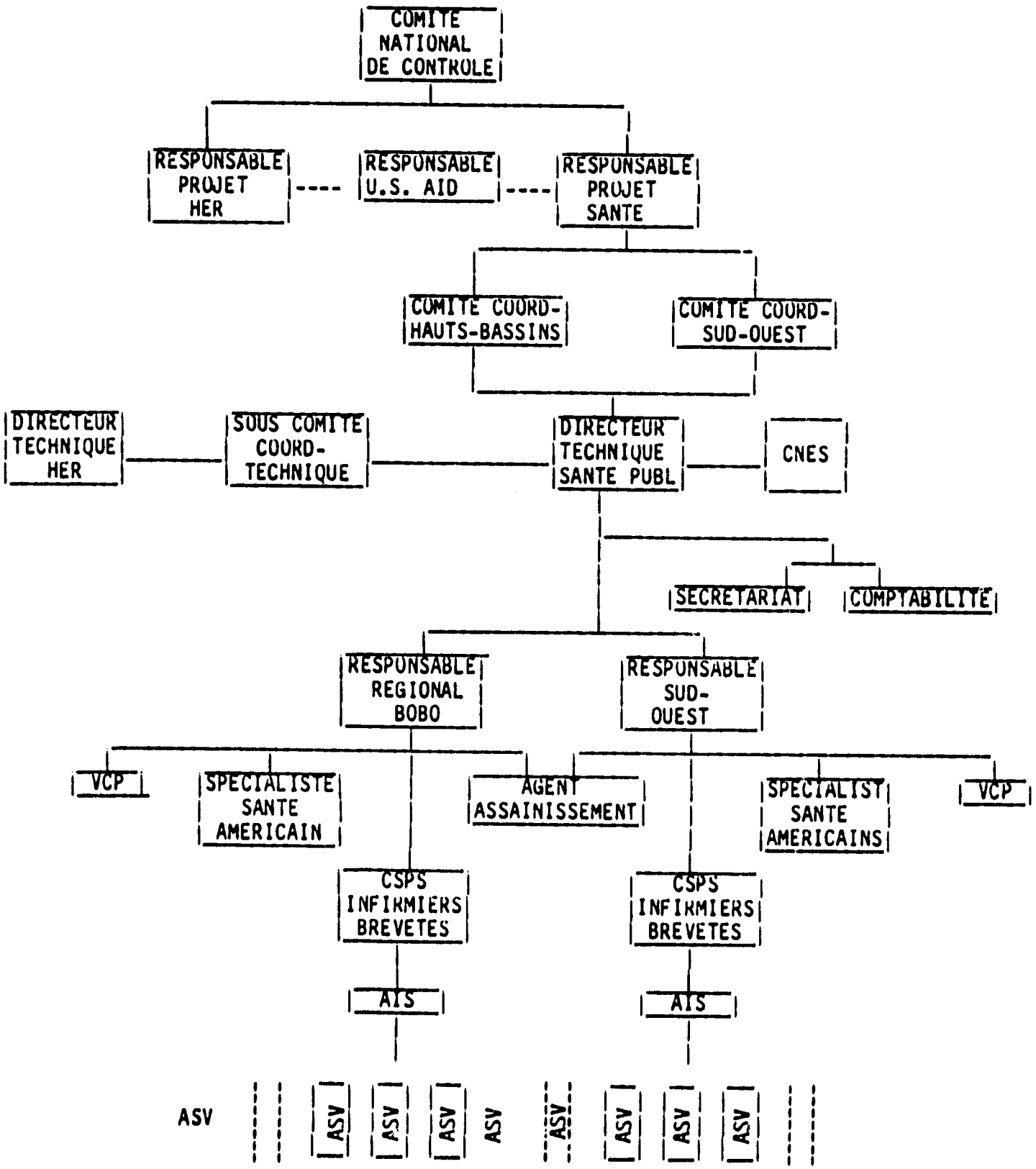
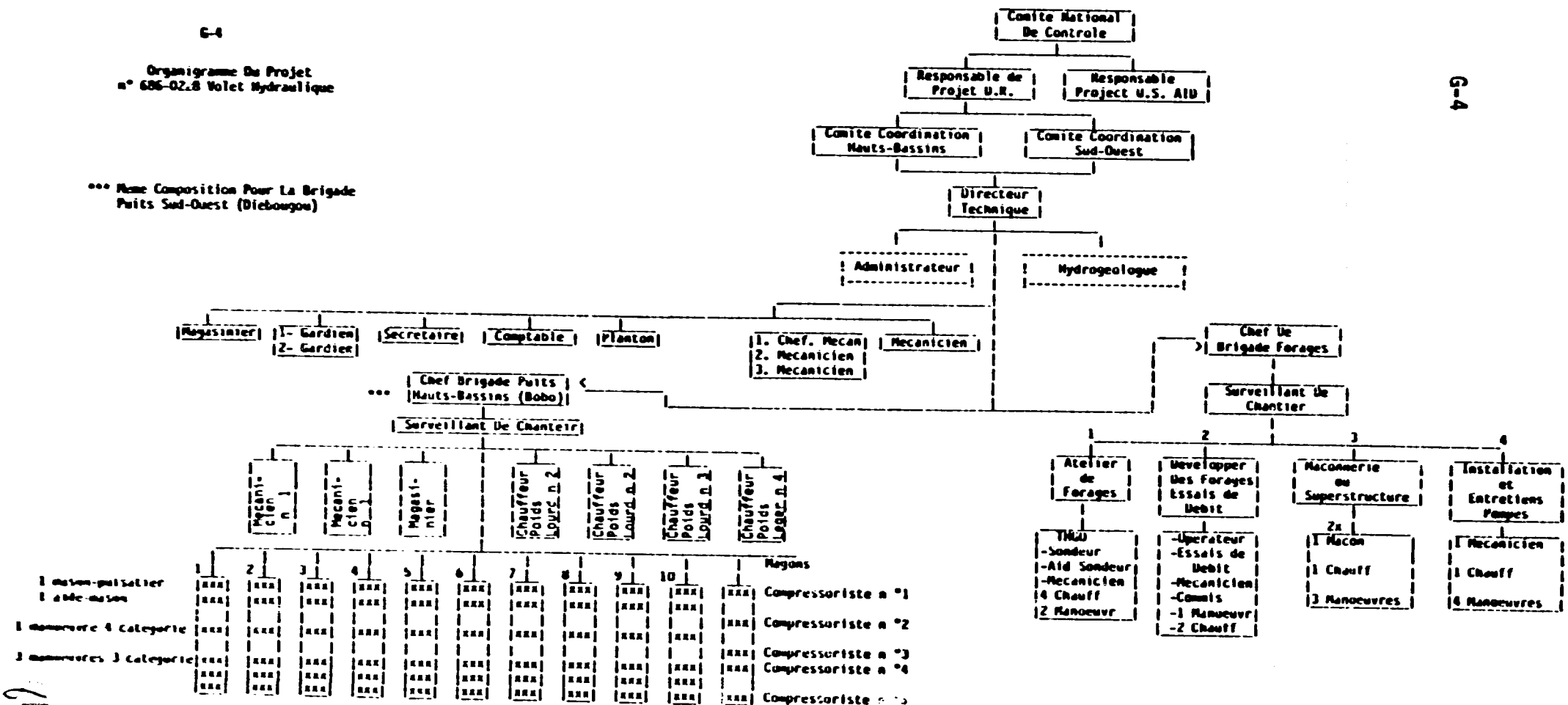
Organigramme Du Projet: Volet Sante
Projet n° 686-0228

