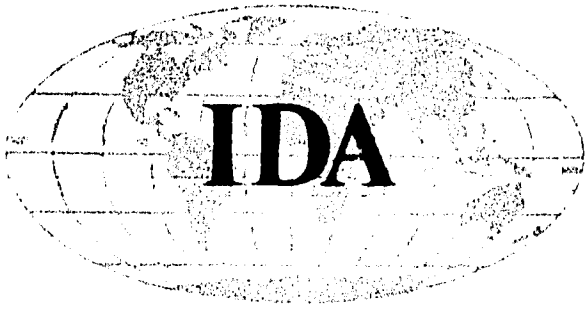
PD-ABJ-706



INSTITUTE FOR DEVELOPMENT ANTHROPOLOGY

99 COLLIER STREET, P.O. BOX 2207, BINGHAMTON, NEW YORK 13902 USA

Telephone (607) 772-6244 FAX (607) 773-8993 Telex 932433 Cable DEVANTHRO BINGHAMTON NY

PD-ABJ-106

isn 91309

SYNTHESIS REPORT

THE CENTRAL TUNISIA RURAL POTABLE WATER INSTITUTIONS PROJECT

1986 - 1991

(USAID Project Number 664-0337)

Institute for Development Anthropology

February 1992

This paper is edited by the Institute for Development Anthropology and reports on work supported by the United States Agency for International Development in Tunisia (BOA No. DHR-5452-B-00-0005-00) and produced under the Cooperative Agreement on Systems Approach to Regional Income and Sustainable Resource Assistance (SARSA II No. DHR 5452-A-00-9083-00) between Clark University, the Institute for Development Anthropology, and Virginia Polytechnic Institute and State University, funded by the U.S. Agency for International Development, Bureau for Science and Technology, Office of Rural and Institutional Development, Division of Rural and Regional Development. The views and interpretations herein are those of the authors and should not be attributed to the Agency for International Development or to any individual acting on its behalf.

TABLE OF CONTENTS

EXECUTIVE SUMMARY iv

CHAPTER I. INTRODUCTION 1
- A. The Area 3
  - 1. Regional Climate 3
  - 2. Regional Hydrology 5
  - 3. Demographic and Economic History of the Region 6
- B. Project Aims and Evolution 7
- C. The Rural Potable Water Institutions Project 9
  - 1. Technology transfer activities. 10
  - 2. Institutional development at the regional level 10
  - 3. Institutional Development at the community level 10

CHAPTER II. TECHNOLOGICAL ACCOMPLISHMENTS OF THE RPWI PROJECT 12
- A. Water-Point Selection Methodology 12
  - 1. Introduction 12
  - 2. Hydrogeology 13
    - a. Available Resources 14
    - b. Findings 15
  - 3. Demography 16
  - 4. Economics 30
    - a. Cost-Benefit Analysis of Well Point Development 30
    - b. Operating Costs of Wells 31
  - 5. Synthesis 31
  - 6. Conclusion: The Use of Thematic Maps 36
- B. Construction Achievements 37

CHAPTER III. INSTITUTIONAL DEVELOPMENTS AT THE REGIONAL LEVEL 41
- A. The Water Users Association Concept 41
  - 1. Local Considerations in Developing WUAs 41
  - 2. National Enabling Legislation 42
- B. Improved planning and coordination for the Regional Water Affairs Group (WAG) or *Groupement d'Intérêt Hydraulique* (GIH) 43
- C. Creation and Operation of the *Unité d'Autogestion* (UAG), or Regional WUA Support Unit 44
- D. Creation of the Rural Health Education Team (RHET) 48
- E. Reorganization of the regional support program for water point operation and maintenance (O&M) 49
- F. Training of project administrators. 49
- G. Conclusion 50

CHAPTER IV. INSTITUTIONAL DEVELOPMENT AT THE COMMUNITY LEVEL 51
A. Principles for Membership, Organization, and Functions of WUAs 51
B. Creation of WUAs in Central Tunisia 52
C. Recruitment and training of Village Health Workers (VHWs) 54
D. Creation of Women's Interest Groups (WIGs) 54

CHAPTER V. THE CURRENT SITUATION AND LESSONS LEARNED 56
A. Successful Project Components 56
1. Project Philosophy 56
2. Collaboration Between Project Actors 58
3. Role of the RPWI project in the definition of a national strategy . . 58
B. Problems Encountered by the RPWI Project 59
1. Need for Adequate Political Support 59
2. Difficulties with the WUA Financial Management System 59
3. Inadequate Monitoring and Evaluation 61
4. Dependence on Outside Financing 61
5. Involvement of the Gafsa Regional WUA Support Unit 62
C. Conclusion 63

APPENDIX I. LIST OF RPWI PROJECT PERSONNEL 65

APPENDIX II. LIST OF DOCUMENTS 69

APPENDIX III. IDA PROJECT STAFF 79

List of Maps

Map 1. The Project Area 4
Map 2 Landsat image of Kasserine 17
Map 3 IGN Topographic Map (Kasserine) 18
Map 4. The Deep Aquifer (Kasserine) 19
Map 5. The Shallow Aquifer (Kasserine) 20
Map 6. Population Distribution with Ethnicity 27
Map 7. Transportation Routes 28
Map 8. Land Use 29

List of Tables

Table 1. Population Characteristics by Governorate and Delegation 22
Table 2. Population Distribution by Settlement Pattern for Delegations, 1984 23
Table 3. Rate per Thousand of Selected Water-Related Diseases Reported in Kasserine Governorate and Delegations Sned and Gafsa North of Gafsa Governorate, 1985 24
Table 4. Assumptions of Three Population Forecasts for Central Tunisia, 1984-2004 25
Table 5. Population, Growth Rates, and Densities for Three Scenarios, Year 2004 26
Table 6. Water Needs for Current and Projected 2004 Populations of Hypothetical Communities 32
Table 7. Economic Indicators of Ten Benefit-Cost Models of Deep Well Potable Water Development 33
Table 8: Construction activities performed by the RPWI project 39

Table 1. Population Characteristics by Governorate and Delegation 22
Table 2. Population Distribution by Settlement Pattern for Delegations, 1984 23
Table 3. Rate per Thousand of Selected Water-Related Diseases Reported in Kasserine Governorate and Delegations Sned and Gafsa North of Gafsa Governorate, 1985 24
Table 4. Assumptions of Three Population Forecasts for Central Tunisia, 1984-2004 25
Table 5. Population, Growth Rates, and Densities for Three Scenarios, Year 2004 26
Table 6. Water Needs for Current and Projected 2004 Populations of Hypothetical Communities 32
Table 7. Economic Indicators of Ten Benefit-Cost Models of Deep Well Potable Water Development 33
Table 8: Construction activities performed by the RPWI project 39

List of Figures

Figure 1. Protocol for Identifying Central Tunisia Water-Short Areas on Thematic Maps 35
Figure 2. The Organizational Context for WUA Development in Central Tunisia . . . 45
Figure 3. Types of WUAs 53

EXECUTIVE SUMMARY

I. The Rural Potable Water Institutions Project

The Rural Potable Water Institutions (RPWI) project in Kasserine and Gafsa governorates is considered a success by both the Government of Tunisia and the United States Agency for International Development. Designed to address specific problems that had plagued earlier rural potable water programs in Central Tunisia, the project achieved its stated objectives and provides a model for future development interventions in Tunisia and elsewhere. The problems addressed included water point selection based on political criteria rather than on the basis of need, waste of both energy and water, a high frequency of water system breakdowns, and a lack of health education programs to ensure hygienic use of potable water. The RPWI project instituted an equity-based site selection methodology and reduced water system operation inefficiencies by promoting community participation through the creation of water user associations (WUAs). These associations also became the focus of a variety of health education interventions. The project visibly reveals the effectiveness of, and the need for, community participation and local management of local water resources.

The project accomplishments demonstrate the central role of the social sciences should take in the design and implementation of rural development policy. Coinciding in the 1980s with a major shift toward political decentralization and economic liberalization in the overall context of Tunisian development, the project was executed by Tunisian engineers, social scientists, and health education specialists, committed to its community-participation focus. With some short-term expatriate assistance, these Tunisians made the RPWI project an impressive success, a development model that is rapidly being disseminated to other regions and development sectors throughout the country.