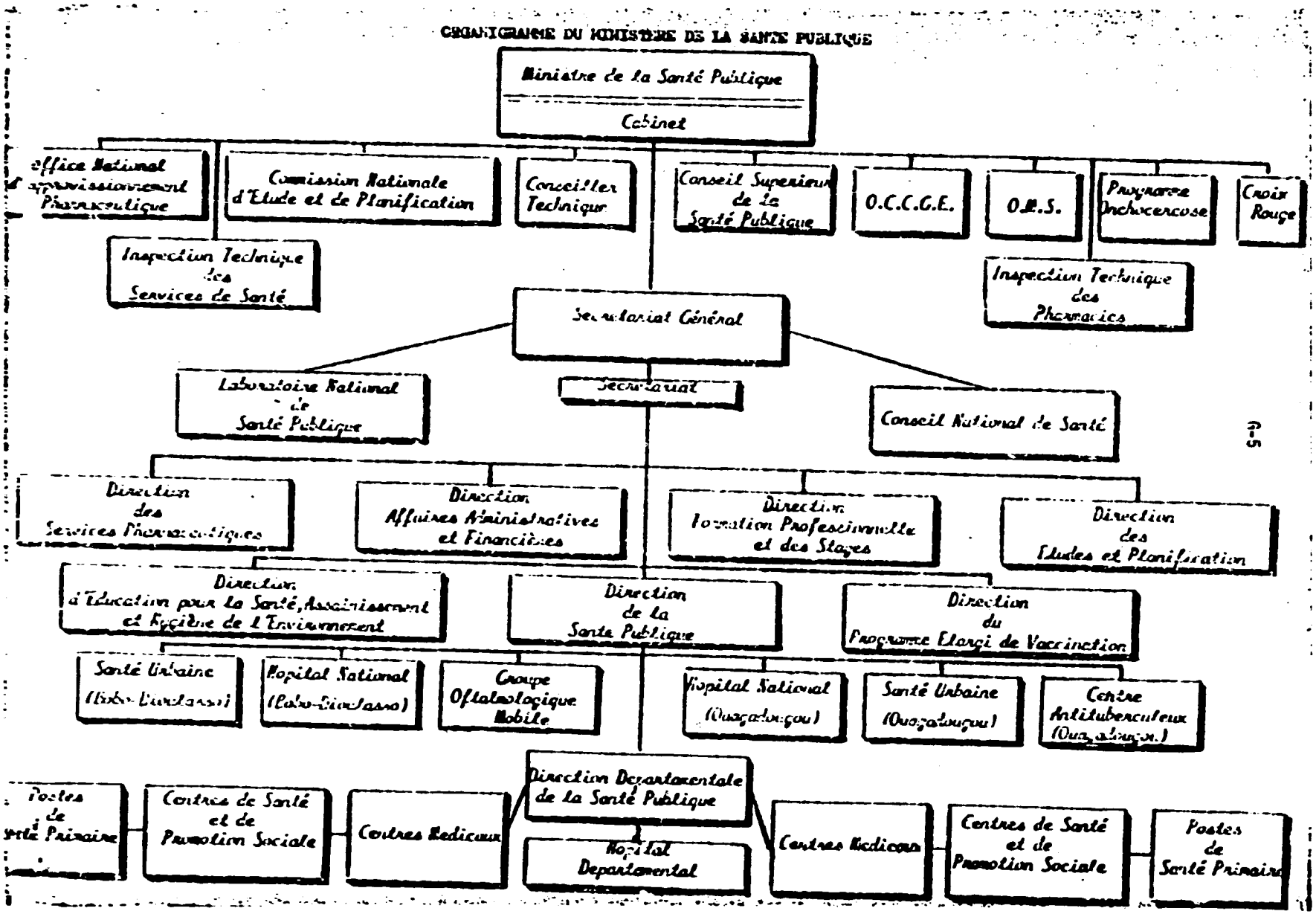


G-4

Organigramme Du Projet
n° 686-02.8 Volet Hydraulique

*** Meme Composition Pour La Brigade Puits Sud-Ouest (Diebougou)





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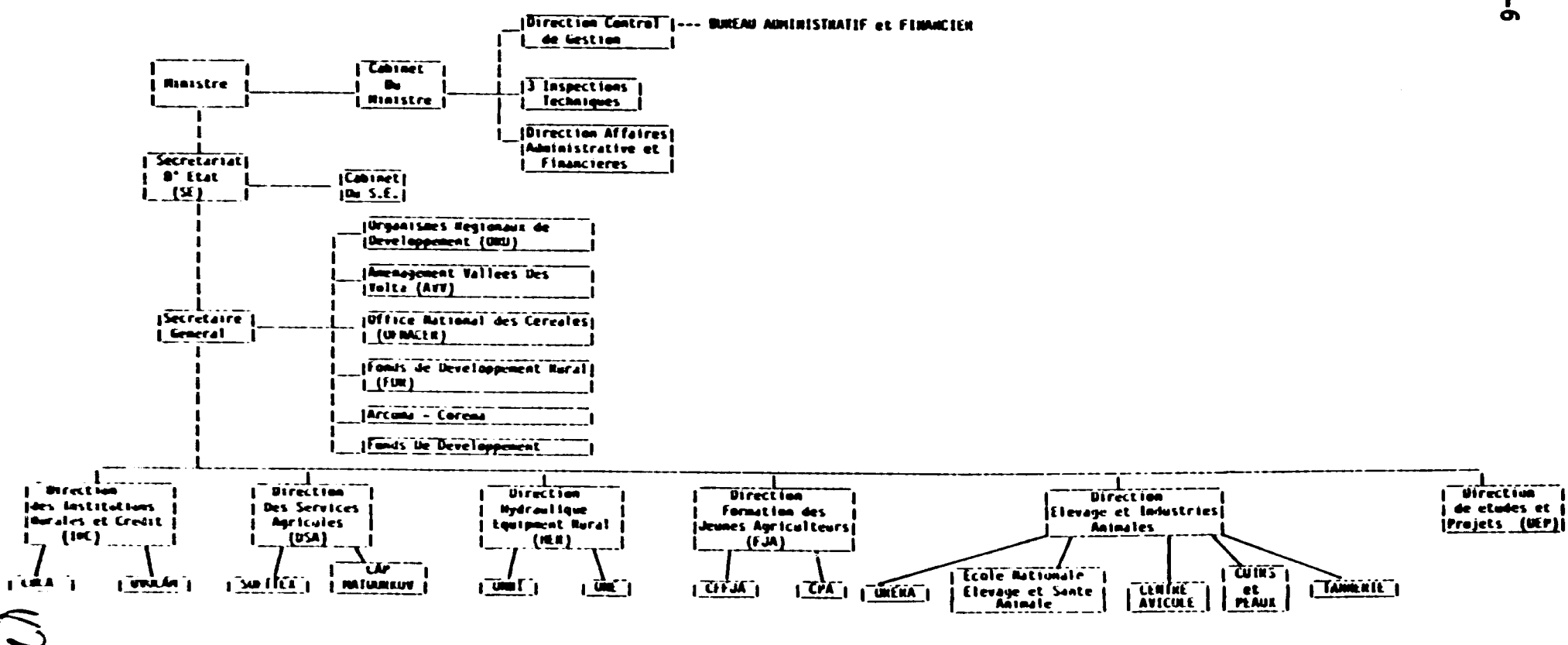
G-6

Organigramme Ministere Developpement Rural



G-7

Depenses Effectives

(non comprises celles effectives directement par l' US AID)

volet hydraulique et volet Santé

G-7

Depenses Effectives (non comprises celles faifes directement par l' US AID) du volet hydraulique

Dates	Montant Total	Salaires et indemnites	Entretiens Pieces et vehicules	Materiaux	Carburant et Lubrifiant	Frais Generause
Mars a Septembre 1980	37,528,604	14,280,555	9,212,144	1,519,978	11,957,470	564,457
Octobre a Decembre 1980	1,312,557	1,087,490	--	--	--	225,067
Janvier a Mars 1981	19,148,937	10,306,662	3,004,297	2,465,494	1,726,400	1,646,084
Avril a Juin 1981	19,862,013	12,359,222	1,505,363	288,544	5,100,923	607,961
Juillet a Septembre 1981	29,739,837	8,120,093	1,955,780	4,824,447	8,198,560	6,640,957
Octobre a Decembre 1981	33,063,049	13,783,415	1,141,523	6,476,421	9,234,390	2,427,300
Janvier 1982	8,142,298	5,633,363	--	148,140	1,720,795	640,000
Fevrier 1982	23,062,700	5,587,305	3,962,684	3,766,792	7,497,060	2,248,859
Mars 1982	18,589,760	7,619,296	592,843	1,482,724	6,292,640	2,602,257
Avril 1982	18,572,674	6,646,905	4,141,896	418,844	5,791,230	1,573,799
Mai 1982	21,701,659	6,515,205	2,166,460	1,108,071	9,656,650	2,255,273
Juin 1982	47,811,175	6,703,388	2,649,405	375,000	7,284,305	30,799,077
	278,535,263	98,642,898	30,332,395	22,874,555	74,454,423	52,231,091

Les chiffres sont exprimes en francs CFA.

Depenses Effectives (non comprises celles faites directement par l' US AID) du volet SANTE

Dates	Montant Total	Salaires et indemnites	Fourniture et Equipement Bureau	Essence	Entretien Motos	Formation AIs-ASV	Outres Materiels	Loyers Pour Volontaires	Divers
Novembre a Decembre 1980	57,605	51,955	5,650	--	--	--	--	--	--
Janvier a Mars 1980	4,789,850	304,394	1,339,226	161,752	2,957,828	--	--	--	26,650
Avril a Juin 1981	2,870,294	554,534	275,972	596,478	28,500	1,127,425	4,500	210,000	72,885
Juillet a Septembre 1981	4,960,731	787,883	1,120,655	1,265,185	56,235	1,538,822	--	210,000	--
Octobre a Decembre 1981	2,814,460	919,955	114,630	1,552,755	23,520	63,600	--	140,000	--
Janirer a Mars 1982	5,352,753	2,114,271	68,292	1,633,493	136,295	272,140	1,100,052	--	28,210
Avril a Juin 1982	6,820,361	2,383,050	231,001	2,384,887	128,234	1,582,258	--	--	110,931
Total Depenses	27,684,102	7,116,041	3,115,426	7,594,550	3,330,612	4,584,245	1,104,552	560,000	238,676

Les chiffres sont exprimes en francs CFA

Annex G-8

MINISTERE DU DEVELOPPEMENT RURAL

DIRECTION DE L'HYDRAULIQUE ET DE L'EQUIPEMENT RURAL

REPUBLIQUE DE HAUTE-VOLTA

Unité - Travail - Justice
-:-:-:-:-:-:-:-

N° 387 /DR/HER.-

LE MINISTRE DU DEVELOPPEMENT RURAL

Vu la proclamation du 25 Novembre 1980 ;

Vu l'Ordonnance N°80-001/CMRPN du 25 Novembre 1980 ;

Vu le Décret N°80-001/CMRPN du 26 Novembre 1980, portant composition du Comité Militaire de Redressement pour le Progrès National ;

Vu le Décret N°80-002/CMRPN du 26 Novembre, portant création du Comité Directeur au sein du Comité Militaire de Redressement pour le Progrès National ;

Vu le Décret N°80/011/PRES/CMRPN du 7 Décembre 1980, portant composition du Gouvernement ;

Vu le Décret N°81-008/PRES/CMRPN du 12 Janvier 1981, portant organisation type des Départements Ministériels ;

Vu le Décret N°81-0016/PRES/CMRPN du 13 Janvier 1981, portant définition des secteurs ministériels ;

Vu le Décret N°81-0324/PRES/CMRPN/MDR/SG du 7 Juillet 1981, portant attribution et réorganisation du Ministère du Développement Rural ;

Vu l'Arrêté N°56/DR/HER du 6 Octobre 1981, portant attribution et organisation de la Direction de l'Hydraulique et de l'Equipement Rural.

D E C I D E

ARTICLE 1er: L'organisation administrative et les modalités de gestion auxquelles doivent se conformer les projets d'Hydraulique Villageoise réalisés par la Direction de l'Hydraulique et de l'Equipement Rural avec financement extérieur sont fixées par les dispositions de la présente décision.

ARTICLE 2 : ORGANISATION ADMINISTRATIVE

- Les projets sont autonomes sur le plan technique et financier.
- Le Directeur de Projet est le Directeur de l'HER. Celui-ci délègue, en totalité ou en partie, la Direction des opérations au Chef de Projet.
- L'organisation d'un projet est en principe la suivante :
  - . Chef de Projet
  - . Une équipe de services généraux
  - . Une (ou plusieurs) brigade de puits et/ou un (ou plusieurs) atelier de forage.
  - . Une équipe de servicing (développement et essais)
  - . Une équipe d'animation
  - . Une équipe d'installation et maintenance des ouvrages.

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- Le personnel national des Projets est recruté ou mis à la disposition des Projets par la Direction de l'HER. La candidature du personnel expatrié fourni au titre de l'Assistance Technique doit avoir été approuvée par la Direction de l'HER.

- Le matériel d'un Projet est soit acheté sur le budget du Projet, soit transféré de la Direction de l'HER. Ce dernier cas peut s'appliquer en particulier à un atelier de forage.

  Le matériel transféré de la Direction de l'HER peut être mis à la disposition d'un Projet, suivant le besoin, soit pour la durée du Projet, soit pour une période déterminée. Ce matériel doit être restitué à la Direction de l'HER en complet et en état de fonctionnement, après reconstitution de la dotation initiale en pièces de rechange fournie avec le matériel. A moins de clauses particulières aucun amortissement de ce matériel n'est imputé au Projet.

ARTICLE 3 - MODALITES D'INTERVENTION

Les Projets soumettent à l'approbation de la Direction de l'HER :

- le planning annuel des différentes opérations :
  - animation
  - travaux de puits et forages
  - fourniture et pose de pompes
  - stages de formation
- les devis détaillés
  - des travaux à réaliser en régie administrative par le projet
  - des travaux à réaliser à l'Entreprise, s'il y a lieu.

La liste des villages à équiper dans le cadre d'un projet est élaborée par la Direction de l'HER. Cette liste est soumise à l'approbation d'une commission présidée par le Préfet du département concerné et composée du Directeur de l'HER, du Chef de Service Départemental de l'HER, du Chef de Projet, du Directeur de l'ORD, des Sous-Préfets, du Medecin Chef du Secteur et d'un représentant de l'organisme donateur.

L'ordre d'exécution des ouvrages au sein d'un programme est laissé à l'initiative du Projet.

Les normes d'exécution des ouvrages et le modèle des compte-rendus des travaux sont soumis à l'approbation de la Direction de l'HER.

ARTICLE 4 - EXECUTION DES TRAVAUX

- Mode d'exécution

Les travaux, sauf stipulation contraire, sont réalisés en régie par les Projets, avec leurs moyens propres.

Certains travaux, en particulier les travaux de forages et travaux annexes peuvent être réalisés en totalité ou en partie à l'Entreprise, après passation de marché sur appel d'offres.

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- Délais d'exécution

  Les travaux sont exécutés dans le cadre du planning général des Projets régulièrement ajusté.

- Marchés de travaux et fournitures

  Les Projets

  . établissent les procès-verbaux de réception provisoire de fournitures et travaux.

  . préparent les ordres de service prévus aux marchés ou nécessaire à la bonne marche des travaux et les soumettent à la signature du Directeur de l'HER.

  . établissent contradictoirement les attachements et situations mensuelles de travaux et fournitures.

  . établissent les décomptes provisoires de paiement qui sont visés par le Directeur de l'HER.

- Contrôle des Projets

  Les Projets sont soumis au contrôle technique et financier de la Direction de l'Hydraulique et de l'Equipement Rural. Un crédit est réservé à cette fin dans le budget des Projets (évaluation H.E.R.).

ARTICLE 5 - MODALITES D'ENGAGEMENT DES DEPENSES

- Le petit matériel et les matériaux sont achetés directement par les Projets auprès des fournisseurs locaux.
- Les pièces détachées qui ne pourraient pas être obtenues par l'intermédiaire de représentants locaux de fournisseurs peuvent être acquises à la diligence des Projets par accréditifs bancaires.
- Les Projets ouvrent un compte bancaire local sur lequel sera gérée leur caisse d'avance.

Tous les chèques doivent [illegible] signés par [illegible] chef de projet et de son [illegible] celle d'une personne habilitée conformément aux dispositions nationales en vigueur.

ARTICLE 6 - MODALITES FINANCIERES

- Caisse d'avance

  Au début d'un Projet il est crée une caisse d'avance dont la dotation initiale correspondant approximativement au montant des dépenses prévues durant les cinq premiers mois de fonctionnement du Projet, pour la partie gérée en régie administrative.

  Le gestionnaire en est le Chef de Projet sous le contrôle direct du Directeur de l'HER. Toute dépense supérieure à 1.000.000 F.CFA est soumise aux procédures nationales en vigueur.

- Fonctionnement de la Caisse d'Avance - Justification des dépenses

  La dotation initiale permet de préfinancer puis leur remboursement (après mise en oeuvre) les matériaux et autres frais liés à l'exécution d'un Projet.

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Le réapprovisionnement de la caisse d'avance s'effectue par le remboursement des dépenses effectuées sur présentation des pièces justificatives (factures, quittances, reçus...), jusqu'à concurrence du montant du devis des dépenses en régie établi pour le programme de la campagne concernée.

L'enregistrement des dépenses se fait de façon analytique afin de permettre le rapprochement des prix de revient à la fin de chaque campagne.

- Périodicité du réapprovisionnement de la Caisse

La justification des dépenses et leur remboursement consécutif ont lieu :
- Obligatoirement à la fin de chaque trimestre et en fin de campagne.
- Si nécessaire, à des périodes intermédiaires, si le montant total des dépenses concernées est supérieur à 20.000.000 F.CFA

ARTICLE 7 - PRESENTATION DES DOSSIERS DE JUSTIFICATION EN FIN DE CAMPAGNE

- Les dossiers sont présentés sous forme de décompte contenant une situation cumulative de l'avancement des chantiers avec application des prix unitaires des dossiers d'exécution approuvés. Les forfaits des dépenses d'encadrement sont appliqués au prorata des prestations réalisées.
- L'apurement global de la caisse en fin de campagne est décidé après approbation du rapport technique et financier accompagné des pièces justificatives.

  Au début de la campagne suivante une nouvelle avance est constituée sur la base du devis programme de cette campagne.

ARTICLE 8 - TENUE COMPTABLE DES PROJETS

Le système comptable doit permettre à un chef de projet de suivre :

- la situation des stocks (comptabilité matière),
- le coût de revient des moyens mis en oeuvre pour la réalisation du programme (engins, véhicules, personnel).
- le coût réel des ouvrages (frais directs) et des actions de vulgarisation.

  Il est tenu en outre une comptabilité des engagements.

  Les résultats de la comptabilité sont arrêtés périodiquement et au moins à la fin de chaque trimestre.

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ARTICLE 9 - RAPPORTS

Les chefs de Projet etablissent un rapport arrêtant la situation a la fin d'un trimestre et le presentent à la Direction de l'HER qui l'examine et le transmet à l'organisme de financement avant la fin du mois suivant ce trimestre.

Ce rapport contient :

- les commentaires au sujet de l'avancement des travaux et les autres éléments contenus dans les dossiers de paiement ;

- le resume des résultats de la comptabilité analytique avec les commentaires.

Les rapports de fin de campagne sont particulièrement documentés sur les résultats obtenus et moyens mis en oeuvre.

Ils servent de base à l'établissement (ou a la réorientation) des devis programmes des campagnes suivantes.

ARTICLE 10 - Les dispositions de la présente décision pourront être adaptés aux procedures que doivent suivre certains organismes donateurs.

ARTICLE 11 - La presente décision sera enregistrée et communiquee partout où besoin sera./-

Fait à Ouagadougou, le 2 Décembre 1981

Pour le Ministre du Developpement Rural et par delegation

Le Secrétaire d'Etat

IDO Batia Dominique

IATIONS :

Original
M.D.R.
Sécretariat d'Etat Général
Dtion HER
Dossier

Annex G-9

Executive Summary

I. What constraints does this project attempt to overcome and who does it constrain? Does the project attack labor, policy or other constraints?

The project attempts to improve the quality of life, to reduce debilitating disease and to increase the economic productivity of the rural population of southwestern Upper Volta through:

a) provision of adequate reliable and convenient water points (modern dug and drilled wells);

b) sanitary protection of the wells with sealed covers and hand pumps for water extraction;

c) establishment of a health education program to optimize the health benefits inherent in a potable water-supply system;

d) coordination of the objectives of the National Health Plan directed by the GOUV Ministry of Public Health with the long-term rural water development objectives of the Ministry of Rural Development; and

e) establishment of a system provided in the National Health Plan to train teachers and supervisors of Village Health Workers.

II. What technology does the project promote to relieve these constraints?

The project promotes:

a) the use of modern, sanitarily protected wells with hand pumps constructed under the project to reduce the consumption of water from polluted water points;

b) the sensitization (animation) of the villagers by Village Health Workers trained under the project on the need for the continuing protection of the water point against proximate sources of pollution; and

c) the education by Health Extension Agents (AIs) and Village Health Workers trained under the project of the villagers on the interrelations between disease, illness and the use and ingestion of polluted water and the need for sanitary protection of culinary and drinking water from the water point to the cooking pot.

III. What technology does the project attempt to replace?

The project attempts to replace:

a) the use of ponds, marshes, temporary water holes in stream channels and open poorly constructed, traditional wells--all of which are easily polluted;

b) the age-old beliefs and myths of the medicine man that disease and illness are related to behaviorial causes rather than to bacteria and/or viruses.

IV. Why do the project planners believe that the intended beneficiaries will adopt the proposed technology?

From the short-term point of view the first priority need of the rural population is an adequate, reliable and permanent water point. The project attempts to provide the water point as near as possible to the point of intended use by the beneficiaries. (Convenience.) In the long-term it is believed that improved health resulting from use of potable water will become self-evident among the user populations. (Improved health and increased productivity.)

V. What characteristics do the intended beneficiaries exhibit that have relevance to their adopting the proposed technology?

The beneficiaries (villagers) have, through representative on-site surveys, uniformily manifest their first priority is to have adequate, reliable and convenient water points and their second priority is to have adequate health education and care.

VI. What adoption rate has this project or previous projects achieved in transferring the proposed technology? Why have or have not the intended beneficiaries adopted this technology?

Virtually all of the sanitarily protected water points (wells) thus far installed have been enthusiastically accepted by the beneficiaries (villagers). They continue, at present, to use temporary nearby polluted water points in the rainy season because of (1) their relative convenience and because (2) the sensitization (animation) activities of the Health Extension Agents (AIs) and Village Health Workers (ASVs) have not yet been fully developed at the village level.

VII. Will the project set in motion forces that will induce further exploration of the constraints and improvements to the technological package proposed to overcome them?

A continuing framework (encadrement) for selection, training, supervision and replacement of Health Extension Agents and Village Health Workers is being set up in the Ministry of Public Health under the project. Also a continuing capability is being established in the Ministry of Rural Development for major pump repairs as well as for day-to-day minor maintenance of the water points by village mechanics-cum-water minders.

VIII. Do private input suppliers have incentives to examine the constraints addressed by the project and come up with solutions?

There is no evidence yet that private suppliers will have a role to play in the project. Such a role, however, may develop in the future with the need for well and pump replacements.

IX. What delivery system does the project employ to transfer the new technology to intended beneficiaries?

The Health Extension Agents, who in turn will train the Village Health Workers, are to be trained at the established Ecole National de Santé Publique in Bobo-Dioulasso. A pump and well maintenance brigade is being developed as a part of the Rural Engineering Service (HER) continuing activity from its Bobo-Dioulasso regional headquarters. This brigade will also supervise the encadrement, supervision and training of village mechanics-cum-water minders.

X. What training techniques does the project use to develop the delivery system?

The training of the Health Extension Agents uses a combination of classroom, audiovisual, and field instruction techniques directed by the Ecole National de Santé Publique. The HER uses a combination of "hands on" training of village mechanics and water minders during the installation and maintenance of hand pumps reinforced by project sanitarians during their visits to the beneficiary villages.

B. Technical Annexes (T)

T-1. Well Superstructure and Surroundings

T-2. Hydrogeologic Data Collection and Analysis

T-3. Hydrogeologic Considerations in Well Site Selection

T-4. Well Construction and Development

T-5. Assessment of the Moyno Handpump

T-6. Schedules of Dug and Drilled Wells visited by the Evaluation Team with on-site Observations and other Hydrogeologic Data

Well Superstructure and Surroundings

The protection of the sanitary quality of the potable water supplies, which are being developed from small-diameter drilled wells (forages) and from large-diameter dug wells (puits modernes), is a major concern of the present project. As users must necessarily draw their water requirements directly at the well itself, the project design has provided for the capping (covering) of project wells and the installation of a hand pump. Where properly designed and sealed, such covers together with the provision of concrete aprons can effectively prevent direct contamination of a well by spillage or other waste, and avoid the creation of mudholes for disease vectors.

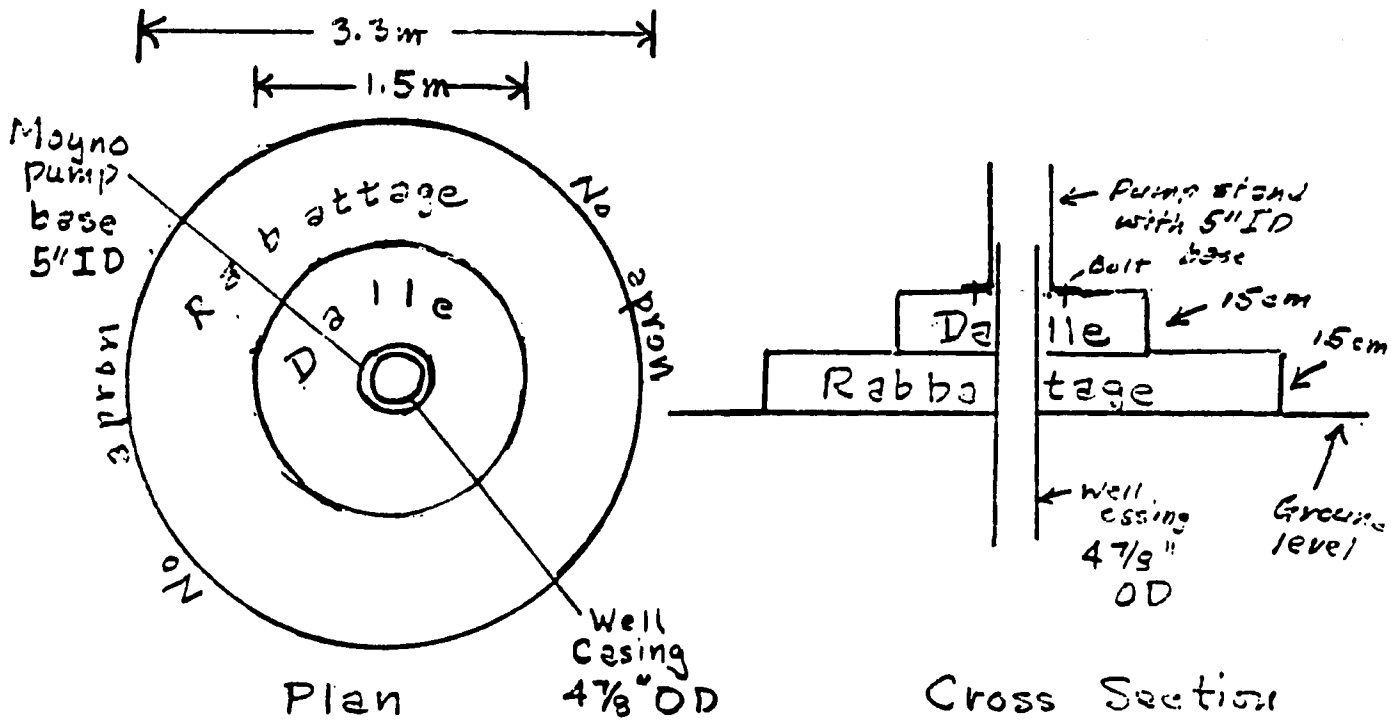
The HER in its well construction and water supply development program in Upper Volta has developed a standard design for the surface concrete superstructure at drilled wells (Figure 1A) and at dug wells (Figure 1B). The evaluation team examined some thirty wells, either completed or under construction, and generally was favorably impressed with the design of the superstructure. There are, however, some improvements which can be made at relatively little additional cost.

(1) One common problem the evaluation team observed is poor surface drainage near the well superstructures. The problem is aggravated by the prevailing flat topography and absence of good natural slopes for drainage. Consequently, mudholes tend to develop around well superstructures, forming breeding sites for disease vectors.

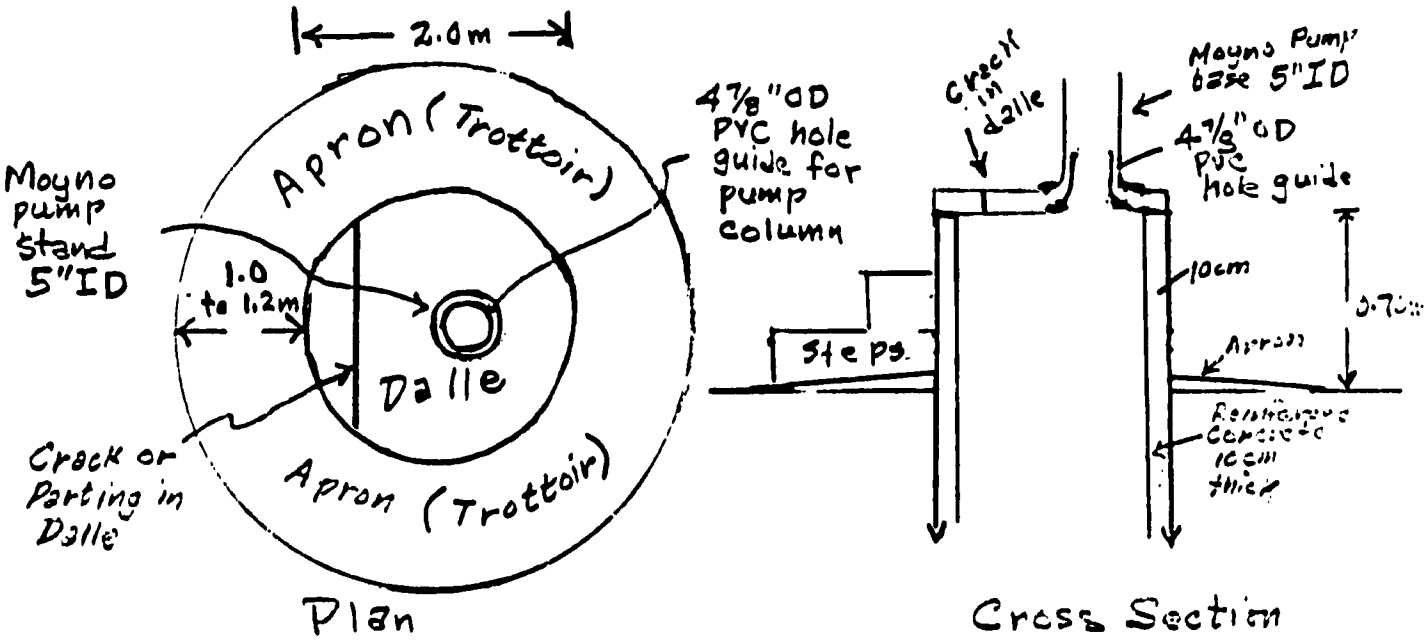
(2) Another problem is the absence of provision for a drainage apron (trottoir) in the standard superstructure of the drilled wells (forages). In the case of the dug wells (puits moderne) the existing aprons observed are two narrow (generally only 1.0 to 1.2 m wide) for good sanitary protection. Moreover, many existing aprons do not have sufficient slope to carry spillage and rainwater away from the immediate vicinity of the well. (An optimum slope is considered to be about 5 percent). It is recommended by the evaluation team that the width of the apron be increased to at least two meters and that a low concrete rim about 10 cm high be placed around the outer edge of the apron (trottoir). At the lowest point on the outer edge, a small cement-lined gutter (rigole) can be constructed to lead spillage and rain water runoff to a point about 5 m away from the well, where it can be used for gardening or allowed to soak away.