II. Project Interventions

The RPWI project (AID project No. 664-0337) began on 30 April 1986, and funding for activities in central Tunisia ended on 30 June 1991, although the project is supporting through June 1992 the elaboration of a national strategy for the creation and support of WUAs. Funding for the RPWI project was provided by both USAID and the GOT. Of the US $ 9,900,000 initially allocated for project activities, the United States appropriation was US $ 6,500,000, with Tunisia contributing the remaining US $ 3,400,000. In May 1989, an additional US $ 2,000,000 from the United States P.L. 480 Title I assistance program was transferred to the project. Half of the P.L. 480 funds were used to complete the RPWI project in central Tunisia and the rest went toward the current program to develop a national strategy for rural community WUAs.

The major activities of the RPWI project, discussed in greater detail throughout this report, included the following:

A. Technology transfer aspects

A. Technology transfer aspects

- establishment of a GIS-based water point selection methodology
- creation of 30 new boreholes and civil works
- extension of four existing potable water systems
- a pilot project of house connections (in one community)

B. Institutional development at the regional level

- improved planning and coordination for the Water Affairs Group (WAG)
- creation and operation of the *Unité d'Autogestion* (UAG), or regional WUA support unit
- creation of the Rural Health Education Team (RHET)
- reorganization of the regional support program for water point operation and maintenance (O&M)
- training of project administrators

C. Institutional development at the community level

- creation and initial support of community Water User Associations (WUAs)
- recruitment and training of Village Health Workers (VHWs)
- creation of Women's Interest Groups (WIGs)

III. Lessons Learned from the RPWI Project

In addition to its concrete achievements and improvements in providing potable water to rural central Tunisian inhabitants, the RPWI project experiences apply in a broader development context. The original project design contained both positive and negative aspects that became apparent as the project evolved. The positive contributions and specific problems encountered contain important lessons for the design of future potable water programs as well as other community-oriented interventions in a wide range of development sectors.

A. Successful Project Components

1. Project Philosophy

The social and community orientation of the project, rather than a strictly technical, engineering emphasis, was, without doubt, critical to the RPWI project's success. The project stressed and achieved a remarkable degree of community participation.

2. Collaboration Between Project Actors

The RPWI project realized a rare degree of cooperation and collaboration between CTDA personnel, private consultants, and USAID officials, who worked together to design and execute this innovative and effective project.

3. Role of the RPWI project in the definition of a national strategy

The success achieved in creating functioning WUAs in central Tunisia sparked interest at the national level, where the political and economic climate is moving toward greater decentralization. USAID rebudgeted $1 million of RPWI project funds to develop and implement an Action Plan that would help the GOT develop an operational national strategy.

B. Specific Problems Encountered by the RPWI Project

1. Need for Adequate Political Support

Political support for the community-participation programs is crucial for success. In Kasserine, project achievements in certain delegations were somewhat hindered because inadequate efforts were made to enlist local political support. The full and visible support of the governor and a broader range of technicians and officials in the governorate would have facilitated the program's introduction.

2. Difficulties with the WUA Financial Management System

The experiences of the RPWI project have indicated that the financial management system introduced is extremely cumbersome. This bureaucratization of the WUAs undermines the concept of financial autonomy and largely frustrates the purpose of turning the water systems over to the communities. The degree of independent action WUAs take in the management of local water resources, an essential element for sustainable, cost-effective resource management, is determined, to a large extent, by the degree of financial control they have.

3. Inadequate Monitoring and Evaluation

Monitoring and evaluation is necessary to direct assistance from regional authorities, to measure the impact of the WUA program and to learn from past experiences, and to prevent abuses. Despite repeated suggestions from consultants and evaluation teams, who even provided possible questionnaire forms, neither the UAG nor the CTDA Planning and Evaluation unit implemented an effective monitoring system.

4. Dependence on Outside Financing

As often occurs with large infusions of project money, there is the danger that a dependence on these funds can counteract the development of a participatory process. To a large extent the RPWI project avoided this pitfall, but it is possible to identify some situations where a dependence on outside funding may have hindered the growth of a self-reliant spirit.