(3) A single concrete ring (buse) about 40 cm high, initially used for mixing cement, is usually left near the well site to serve as an "abreuvoir". These are usually too close to the well for good sanitation and should be used to a point at least 12 or 15 meters away from the well.

(4) Another concern of the evaluation team relates to the design of the concrete cover (dalle) used for dug wells. The design calls for casting the concrete with reinforcing steel in a circular steel mold about 10 cm high. A removable steel partition separates the cover into two pieces--the larger one containing a sealed aperture for the Moyno pump base. When set on the concrete rim (margelle) of the well, the small



Standard Superstructure around a Drilled Well (Figure 1A)



Standard Superstructure around a Dug Well (Figure 1B).

piece can be lifted off the well by the users in case of failure of the pump and water can be drawn by hand line and rubber or leather bags. Unfortunately, this design permits spillage and entrained pollutants to enter the well directly through the crack between the two pieces. The evaluation team noted instances in which the crack was as much as 2 to 3 cm wide extending entirely across the well cover. One relatively simple solution would be to fill the crack with cement at the time of emplacement of the dalle on the margelle. In case of pump failure, the crack could be reopened with hammer and chisel. The evaluation team suggests as better alternative that a lock hatch be constructed in the well cover (dalle). (Such a lockable hatch has already been specified in the GOUV/USAID Project Agreement). The join between the dalle and the margelle should also be cemented to provide a tight seal and to prevent snakes or other vermin from entering the well.

In addition to direct pollution of the well itself, there are other hazards for contamination of the aquifer which is tapped by the well. Such pollution sources include animal enclosures, waste dumps, latrines (particularly), or even the general accumulation of animal and human ordure in densely clustered villages. In general, it is advisable to place well sites on the outskirts of villages or at least in large open areas. Also other factors being equal, the well should have a radius of 50 m around it, clear of obvious contamination sources. Sanitary protection of aquifers is particularly important in the case of the dug wells (puits moderne) which generally tap the uppermost or shallowest ground water. The protection of the areas around drilled wells (forages) is less critical as these generally tap deeper water-bearing zones. The evaluation team during its visits to project wells found them generally well-sited with respect to sanitary protection and very few proximate sources of pollution were observed.

Hydrogeologic Data Collection and Analysis

The evaluation team noted that whereas the construction aspects of well drilling and digging in the project are moving along favorably, inadequate attention is being given to hydrogeologic data collection and anlysis. At present the hydrogeologist is occuppied almost full time in his tasks of well-site selection with very little free time available for the collection, compilation and analysis of valuable hydrogeologic data that become available from the well construction and development operations. Some of the more critical needs are outlined below:

(1) Establishment of a filing system in which all pertinent data on each water point (well) are recorded as the data become available. The data would include geographic coordinaties of the well, details of the well's construction, depth, water level, geologic log, altitude, yield, hydraulic characteristics, etc. These data would be recorded on a schedule (fiche) for each well. An example of such a fiche for a drilled well (forage) used by the HER is shown in Exhibit 10.

(2) Establishing a filing system for the inventory of villages in the project areas. (This work has already been initiated under the direction of the hydrogeologist and is making good progress. However, much remains to be done to make the data readily available to users on the project and elsewhere in the GOUV.)

(3) Establishment of observation wells. A national observation well network is now under development in the HER. Drilled wells (forages) which are considered negative should be converted to piezometers in which water levels can be measured periodically as part of the national network.

(4) Pumping (aquifer) tests. The importance of longer-term pumping tests especially of the higher yield wells (5 m3/hr or greater) has already been referred to in Annex T-4. In this regard there is a need to develop a standard step drawdown and recovery test to determine well yield versus pumping left and aquifer characteristics. Adequate time needs to be programmed for the field tests as well as for office computation of aquifer parameters. As this work is in the realm of the well development teams, these personnel need instruction in the basic requirements of data collection in the field as well as in the computations and analysis of the data.

(5) Water quality data, collection and analysis both chemical and bacteriological, are almost totalling lacking in the project at present. As a starter, a minimum of 20 water samples should be collected for chemical analysis from a suite of completed and operating drilled and dug wells widely scattered over the project area. The samples should be given complete laboratory analysis for all common avious and catious as well as pH, specific conductivity, silica, fluoride, and total dissolved solids. Also there is a need to set up a system of routine field measurements of water quality parameters such as temperature, pH, specific conductivity and alkalinity. These data should be filed together with other hydrogeologic data described in item 1 above.

(6) Office equipment is needed for the proper filing and storage of well and village schedules (fiches) and maps. The project should obtain filing cabinets, drafting stools, drafting tables, map files and chairs. (None of these are currently available for necessary hydrogeologic office work on the project.)

(7) Additional equipment and supplies are needed to carry out the work mentioned in item 2, 3, 4, and 5 above. Equipment and supplies needed would include graph paper, tracing paper, drafting equipment and supplies. For photogeologic studies a complete set of aerial photographs (scale 1:50,000) should be acquired for the project. If not available at the Institut Geographique de Haute Volta in Ouagadougou or the HER, they can be obtained from Institut Geographique National of France in Paris. In addition to the photographs, stereoscopic equipment including sketchmasters needs to be acquired for the detailed geologic analysis and interpretation of the photographs.

For pumping tests and routine water-level measurements additional electrical water-level measurements additional electrical water-level tapes, stop watches and a programmable calculator (calculation) are needed on the project. Also perhaps more precise means of measuring well discharges such as portable flumes. (Discharges are presently measured by stop watch in steel drums or buckets of know capacity.)

For field water-quality measurements thermometers, specific conductivity meters and pH meters are probably sufficient. However, protable field laboratories with capability for a larger number of water-quality determinations are also available.

Hydrogeologic Considerations in Well Site Selection

Within the realm of regional hydrogeologic problems in the project area is the presence on the plateau of an extensive belt of shales, slates, thin sandstones, and dolomites known as the "Etage schisto-greso-dolomitique" (ISGD). (See Carte Geologique do la Republique de Haute Volta, scale 1:1,000,000.) Experience to date suggests that the rocks of this group contain only weak aquifers and in places such as at Dinderosseo, drilled wells have been virtually dry holes. On the other hand shallow large diameter wells such as those at Banankiledara and Sourkoudougou, because of their large volume of "in well" storage have been successful in developing enough water to sustain a hand pump. The evaluation team recommends that in this belt of rocks preference be given to large diameter dug wells rather than drilled wells-particularly where the dry season position of the water table is less than 25 m below land surface.

The evaluation team noted that about 20% of the wells in the project ares have been failures in the sense that they yielded considerably less than the 500 l/hr which is the theoretical "success-failure" threshold. Most of these failures have occurred in the crystalline and metamorphic rock terrain of the Pre-Cambrian shield (socle). In this terrain a more precise siting of drilled wells could be made, in areas or zones known from past experience to be unfavorable, by geophysical surveys-particularly by the electrical resistivity method. (Equipment and expertise for this work is available on request from HER headquarters in Ouagadougou.) It is recommended that such surveys be made in problem areas in an effort to locate larger vertical or sub-vertical fractures which may contain important water-bearing zones which can be tapped by drilled wells.

All other factors being equal where weak aquifers prevail and the dry-season water table is less than 25 m below land surface, it is recommended that large diameter dug wells (puits) rather than drilled wells (forages) be constructed. Here again the "in-well" storage factor is the paramount consideration.

Well Construction and Development

The present project has as one of its overall objectives the construction of some 620 successful wells (water points) each sanitarily protected and equipped with a Moyne handpump. Of the 620 wells about 320 are to be small diameter drilled wells, 150 new large diameter dry wells and 150 deepenings and rehabilitations of existing large-diameter dug wells.

The Ingersoll-Round TH-60 drilling rig now used for construction of small diameter wells has capability for drilling in all the geologic terrains encountered in the project areas. Also the rig has the capability for rotary or downhole drilling with compressed air, foam or mud. First, a hole 6 to 7 5/8 inches in diameter is drilled to the total depth (commonly about 40 to 60 m) of the well using either (1) a roller cone bit with air foam or (2) a downhole hammer with compressed air and a 4 1/2 inch OD drill pipe. Once the maximum depth has been reached the drill tools are removed. Then one or two lengths (6 to 12 m) of 4 4 1/2 inch ID slotted PVC easing with openings .012 to .02 inches wide is attached at the bottom of a string of 4 1/2 inch blank PVC casing. The belled joints, which are 5 1/4 inch OD, are cemented together, as each pipe length is lowered into the borehole. Ater the casing with slotted section is in place finely crushed granite is introduced into the annulus simply by shovelling it in. This is known locally as gravel packing. The annulus above the gravel packing is then back filled with clay.

As the diameter of the drill-pipe is too large (4 1/2 inches OD) to be inserted in the well casing (4 1/2 inches ID), the drilling rig itself is not used for development and is moved off the site after emplacement of the gravel packing. Well development is carried out with a separate truck-mounted unit which included a small derrick, a compressor, a portable generator, airline pipe and a 100-liter drum is used measuring discharge with a stop watch. For longer term pumping tests a 3 1/2 inch submersible pump is used. This is powered by the portable generator from the well-development unit.

In its visits to well drilling sites the evaluation team was generally favorably impressed with drilling and well construction operations. There are, however, some <u>improvements</u> which can be suggested.

(1) With the TH-60 drilling rig it is possible to drill a 50 to 60 m 6 to 7 5/8 inch hole, set the 4 1/2 inch ID PVC casing, and install the gravel packing in a matter of a few hours. However, the development of a well is necessarily a more time-consuming process. At present most wells in the project are not developed for a sufficient length of time to attain full cleaning of the gravel pack and borehole walls (usually only 6 to 8 hours). Thus the full potential yield, particularly of lower yield wells, is not always fully attained. For this reason, it is <u>recommended</u> that all drilled wells be pumped for at least 12 hours and preferably longer for full development.

(2) The GOUV is particularly interested in knowning the hydraulic characteristics of wells capable of larger yields, that is, about 5 m3/hr. or more, as such wells might individually supply larger villages or small industries, if equipped with power pumps. On each such well, it is

recommended that a pumping test be made. The test should include, preferably, an 18 to 24 hour pumping cycle followed by an 18-hour recovery cycle during which water-level and discharges measurements would be made to determine the drawdown and recovery curve of the well and its hydraulic coefficients.

The construction of the modern hand dug well now used in the project still requires a large component of manual labor. Such a well usually begins with the excavation of a hole 2.0 m in diameter by local villagers using hand tools provided by the project. Digging is carried to as great a depth as possible by this means-usually down to the water table or until a soft covering formation is encountered. At this point a dewatering pump powered by a 250 CFM deisel-driven air compressor is brought in and digging continues to a depth which depends on the rate of water inflow and the strength of the formations encountered in digging.

When the maximum practicable depth below the water table has been reached in a consolidated formation, dewatering continues while masons erect internal steel forms in the 2.0 m hole. Reinforced concrete 0.10 m thick is then set to form a strong, smooth and imperious wall with a 1.80 m ID. The concrete wall is constructed starting from the bottom of the hole and extending up to the land surface.

After the wall is in place de-watering beings again and excavation continues using jackhammers with breaker bits. If the formation is hard consolidated rock such as granite, air star drills are used to place a pattern of blast holes. These are then packed with dynamite which is detonated by electrical blasting caps. Excavation is continued until the inflow of water exceeds capacity of the dewatering pump (usually about 50 m3/hr) or the bottom of the water-yielding formation is reached.

Where unconsolidated formations are encountered, the 1.80 m ID concrete curbing is still placed to as great a depth as possible. Then a sinking shoe with a 1.70 m OD and a 1.40 m ID is cast in place inside and at the bottom of the 1.80 m ID concrete curbing. This shoe is about 1.0m long and is tapered at the bottom so that the outside has a cutting edge. (See Wells Exhibit 2) On top of the shoe a concrete liner pipe 1.60 m OD and 1.40 m ID is cast in place. Sections are added at the top as a combination of understopping and dewatering are used to sink the liner into place. Generally, in the project a perforated liner pipe with gravel packing is used to stabilize the unconsolidated formation. Alternatively, the unconsolidated formation can be shut off from the well by using a solid wall liner and excavation continued until an underlying consolidated water-bearing formation is encountered.

The evaluation team visited the sites of several modern dug wells under construction and was favorably impressed with the competency of personnel and the efficiency of operations. One of the most common problems encountered in construction is the presence of a heaving clay layer (boue fluent) generally under the lateriate-particularly in granite terrains. Whereas this problem may delay the rate of progress and successful completion of such wells, it can generally be controlled with the inner liner (captage) and sinking shoe (trousse coupante) described above. The team recommends that this type of work is best pursued toward the end of the dry season when the heaving clay is at least partly dewatered as the water table declines into the underlying fractured zone.

Assessment of the Moyno Handpump

Only 16 handpumps had been installed by the project before the start of the present campaign, which provides us with very little field data for a conclusive assessment of their performance. While these pumps have so far not shown any major technical problems -- aside from a specific fault that has been traced by the manufacturer to a faulty electro-plating process -- it is nevertheless clear that the pump has three major drawbacks:

1) the impossibility, because of its design, to maintain the pump on the village level;

2) its relatively high cost, and

3) the fact that it is difficult to operate.

Of these, the first is by far the most serious one in the case of Upper Volta. These points are further discussed below:

Durability of the Pump

The original choice to use the Moyno pump, manufactured by Robbins and Myers, USA, was made already some four years back at the time the project paper was prepared. The two main criteria used to make this choice were (a) that it had to be a US pump, and (b) that it should be durable. The only supposedly systematic field test results of the performance of different handpumps which was available at that time was the Canadian-sponsored study in Ghana, in which the Moyno got high marks for durability. It has been found in the meantime, however, that the Ghana study was not as objective as had been claimed, and that the Dempster (another US-manufactured pump) in fact was not necessarily inferior to the Moyno, and might even have been better, especially if the factors of price and maintainability are also considered. Given the state of knowledge available to AID in 1978 about the performance of US-manufactured handpumps, the Moyno appears to have been the best choice then. What had not been foreseen, however, was (a) the rapid progress made in the last few years in the improvement of various handpump designs and the development of new types of pumps, and (b) a strong movement in developing countries (including Upper Volta) towards a decentralized, village-centered maintenance system.

The technical experts of the handpumps project consider it likely -- based, supposedly, on the claims by the manufacturer -- that the pumps will operate more-or-less troublefree for at least five years after installation. If one considers the evidence gained to date on the performance of the pumps, this claim is highly questionable. There is hardly a manufacturer who does not claim that his pump is unique and virtually free of maintenance, and that any evidence to the contrary represents merely an exception to the rule or was a biased observation.

The project itself has already experienced a major technical problem with its pumps. After installing several pumps of the first shipment, it was found that the chrome plating of the rotor had flaked off on some of them after they had been installed, rusting and pitting on the exposed steel surface. The manufacturer sent a representative who visually inspected all the rotors of the first

shipment, and concluded that some 150 rotors should be replaced. This was done, and the rotors have not given any problem since then. The manufacturer traced the problem to a faulty electrolysis operation in the factory, and said that the process had subsquently been changed. It remains to be seen whether other rotors of the first shipment have flaws in the chrome plating that could not be detected visually during inspection and which would show up only with time and use. Acidity of the water in some places (there is evidence that it might exist, juding from the fact that the spring which supplies Bobo-Dioulasso has pH of 4), and abrasive particles that enter the well could accelerate the process.

The Consumer Association Testing and Research Laboratories (CATR) in Britain just completed a 4000 hour endurance test on the Moyno pump. While the first 1000 hours of testing were trouble-free, the pump did have some problems after that, according to preliminary and as yet unpublished test results. (A summary of the results from the first two batches of pumps each tested by CATR, and of the interim results of the third and fourth batch of 6 pumps each which also contains the Moyno, is shown at the end of this annex.

Regarding the pump's durability, the conclusion that can be drawn is that the Moyno might well be more durable than most other pumps, but the validity of this claim is by no means certain. Problems which might frequently develop after some period of use are oil leaking from the gearbox into the rising pipe (an oil film on top of the water was in fact observed by the evaluating team at one of the pumps in Houndé) and a hardening or other failure of the stator.

Ease of Operation

Even though this is relatively minor point in the evaluation of the Moyno pump, it should be mentioned that compared to other pump types, the Moyno ranks low in ease of operation. On the CATR user trials (CATR, "Interim Report, Laboratory Tests on Hand-Operated Water Pumps for Use in Developing Countries, Report No. 1, February 1982, p. 28) the Moyno pump raked clearly the lowest from among all the 6 pumps tested in that batch on ease of operation. The likely reasons for this are (a) that the rotary motion required to operate the pump only make use of arm and shoulder muscles which -- especially with the elbow bent for most of the turn -- activates considerably weaker muscles than up and down or foot-operated pumping motions; and (b) the relatively low efficiency of the pump itself as measured by the ratio of input work (human labor) over the output work (water lifted; see CATR, pp. 34-37): the Moyno had by far the lowest efficiency of all 6 pumps in the batch under all three simulated heads of 7,25, and 45 meters.

It should be added, however, that no such complaints were found during our field visits. Perhaps because they lacked the comparison with other pump types, the villagers, when asked informally by members of the evaluating team if they found the pump inconvenient to operate, denied that they had any difficulty. The manner of operation by the users in the CATR laboratory was also different from that encountered in the field insofar as in Upper Volta it was usually two people who operated the pump, one on either side of the crank. This made it even possible for girls above age 10 or so to draw water.

In our view, ease of operation of the Moyno pump is not a significant factor in its use in the project. The fact that many households prefer drawing water from water holes or open wells during the rainy season would, in all likelihood, not be different had a more easily operable pump been installed.

One further remark concerning ease of operation: the Moyno pumps used in the project are of the IV type, as opposed to the 2V which requires a considerably greater effort, but which can draw water from over 40 m depth. We concur with the decision of the Technical Director (HER) to stick to the IV type unless the depth exceeds the limit of about 35 m beyond which point the output of the IV type drops off very rapidly.

Maintainability

The only major drawback of the Moyno pump is that it cannot be maintained at the village level, except for some tigthening of the exposed screws and possibly replacing the short bit of delivery pipe. All other maintenance and repair requires special tools and special skills which are beyond the capacity of a trained village mechanic.

Upper Volta is one of a rapidly increasing number of developing countries which has adopted in principle a system of decentralized maintenance. The key element of this policy is that all maintenance charges will after some period of adjustment, have to be borne by the village. Each village with a handpump is therefore required to institute a system of collecting FCFA 400 per capita per year for a village maintenance fund to pay for spare parts and for any government intervention that might be required for the repair of the pump. The village must also choose a responsible man in charge of the pump, who will receive a short training so that he can look after light maintenance of the pump, call the government maintenance team if necessary, and ultimately procure the spare parts.

This policy is close to what has been termed the VLOM (Village Level Operation and Maintenance) system, which is one of the main criteria in the global UNDP/World Bank handpump testing and development project. The aim of this project is to develop the technical preconditions -- in the form of proven handpump designs which are durable, suitable for VLOM, relatively inexpensive, and can be manufactured in developing countries. It should be understood in this connection that the Moyno is unsuitable for VLOM and will therefore not allow Upper Volta to establish a workable village-level maintenance system.

The maintenance system that has been proposed by the Technical Director (HER) is in our view unrealistic insofar as it is based on the ability and willingness of the villagers to pay for maintenance to be carried out by HER in addition to paying for the spare parts. This kind of maintenance has shown itself to be much more expensive than one where the village mechanic takes care of most maintenance and repair and calls for the mobile team only when a situation which he cannot handle has arisen. There is also the psychological factor to contend with that the pump will always remain 'government property" in the eyes of the villagers as long as it requires frequent government intervention to maintain and repair it.

Most to the 600 pumps which are to be installed under the project have already been purchased, and AID is committed to buying Moyno pumps also for the rest. These pumps will have to be maintained by HER until the end of their economic life, which will probably be around 8-10 years. The following measures are recommended:

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(1) To continue the meticulous and detailed recording of breakdowns and repairs for each pump, and to participate in the handpumps field testing that will be carried out in Upper Volta by the World Bank as part of a global testing program.

(2) To include the delivery of spare parts for the pumps under the current assistance project to reduce the high cost of maintenance to Upper Volta. Otherwise the risk that a large proportion of the installed pumps will be out of service after a few years due to lack of maintenace and repair will be even greater. The delivery of spares as part of the recommended extension of the project into Phase II will be even more crucial.

(3) A different pump should be chosen for Phase III. By the time Phase II project will be formulated, some preliminary results from the UNDP/World Bank global testing project will be out, and recommendations for an alternative pump might then become available from this study and from numerous other experiences with handpumps for rural water supply.

ABSTRACT OF ODA - HANDPUMPS LABORATORY TESTING

Re: Final Summary Report June 1980, Final Report January 1981

Manufacturer (Country of Origin)	Model	Deep/ shallow	Ex-Factory Cost per pump equival. in £ 1/	Type of pumps	Ease of Maintenance & Repair 2/	Results of Endurance Test: Hours	Failures	Performance	Reliability	Wear
Petropump (Sweden)	Type 95	deep	221.5 (excluding pipe)	Hand-operated diaphragmatic hose	9	670	pumping element disconnected. 962/ nut on handle loose. 1636/ pumping element split. 2848 /pumping element failed)212/ pumping element split	Adequate but low efficiency	Somewhat variable	Likely to be small
Vergnet (France)	Hydropompe Type AC 2	deep	421.7 (complete to 50m)	Foot-operated hydraulic operation, diaphragmatic hose	10	317 2000	significant wear in pedal rod guide. pedal rod guide worn right through.	Acceptable, low efficiency	Fairly good	
Bowpeter (USA)	23 F (CS)	deep	56.5 (excl. pipe and rod)	Hand-operated lift pump	8	930	pump rod broken. 1130 /pump rod broke again. 3037 / split pin on handle fulcrum bearing fractured	Good	Poor	
Mono (England)	ES 30	deep	370.4 (complete to 10m)	Hand-operated rotary, helical screw-type operation	6		No failures occured. (However, continual oil leakage from gearbox)	Poor	Very good	
Climax (England)	Not stated	deep	730.9 (complete to 21m)	Hand-operated flywheel-lift pump	2	1323	water leaking from pumpstand inspection covers. 1355 / Handle fractured.	Good	Very good	Likely to be minimal
Godwin (England)	W1 M51	deep	865.5 (complete to 21m)	Hand-operated geared lift pump	3		No failures occured	Adequate	Excellent	
ABI (Ivory Coast)	Type M	deep	358.3 (Excl. pipe & rod)	Hand-operated lift pump	9		No failures occured	Good	Excellent	Unlikely to cause problems
CSW (Beatty) (Canada)	1205	deep	163 (excl. pipe and rod)	Hand-operated lift pump	4		No failures occured	Fairly good	Quite good	
Monarch (Canada)	P 3	deep	359 (complete to 30 m)	Hand-operated lift pump	5	2772 3692	Wooden handle loose Pump rod top guide bush worn through	Good	Quite good	
Kangaroo (Holland)	Not stated	deep	282.5 (Complete to 20m)	Foot/Spring-operated lift pump	7	251 400	Spring in pumpstand broken No spares, pump removed from test	Poor	Very poor	
India (India)	Mark II	deep	64.9 (excl. pipe and rod)	Hand-operated lift pump	6		No failures occured	Fairly good	Excellent	Unlikely to be a problem
Cannellon (United Kingdom)	L D 5	deep	296.8 (complete to 2m)	Hand-operated lift pump	8		No failures occured	Quite good	Good	

Remarks: 1/Price basis late 1977/early 1978

2/Rating: 1 poor, 10 very good

ABSTRACT of UNDP INT/81/026 Handpumps Laboratory Testing (1981 -

Re: Report No. 1, March 1981

Code	MANUFACTURER (Country of origin)	Model	Deep/ Shallow	Ex-factory cost per pump equiv. in US$ 1)	Type of pump	Ease of maintenance and repair (2)	Hours	Results of Endurance Test: Failures within the first 1000/300 hours	Comments
A	Saha Kolkara (Thailand)	Korat 608 608 A-1	deep	295 (incl. pipe & rod)	Hand-operated pump	4	1000 hours	No failures	Pump cylinder top casing found to leak during foot valve leakage test. Casting imperfect.
C	Robbins and Myers (USA)	Moyno IV 2.6	deep	641 (incl. pipe & rod)	Hand-operated rotary, helical screw-type operation	1	1000 hours	No failures	No apparent problems.
D	Brimo SA (France)	Hepta	deep	910 3) (Incl. pipe & rod)	Hand-operated lift-pump	2	1000 hours	No failures	Handle pivot bearings noisy, in need of lubrification.
F	UNICEF (Bangladesh)	New No. 6	shallow	20	Hand-operated	5	1000 hours	No failures	No apparent problems.
G	Vammalan Kaapeli a Oy (Finland)	Hira AF-76	deep	330 (incl. pipe & rod)	Hand-operated lift-pump	3	1000 hours	Handle broken after 314 hours	Handle broke in a region of high stress.
L	UNICEF (Indonesia)	Bandung	shallow	54	Hand-operated	4	1000 hours	Cup seal split after 809 hours	Cup seal replaced.
B	Kawamoto (Japan)	Dragon No. 2 (D)	deep	184	Hand-operated lift-pump	2	300 hours	No failures	
E	Atlas Copco (Kenya)	Kenya	deep	669	Hand-operated lift-pump	4	300 hours	Severe wear in pump rod connecting tube after 153 hours	Severe wear probably caused by out-of-line forces.
H	IBRC Ethiopia (Ethiopia)	BP	shallow	75	Hand-operated	5	300 hours	No failures	
J	Vereinigte Edelstahlwerke (Austria)	A 18	deep	1286	Hand-operated	1	300 hours	Severe wear after 153 hours. Handle broken after 177 hours.	Severe wear of crank pin and webs and connecting li one bearing worn away. Test stopped.
K	Sea Commercial Co. (Philippines)	Jetmatic	deep	38	Hand-operated	3	300 hours	Cylinder dislocated after 280 hours	Outlet diverter valve (for tank filling) can be dislodged by the vibration caused by usage.
M	[3] (Indonesia)	AID/ Bakelle	deep	120	Hand-operated	3	300 hours	Severe wear after 248 hours. Connecting rod broken after 287 hours.	Severe wear probably caused by misalignment. Pump difficult to align.

Remarks: 1) Exchange rates: June 5, 1981 (A, C, D, F, G, L); November 30, 1981 (B, E, H, J, K, M)

2) Rating: 1 very difficult, 5 very easy

3) Estimated, precise ex-factory price not clear from invoice

Annex T-6

Schedules of Dug and Drilled Wells visited by the Evaluation Team with on-site Observations and other Hydrogeologic Data

July 1982

ID, Inside Diameter
OD, Outside Diameter
MP, Measuring Point
GL, Ground Level or Land Surface

Village Sanandeni Quartier

Sous-Préfecture Bobo Dioulasso Canton

Données pour le village : Accès 25 Km NW of Bobo Dioulasso

Population Type d'habitat Dispersed

Topographie Flat

Carte Bobo Dioulasso 1:200,000 carré I/16 carré I/36

Coordonnees

	MM	KM	MTU		°	'	"
X				Latitude			
Y				Longitude			

Z m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage			/	
Nombre en saison sèche			/	

Données pour un puits : à *HER/USAID

Date			
Heure			
Côte de sol			
Niveau d'eau			
Profondeur			
Niveau d'eau en fin saison sèche			
Niveau d'eau en saison des pluies			
Margelle			

Repère Distance m Angle °

Observations

* Well under construction. No curbing. No water has been encountered yet. Have reached a depth of 12m and could not advance digging because a layer of hard quartzitic sandstone was encountered at 12 m. Recommend deepening by drilling with TH 60 rig and completion of a "puits-forage" well due in dark gray shale with a layer of quartzitic sandstone. Well is located 300 m from village and [illegible] of users.

Observateur

~~Réservoir~~

Best Available Document

Village Banaradougou Quartier

Sous-Préfecture Bobo Dioulasso Canton Bobo Dioulasso

Données pour le village : Accès 20 Km NW of Bobo Dioulasso

Population 183 Type d'habitat Grouped

Topographie Flat

Carte Bobo Dioulasso 1:200,000 carré I/15 11 carré I/36 23

Coordonnées

	MM	MM	MTU		°	'	"
X	356	71.5	353.2	Latitude	11	20	0.5
Y	184	36.9	1253.2	Longitude	04	20	40

Z ±322 m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage	River	9	1	0
Nombre en saison sèche	Dry	2	1	0

Données pour un puits : à Traditional *HER/USAID

Date	Dec. 10, 1981		
Heure	1630		
Côte de sol	± 322		
Niveau d'eau	3.05	16.95	MD = top of margelle, 0.70m above land surface
Profondeur	4.70	*17.50	
Niveau d'eau en fin saison sèche	Dry		
Niveau d'eau en saison des pluies	1.00		⊙ 1.90 m
Margelle	⊙ 0.80m		

Repère Distance m Angle

Observations

* Well under construction. No apron yet. Location OK.
No proximate sources of pollution.
Well dug in fissile slaty shales of gray to cream color.

Observateur

Rév. du 5/7/82

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Village Sourkoudougou Quartier

Sous-Préfecture Bobo Dioulasso Canton Bobo Dioulasso

Données pour le village : Accès 19 Km NW of Bobo Dioulasso

Population 264 Type d'habitat Grouped

Topographie Flat

Carte Bobo Dioulasso (1:200,000) carré I/15 14 carré I/16 27

Coordonnées

	MM	MM	MTU		°	'	"
X	360	72.3	354.6	Latitude	11	19	50
Y	182	36.5	1252.8	Longitude	04	20	15

Z 320± m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage	River	12	1	0
Nombre en saison sèche	Dry	2	1	0

Données pour un puits : à Traditional well *HER/USAID

Date	Dec. 10, 1951	July 9, 1982	
Heure	1550	0920	
Côte de sol	±320 m		
Niveau d'eau	2.55 m	4.62 m	MP = top of margelle, 0.70 m above ground level
Profondeur	4.55 m	18.40 m	
Niveau d'eau en fin saison sèche	Dry		
Niveau d'eau en saison des pluies	1.00		⊙ 1.50 m
Margelle ⊙ 1.40 m	0.40 m		

Repère Distance m Angle °

Observations

*yield of well will probably exceed 1 m³/h during most of the year. Well recently completed but not yet equipped. Apron (trottoir) has a good slope but is too narrow (1.5 m). Location good. No evident Pollution Sources.

Well dug in thin-bedded compact sandstone interbedded with compact dark gray shale.

~~Observateur~~

Rév. du 5/7/82

112

Village Bansankélédara Quartier

Sous-Préfecture Bobo Dioulasso Canton Bobo Dioulasso

Données pour le village : Accès Easy in all seasons

Population 665 Type d'habitat Grouped

Topographie Slightly undulating

Carte Bobo Dioulasso 1:200,000 carré I/16 11 carré I/36 29

Coordonnées

	MM	KM	MTU		°	'	"
X	366	73.0	355.4	Latitude	11	19	05
Y	175	35.0	1251.4	Longitude	04	19	50

Z 323 m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage	River	> 20	4	0
Nombre en saison sèche	Dry	3		0

Données pour un puits : à Traditional well Chief's compound *HER/USAID

Date	Dec. 10, 1981	July 9, 1982	
Heure	1520		
Côte de sol			
Niveau d'eau	11.72m	15.72m	-
Profondeur	12.44m	21.35m	MP = top of margelle 0.70 m above land surface
Niveau d'eau en fin saison seche	Sec		
Niveau d'eau en saison des pluies	4.15m		
Margelle ⊙ 1.40	0.10m		⊙ 1.80 m ID 2.00 m OD.

Repère Distance m Angle

Observations

*Well dug in thin bedded compact sandstone with some layers of dark gray slaty shale and dolomite.
Apron (trottoir) is too narrow (only about 1.5m). Should be widened to 2.0 m. Muddy around apron. Poor drainage. Location OK. No latrines nearby. Well recently finished and not yet equipped.
Most traditional wells in vicinity go dry in dry season.

~~Observations~~

Rév. du 5/7/82

11(1)

Village Karankasso Sembla Quartier Massasso

Sous-Préfecture Bobo Dioulasso Canton

Données pour le village : Accès

Population 2085 Type d'habitat Groupé

Topographie Level flat

Carte Bobo Dioulasso 1:200,000 carré I/16 14 carré I/36 27

Coordonnées

	MM	MM	MTU		°	'	"
X	195	39.0	321.0	Latitude	11	13	45
Y	126	25.2	1241.7	Longitude	4	38	35

Z 354 m à bridge (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage	1 zone	23	0	* 1
Nombre en saison sèche	0	3	0	1

Données pour un puits : à	Traditional well in Chief's compound		*HER/USAID
Date	Dec 8, 1981		
Heure	0902		
Côte de sol	362		
Niveau d'eau	5.20		
Profondeur	6.30	⊙ 0.90 m	62 m
Niveau d'eau en fin saison sèche	Sec		
Niveau d'eau en saison des pluies	3.05		⊙ 4½-inch PVC
Margelle			

Repère _____ Distance _____ m Angle _____ °

Observations

* Drilled to 62 m on 9 July 1982. Casing and gravel packed but no development or yield test yet. All traditional wells go dry in dry season. Villagers take water from puisards in nearby ephemeral watercourse during dry season. Acute shortage of water in dry season.

Observateur _____

Rév. du 5/7/82

Village Naro Quartier

Sous-Préfecture Dano Canton Guéguéré

Données pour le village : Accès 8 Km N of Guéguéré

Population 300 Type d'habitat Dispersed

Topographie Level

Carte Hounde 1:200,000 carré I/15 carre I/36

Coordonnées

	MM	MM	MTU		°	'	"
X	477			Latitude			
Y	1236.5			Longitude			

Z 285 m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage	2	2	*1	0
Nombre en saison sèche	2	2	1	0

Donnees pour un puits : à ↓ * HER/US AID Puits moderne

Date			
Heure			
Côte de sol			
Niveau d'eau			
Profondeur	7 to 8 m	7.70m	ø 1.90 m ID
Niveau d'eau en fin saison sèche	3		Capped 2.00 m OD
Niveau d'eau en saison des pluies	5 to 6		
Margelle		0.70 m above GL	

Repère Distance m Angle

Observations 0-6 m Lateritic crust and lateritic clays; 6-10 m Clayey fluid arkose; 10 m Arkose (weathered granite) yields of traditional wells less than 170 l/d each at end of dry seasons

* HER/US AID puits moderne equipped with operating Mayno pump. Set 1.40 m perf. and gravel packed section 1.0 m long in bottom. Ground-water levels fluctuate between 2.00 m at end of wet season to 5.30 m at end of dry season (below land surface).

~~Observateur~~

Rév. du 5/7/82

15

Village Kovio Quartier

Sous-Préfecture Dano Canton Founzo

Données pour le village : Accès 11 Km SW of Fano

Population 707 Type d'habitat Dispersed

Topographie Level Elev. 285

Carte Hounde 1:200,000 carré I/15 carré I/16

Coordonnées

	MM	MM	MTU		°	'	"
X	465.7			Latitude			
Y	12606			Longitude			

Z 296 m à (Carte, Altimetre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage	1	4	0	* 0
Nombre en saison sèche	1	1	0	0

Données pour un puits : à ✓ *HER/USAID

Date	Dec 8, 1972		
Heure			
Côte de sol			
Niveau d'eau	4.30		Very little water
Profondeur	5.00		51.25 m
Niveau d'eau en fin saison sèche			
Niveau d'eau en saison des pluies			
Margelle	0.40 m	⊙ 1.30 m	

Repère Distance m Angle °

Observations

* A forage drilled in 1982. Not developed. Very little water.
The weathered zone on granite is only about 4 m thick with thick laterite caps. Most puits traditionnels fail in dry seasons.
Detailed geophysical study recommend to locate fracture zones for additional test drillings.
Acute water shortages.

~~Observateur~~

Rév. du 5/7/82

116

Village Bonzan Bobo Quartier

Sous-Préfecture Dano Canton Founzan

Données pour le village : Accès Easy from Founzan about 3 km S.

Population 899 Type d'habitat Grouped

Topographie Level

Carte Hounde, 1:200,000 carré I/16 12 carré I/36 24

Coordonnées

	MM	IM	MTU		°	'	"
X	423	84.9	475.7	Latitude	11	25	20
Y	233	46.7	1262.7	Longitude	03	13	20

Z 285 m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage	-	± 10	1	0
Nombre en saison sèche	1	-	1	0

Données pour un puits : à

		* Puits Moderne Concession Chef	
Date		Dec. 22, 1981	
Heure		1445	
Côte de sol			
Niveau d'eau		14.97 m	MP = top of margelle, 0.73 above ground level
Profondeur		14.99 m	
Niveau d'eau en fin saison sèche		Traces	
Niveau d'eau en saison des pluies		3.98 m	
Margelle		⊙ 1.90 m ID	

Repère Bldg Distance 50 m m Angle SSE

Observations

*The lined well was constructed in 1979 but virtually goes dry in dry season, as do the traditional wells. Originally scheduled for a new HER/US AID puits or forage but then taken off list. Why? The only viable water points in the dry season are puisards located in an ephemeral stream channel near the village. A deepening of the "puits moderne" is recommended.

~~Observateur~~ Well dug in weathered medium-grained granite

Rév. du 5/7/82

111

Village Bobora (Sazáu) Quartier

Sous-Préfecture Dano Canton Koper

Données pour le village : Accès About 20 km ESE of Dano

Population 1600 Type d'habitat Dispersed

Topographie Low flat

Carte LCO 1:200,000 carré I/16 carré I/36

Coordonnées

	MM	KM	MTU		°	'	"
X	507.5			Latitude			
Y	1225.			Longitude			

Z 250 m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage	2	6	*1	0
Nombre en saison sèche	2	5	1	0

*HER/USAID

Données pour un puits : à

Date			
Heure			
Côte de sol			
Niveau d'eau		Dry at 10.65m	MP = top of
Profondeur	8 to 10m		manganite, 0.75m above GL
Niveau d'eau en fin saison sèche	7 to 9m		
Niveau d'eau en saison des pluies	2 to 3m		
Margelle			

Repère Distance m Angle °

Observations

Granite outcrops in vicinity. Laterite and arkosic (weathered) granite form shallow aquifers i.e. less than 10 m below land surface. Puisards near principal marigot are principal water sources in dry season.

* Dry. Constructed in 1980 or 1981. * Temporarily stopped by hitting clay but will finish well with the sinking shoe method. Villagers not interested in well.

Observateur

Rév. du 5/7/82

118

Village Léna Quartier

Sous-Préfecture Bobo Dioulasso Canton

Données pour le village : Accès 55 Km east of Bobo Dioulasso

Population Type d'habitat Dispersed

Topographie Flat plain

Carte Houndé carré I/16 10 carré I/36 25

Coordonnées

	MM	MM	MTU		°	'	"
X				Latitude			
Y				Longitude			

Z m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage	?	?	?	/
Nombre en saison sèche	?	?	?	/

Données pour un puits : à

Date			June 30, 1982
Heure			
Côte de sol			
Niveau d'eau			5.00 m
Profondeur			* 30.36 m
Niveau d'eau en fin saison sèche			
Niveau d'eau en saison des pluies			
Margelle			

Repère Distance m Angle °

Observations

* Drilled well 4½-inches diam. PVC casing
Yield tested by air lift at 0.300 m³/hr.
Equipped with Moyno pump. Site is in open area. OK.
School here. Also dispensary and infirmary constructed by villagers

Observateur

Rév. du 5/7/82

111

Village Walena Quartier

Sous-Préfecture Bobo Dioulasso Canton

Données pour le village : Accès 50 Km east of Bobo Dioulasso

Population 218 Type d'habitat Grouped

Topographie Flat plain

Carte Houndé carré I/16 10 carré I/36 25

Coordonnées

	MM	MM	MTU		°	'	"
X	45	9.0	395.9	Latitude	11	18	15
Y	167.5	33.6	1249.8	Longitude	3	55	00

Z _____ m à _____ (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage	1	2	1	0
Nombre en saison sèche	1	0	1	0

Données pour un puits : à		Puits d'entreprise Chef de village	HER/USAID No wells yet
Date	June 24, 1992		
Heure	11:25 am		
Côte de sol	284		
Niveau d'eau	9.33		
Profondeur	13.90	⊙ 0.90 m ID	
Niveau d'eau en fin saison sèche	13.80		
Niveau d'eau en saison des pluies	4.35		
Margelle			

Repère _____ Distance _____ m Angle _____ °

Observations

Acute water shortage in dry season. Modern enterprise well of village chief. Yield declines markedly in the dry season and sometimes goes dry. Traditional wells go dry in dry season. Villagers have collected 50,000 CFAs toward a modern large diameter well, but it has been decided that a drilled well (forage) will be put down here, because the geologic terrain is a very hard gneissic migmatite and total depth required may be as much as 45 m.

~~Observation~~

Rév. du 5/7/82

120

Village Kounolimi Ba Quartier

Sous-Préfecture Bobo Dialasso Canton Katedougou

Données pour le village : Accès 30 Km east of Bobo Dialasso

Population 665 Type d'habitat Grouped

Topographie Relatively flat; at ed

Carte Bobo Dialasso carré I/16 16 carré I/36 30

Coordonnées

	MM	IGN	MTU		°	'	"
X	507	101.6	383.2	Latitude	11	13	25
Y	123	24.6	1240.8	Longitude	04	04	10

Z _____ m à _____ (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage	1	3	* 1	None
Nombre en saison sèche	1	0	1	do

Données pour un puits : à _____ HERIDS AID Puits Moderne

Date	24 June 1982		6 July 1982
Heure	9:07 am		10:23 am
Côte de sol	± 301 m		
Niveau d'eau	6.67 m		3.45 m
Profondeur	12.18 m		12.70 m
Niveau d'eau en fin saison sèche			*
Niveau d'eau en saison des pluies			*
Margelle	0.70 m	⊙ 1.80 m diam ID ⊙ 2.00 m diam OD	

Repère _____ Distance _____ m Angle _____ °

Observations

* Under construction 6 July 1982. Operations have ceased until next dry season. Water struck in weathered reddish granite gneiss. Site location at edge of village. Good surface drainage toward bas-fond which can provide recharge to the aquifer.

Observateur _____

Rév. du 5/7/82

Village Kotédougou Bobo Quartier

Sous-Préfecture Bobo Dioulasso Canton Kotédougou

Données pour le village : Accès 18 Km east of Bobo Dioulasso

Population Type d'habitat Dispersed

Topographie Slight elevation

Carte Bobo Dialasso carré I/16 16 carré I/36 30

Coordonnées

	MM	KM	MTU		°	'	"
X	472	94.6	376.2	Latitude	11	17	05
Y	111	22.6	1238.4	Longitude	4	08	00

Z 361 m à PC (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage	0	1	None	1
Nombre en saison sèche	4	0	do	1

Données pour un puits : à HER/USAID Forage

Date	24 June 1988		*22 May 1981
Heure	8:27 am		
Côte de sol	± 346 m		
Niveau d'eau	6.34 m		*3.60
Profondeur	7.22 m	⊙ 0.8 m diam.	*41.05
Niveau d'eau en fin saison sèche	7.22 m		
Niveau d'eau en saison des pluies	0.75 m		4½-inch
Margelle	0.37 m		PVC Casing

Repère Distance m Angle °

Observations

*Data obtained at time of completion – 2.00 m³/h. Moyno pump set on standard 1.5 m X 0.15 m circular base and 3.31 m x 0.15 m circular gallery. Poor surface drainage, puddles from spillages. Well drilled in rose-colored gneissic granite. Water struck at 30.50 m. During field visit well pumped at 1.23 to 1.39 m³/h for 15 minutes. Pump yield diminished and irregular after 20 minutes. Four (4) users waiting for turn at pump. During dry season long lines form at pump with fights between users. Well yield diminishes and users must wait long period for well to recover after pumping. Pump intake at 32.90 m.

Observateur

Rév. du 5/7/82

Village Baré Quartier

Sous-Préfecture Bobo Dioulasso Canton

Données pour le village : Accès On Bobo Dioulasso - Diebougou Km N6

Population Type d'habitat Large village Disperse

Topographie Flat terrain

Carte carré I/15 carré I/36

Coordonnées

	MM	MM	MTU		°	'	"
X				Latitude			
Y				Longitude			

Z m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage				/
Nombre en saison sèche				/

Données pour un puits : à *HER/USAID

Date			
Heure			
Côte de sol			
Niveau d'eau			
Profondeur			*55m
Niveau d'eau en fin saison sèche			
Niveau d'eau en saison des pluies			
Margelle			

Repère Distance m Angle °

Observations

*Finished in Feb. 1982. Yield by air lift 2.0 m³/hr. Standard HER superstructure. No apron. Some shallow mudholes in vicinity. Yield of the drilled well is good even in the dry season. Moyno pump installed. Operation OK. Only one young girl at pump now. (People are now using more convenient traditional wells.) When traditional wells go dry the use of this forage is very heavy. Long lines form in dry season from 7:00 a.m. to 4:00 p.m. waiting to use pump. Well drilled in basalto [illegible].

Observateur

Rév. du 5/7/82

Village Mandiasso Quartier

Sous-Préfecture Diebougou Canton

Données pour le village : Accès On Bobo Dioulasso-Diebougou Rte N6

Population Type d'habitat Dispersed

Topographie Flat terrain

Carte carré I/15 carré I/36

Coordonnées

	MM	MM	MTU		°	'	"
X				Latitude			
Y				Longitude			

Z m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage				*1
Nombre en saison sèche				1

Données pour un puits : à *HER/USAID

Date			
Heure			
Côte de sol			
Niveau d'eau			*19.0m
Profondeur			*41 m
Niveau d'eau en fin saison sèche			
Niveau d'eau en saison des pluies			
Margelle			

Repère Distance m Angle °

Observations

*No proximate pollution sources. Location OK. Forage completed in Feb. 1982. Yield by air lift 400 l/hr. Moyno pump installed. Yield falls off in dry season but always some water. Traditional wells in this area fail entirely in dry season. Standard superstructure. No apron. Good drainage. No proximate sources of pollution. A geophysical survey in this area might help to locate a better drilling site. Forage drilled in soft argillaceous metasediments.

~~Observations~~

Rév. du 5/7/82

Village Gomako Quartier

Sous-Préfecture Diebougou Canton

Données pour le village : Accès 12 Km WSW of Diebougou

Population Large village Type d'habitat Grouped

Topographie Flat

Carte carré I/15 carré I/36

Coordonnées

	MM	MM	MTU		°	'	"
X				Latitude			
Y				Longitude			

Z m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage			/	
Nombre en saison sèche			/	

Données pour un puits : à *HER/US AID

Date		/	
Heure			
Côte de sol			
Niveau d'eau		*13.0 m	MP=top of
Profondeur		*20.0 m	margelle, 0.70 m above GL
Niveau d'eau en fin saison sèche			
Niveau d'eau en saison des pluies			
Margelle			0.460 m LD 1.90 m OD

Repère Distance m Angle °

Observations

* Recently completed deepening an old well. The cap and Nicyno pump stand are now being installed. The water level rises to 6 to 7 m below the margelle top during the wet season. Location OK About 50 m from nearest dwelling. No evident proximate pollution sources. Well dug in weathered gneissic granite.

~~Observateur~~

Rév. du 5/7/82

Village Loto Quartier

Sous-Préfecture Diebougou Canton

Données pour le village : Accès 5 Km WSW of Diebougou

Population Type d'habitat

Topographie

Carte carré I/15 carré I/36

Coordonnées

	MM	MM	MTU		°	'	"
X				Latitude			
Y				Longitude			

Z m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage				/
Nombre en saison sèche				/

Données pour un puits : à *HER/US AID

Date			
Heure			
Côte de sol			
Niveau d'eau			
Profondeur			*54.7
Niveau d'eau en fin saison sèche			*6.20
Niveau d'eau en saison des pluies			
Margelle			

Repère Distance m Angle

Observations

*Completed in Feb. 1982. Yield 500 l/hr by air lift. Standard superstructure. No apron. Abyssa pump being installed. No proximate sources of pollution. Location OK. Well drilled in greenstone (?).

~~Observateur~~

Rév. du 5/7/82

106

Village Kpèdis (Tiedjo) Quartier

Sous-Préfecture Diebougou Canton

Données pour le village : Accès About 5-6 Km W of Diebougou

Population Type d'habitat Dispersed

Topographie Gently sloping

Carte carré I/15 carré I/36

Coordonnées

	MM	MM	MTU		°	'	"
X				Latitude			
Y				Longitude			

Z m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage			/	
Nombre en saison sèche			/	

Données pour un puits : à *HER/US AID

Date			
Heure			
Côte de sol			
Niveau d'eau		*13.55	M.P. top of margelle
Profondeur		*15.70	0.75 m above GL
Niveau d'eau en fin saison sèche			
Niveau d'eau en saison des pluies			
Margelle			0.75 m [illegible]

Repère Distance m Angle °

Observations

Completed in April 1982. No cap or pump installed. Natural drainage good. Apron 1.80 m wide with good slope. No proximate sources of pollution. Well dug in manganiferous and ferruginous schist and phyllite.

~~Observateur~~

Rév. du 5/7/82

Village Lokpodia Quartier

Sous-Préfecture Diébougou Canton

Données pour le village : Accès About 5 Km S of Diébougou

Population Type d'habitat Dispersed

Topographie Flat

Carte carré I/15 carré I/36

Coordonnées

	MM	MM	MTU		°	'	"
X				Latitude			
Y				Longitude			

Z m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage			/	
Nombre en saison sèche			/	

Données pour un puits : à HER/USAID

Date			
Heure			
Côte de sol			
Niveau d'eau		17.30 m	Below Ground level
Profondeur			
Niveau d'eau en fin saison sèche			
Niveau d'eau en saison des pluies			
Margelle			

Repère Distance m Angle °

Observations

Still under construction. In large open area. No proximate sources of pollution. Well dug in weathered alkaline granite.

Observateur

Rév. du 5/7/82

11

Village Djoroogo Quartier

Sous-Préfecture Diebougou Canton

Données pour le village : Accès At jct of road (E&W) with N-S road to Dano

Population Type d'habitat

Topographie Flat

Carte carré I/15 carré I/36

Coordonnées

	MM	MM	MTU		°	'	"
X				Latitude			
Y				Longitude			

Z m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage			/	
Nombre en saison sèche			/	

Données pour un puits : à *HERIUS AID

Date			
Heure			
Côte de sol			
Niveau d'eau		*20.00 m	MF station at Manouin
Profondeur			0.70 m below FL
Niveau d'eau en fin saison sèche			
Niveau d'eau en saison des pluies			
Margelle			⊙ 1.90 m ⊐ 2.00 m ⊐

Repère Distance m Angle °

Observations

* Under construction. Margelle and apron in place. Apron 1.20 m wide with good stone. No proximate pollution sources. Well dug in metavolcanics

Observateur

Rév. du 5/7/82

Village Sapba Quartier

Sous-Préfecture Dano Canton

Données pour le village : Accès About 15 Km SSW of Dano

Population Type d'habitat Dispersed

Topographie

Carte carré I/16 carré I/36

Coordonnées

	MM	IM	MTU		°	'	"
X				Latitude			
Y				Longitude			

Z m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage			/	
Nombre en saison sèche			/	

Données pour un puits : à *HER/USAID

Date			
Heure			
Côte de sol			
Niveau d'eau		15.84m	Metal cap on margelle
Profondeur		19.70m	0.75m above GL
Niveau d'eau en fin saison seche			
Niveau d'eau en saison des pluies			
Margelle			0.150m TD 0.00m GD

Repère Distance m Angle

Observations

*Completed May 1982. No dalle or pump installed. About 100 m from nearest house. No proximate pollution sources. Good surface drainage. Apron 1.20 m wide has good slope. Well dug in weathered granite.

~~Observateur~~

Rév. du 5/7/82

Village Kompi 2' Quartier

Sous-Préfecture Dano Canton

Données pour le village : Accès About 13 Km ESE of Dano

Population Type d'habitat Dispersed

Topographie Flat

Carte carré I/16 carré I/36

Coordonnées

	MM	MM	MTU		°	'	"
X				Latitude			
Y				Longitude			

Z m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage			/	
Nombre en saison sèche			/	

Données pour un puits : à *HER/USAID

Date			
Heure			
Côte de sol			
Niveau d'eau		6.70 m	Metal at margelle, 6.70m above GL
Profondeur		21.00 m	
Niveau d'eau en fin saison sèche			
Niveau d'eau en saison des pluies			
Margelle			0.90m ED 2.00m OD

Repère Distance m Angle °

Observations

Completed in April 1982. No delle or pump installed yet. Apron is 1.00 m wide with good slope. Well located about 150 m from nearest dwelling. Well dug in micaceous schist and phyllite with quartz veins.

~~Observateur~~

Rév. du 5/7/82

Village Kaai Quartier

Sous-Préfecture Dano Canton

Données pour le village : Accès 18 Km. ESE of Dano

Population Large Village Type d'habitat

Topographie Flat

Carte carré I/16 carré I/36

Coordonnées

	MM	MM	MTU		°	'	"
X				Latitude			
Y				Longitude	°	'	"

Z m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage		/		
Nombre en saison sèche		/		

Données pour un puits : à

Date			
Heure			
Côte de sol			
Niveau d'eau			
Profondeur			
Niveau d'eau en fin saison sèche			
Niveau d'eau en saison des pluies			
Margelle			

Repère Distance m Angle °

Observations

Traditional well under construction. Open hole now. Laterite 5.25 m thick with soft sub-lateritic clay below.

Observateur

Rév. du 5/7/82

Village Vianvor Quartier

Sous-Préfecture Dano Canton

Données pour le village : Accès About 20 km ESE of Dano between Bodare and Kosser

Population Type d'habitat Dispersed

Topographie

Carte carré I/16 carré I/36

Coordonnées

	MM	M	MTU		°	'	"
X				Latitude			
Y				Longitude			

Z m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage			/	
Nombre en saison sèche			/	

Données pour un puits : à *HER/USAID

Date			
Heure			
Côte de sol			
Niveau d'eau		*10.74m	MP to top of margelle
Profondeur		*13.38m	0.75m above GL
Niveau d'eau en fin saison sèche			
Niveau d'eau en saison des pluies			0.50m ID 2.00m OD
Margelle			

Repère Distance m Angle °

Observations

Completed in June 1991. Dalle and pump not installed.

Installed a gravel-pack perf. "captage" to control heaving clay (boue fluente). Apron 1.20m wide has good slope. No proximate sources of pollution. Located in large open area.

Observateur

Rév. du 5/7/82

Village Dano Nord Quartier

Sous-Préfecture Dano Canton

Données pour le village : Accès Du center of Dano

Population Type d'habitat

Topographie Flat

Carte carré I/16 carré I/36

Coordonnées

	MM	IM	IMTU		°	'	"
X				Latitude			
Y				Longitude	°	'	"

Z m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
Nombre en Hivernage				/
Nombre en saison sèche				/

Données pour un puits : à * HER/USAID

Date			
Heure			
Côte de sol			
Niveau d'eau			
Profondeur			45.14 m
Niveau d'eau en fin saison sèche			
Niveau d'eau en saison des pluies			
Margelle			

Repère Distance m Angle

Observations

Completed in Feb. 1982. Moyno pump installed. Standard superstructure. No apron. Extensively used. Poor drainage. Large mudholes in vicinity. Well was not developed so yield unknown. Well drilled in volcanics and metasediments (Birrimanian).

Observateur

Rév. du 5/7/82

llage Orankoi Quartier

us-Préfecture Dano Canton

nnées pour le village : Accès 16 Km N. of Dano

pulation Type d'habitat

pographie

te carré I/16 carré I/36

ydonnées
MM KM MTU

Latitude ° ' "

Longitude ° ' "

m à (Carte, Altimètre, Nivelation)

	Puisards	Puits trad.	Puits Mod.	Forages
re en Hivernage			/	
re en saison sèche			/	

ées pour un puits : à *HER/US AID

e			
de sol			
au d'eau		*14.50m	MP=top of
ondeur		*17.50	margelle, 0.75m above
au d'eau en fin saison sèche			GL
au d'eau en saison des pluies			
elle			Ø 1.90m ID 2.30m OD

re Distance m Angle °

rvations
ll completed and Moyno pump installed on dalle (cap). n crack 2-3 cm at join in dalle. Dalle is not cemented and rocks on top of margelle. Poor natural drainage gc mudholes around well. Apron 1.2m with good pe but needs to be wider.

nateur

du 5/7/82

V

C. Health Annex (S)

S-1. The Need to Safeguard the Community Approach to Health Care

Annex S-1

The Need to Safeguard the Community Approach to Health Care

The original goal of the health component of the project, as outlined in the Project Paper, was to institute a health education and sanitation program that would emphasize a preventative and community treatment approach rather than an individual treatment approach to health care. When the organization of the health component was modified to conform with the National Health Plan for primary care, the attention of the project was now partially focussed on individual curative treatment. While a certain amount of this is necessary, the project must be on guard so as to prevent the historical tendency of the individual treatment approach to subsume the greater part of the health program.

For example, in the training of the AIs at the school in Bobo-Dioulasso, although it can be seen from Annex S-1 that 40 percent of their study time is spent in the area of public health, 30 percent is given over to "nursing". Included in this curriculum is training in how to give injections. This is limited to training in subcutaneous injections which is considered necessary for snake bite treatment. Nevertheless, there is a danger that in the future when these AIs are in the field, these curative aspects of their job might increase for many reasons, including the demands of the villagers, the direction of their supervision, and possibly, career opportunities which call for a greater proficiency in curative health care.

In addition, because of the potential profits involved, these curative services could prove to be seductive to both the health providers as well as to the drug suppliers. In this regard, the project is supporting the activities of CNES national efforts to educate the people in the community approach to treatment and prevention. These efforts should be increased both by more vigorous efforts in a community health education campaign. These should range from short-term technical consultants in this area to replacing the drug company posters at the dispensaries and a strict policy regarding the use of free samples, such as cough syrups.

Another suggestion is that the CNES could develop an oral rehydration program, using locally available resources, such as clean water, salt and sugar, for the prevention and treatment of infantile diarrhea, one of the largest causes of mortality in Upper Volta. This would replace the current emphasis being given to GANIDAN and other post facto treatments that are not very effective. This kind of campaign would be useful at many other levels as well. For example, it would be a focus of action at the ASV level in agreement with the concepts of both individual and community approaches to treatment, while, at the same time, according to experiences in other countries, would have an impact that could be obvious to the villagers and take away from some of the recent energy and attention being paid to the drug kits.

The decision to give over 30 percent of the training time of the AI to nursing and activities such as massae and injections was said to be done in accordance with both the National Health Plan and the Presidential Decree of May 8, 1976. (Dec 76/278/PRES/MF/FPT/MSP.BS de 5/8/76). However, there is a difference in the emphasis given in these two documents as to the position of the AIs vis-a-vis curative treatment and its relationship to the IBs whose training and function is almost totally curative. In the National Health Plan, emphasis is

placed on the AI's function as a supervisor and trainer of the ASV and on community treatment. Only a few words of the total 306-page description are devoted to his function as a "replacement" for the IB. In the other document, more attention is paid to the AI's role in curative treatment. The curriculum for the AI training seems to be more in keeping with this latter approach. In any case, both of these factors, i.e., his training in curative areas and the supervision of the AIs by the IB, whose competence in this area may cause the AIs by the IB, whose competence in this area may cause the AIs to spend most of his time and attention doing curative medicine, or at least the tendency, seems to be built into the system.

There is another reason why the AI may pay more attention to the individual treatment approach rather than to community treatment and prevention. This has to do with the career development path that is built into the system.

Currently it is planned that there will be an IB at the dispensary level to supervise the AI, and so the only career path open to the AIs is to rise through the nursing structure with its individual treatment approach. This may cause him also to spend most of his time and attention to this area, which is likely to occur even if the IBs are recycled into the area of public health. An alternative has been suggested by some: since there already is an IB certified in laboratory methods, a new speciality of IB in public health might be created to work specifically at the dispensary level.

A recent review of the training of village health workers in the Sahel concluded that "experience has shown that as soon as the village health worker starts distributing medicines, he continues to do so, and with rare exceptions, nothing but that."

Another problem regarding the emphasis on the individual curative approach has arisen around the supplying of the ASVs with drug kits. The problem of resupplying of these kits has assumed much of the attention of the current field workers and there is no reason to think that this situation will soon change when the AIs get into the field. This may become the main part of their duties. This is a complex problem with no resolution soon in view, (indeed the answer to the question of drug supply has wide range of economic implications for the entire health system). For this reason, a great deal of energy will be spent on this area at the local level, more than the project goals allow.

As is pointed out in other parts of this report, better coordination between the HER and the health side may allow future organization of the ASV to be focussed on the coming of water supply and its uses in rehydration, for example, rather than on their drug kits. In this regard, the training of the ASV occurs first in the dispensary functions and only a few months later are they given training in public health. This order will be reversed when the AIs are in the field and are responsible for the ASVs training, but the 107 ASVs who were first trained in the dispensaries may now always see the curative aspects of their duties as their primary function.

Thus, it can be seen that even though it is the goal of the project and the goal of people involved in its direction, to emphasize the community treatment and preventative approach along with health education, there is a natural tendency from many directions to subvert these ends. Therefore, planning decisions must be made with these factors constantly in mind once certain systems are established, they will be very difficult to change later on.