There is some evidence that when project actions called for collaboration between GOT agencies, jealousies over the distribution of project resources may have hindered the process. At the community level, the WUAs' dependence on project financing became apparent when outside funding was completed in June 1991. This is particularly true for the women's interest groups (WIGs), the village health worker (VHW) program, and community-initiated programs to construct showers and latrines. These activities more or less stalled when USAID funding was ended. More time is needed to see whether these programs will become active again on their own. It may be necessary to start over and work with the community groups, reorienting them toward self-initiated action and emphasizing the possibilities to be realized through community participation.

5. Involvement of the Gafsa Regional WUA Support Unit

The RPWI project included a number of interventions in the North Gafsa and Sened delegations of Gafsa governorate. When the CTDA merged with the CRDA/Kasserine in early 1990, the supervision of WUAs in the Gafsa delegations passed to representatives of the *Génie Rural* (GR) division of CRDA/Gafsa. The GR/Gafsa staff did not have the same training as the UAG members or the same resources to conduct their supportive role. Despite these constraints, the Gafsa personnel have done a remarkable job of instituting a regional support program, partly because of the enthusiasm for the WUA program shown by the northern Gafsa communities. Still, GR/Gafsa's task might have been easier if they had been more closely involved with the UAG and the RPWI project from the beginning.

Despite the difficulties, the RPWI project experience was exemplary, and so helped shape the Tunisian program for WUAs. Today's concerns center not on the viability of WUAs but on the modalities of government assistance and support, on how government and its agencies and personnel should relate to these grassroots organizations. The Kasserine experience continues to provide--as it has for the past six years--meaningful and pertinent guidelines on how to go about rural development.

CHAPTER I. INTRODUCTION

The central Tunisia Rural Potable Water Institutions (RPWI) project was designed and agreed to by the United States Agency for International Development (USAID), and the Government of Tunisia (GOT), in order "to improve the quality of life of the rural poor in central Tunisia by establishing a coordinated and decentralized institutional approach to rural potable water operations and maintenance, with user participation and user fees, demonstrating a model to the GOT which may be appropriate for adoption as a national strategy" (USAID 1986). Over its five-year life span the RPWI project successfully achieved all of its stated objectives, and the GOT and USAID are proud of the accomplishments. This report documents the project activities and lessons learned for a broader audience in Tunisia and elsewhere.

The first chapter of this report describes the central Tunisian zone—its geography, topography, climate, hydrology, and demography—and the evolution of the RPWI project. It concludes with a broad description of the project and its three major components. These include: 1) transfer of new technology for rural potable water supply; 2) institutional development at the regional level; and 3) institutional development at the local, or water-user-community level. Chapters II-V then relate how the RPWI project addressed each of these elements. The contributions of the project staff are recounted, as well as those of various Tunisian and expatriate organizations and individuals who assisted in the implementation of the project.

The physical achievements of the project are reviewed in Chapter II. The technology transfer activities included not only the engineering feats accomplished in the execution of 30 new boreholes equipped with reservoirs and distribution systems, but also a multidisciplinary, multiobjective methodology for locating new boreholes. Other construction activities accomplished by the RPWI project included the extension of four existing potable water systems and a pilot project to install individual potable water house hookups in one community.

Several institutions at the regional level were created or reactivated to implement the diverse project activities. Chapter III describes the structure and actions of the regional Water Affairs Group (WAG), composed of representatives from all the Tunisian offices and development agencies operating in rural central Tunisia. Although the WAG pre-dates the RPWI project in Kasserine and is present in other Tunisian governorates, it was mobilized in new ways to maximize water investments by improving site selection for new water systems and thereby providing improved access to potable water for underserved rural populations. Within the *Office de Développement de la Tunisie Centrale* (ODTC, or the Central Tunisia Development Authority, CTDA)[1], the organization responsible for administering and implementing the RPWI

[1]In early 1990 when the Government of Tunisia reorganized some of its rural development agencies, the ODTC was absorbed by the *Commissariat Régional du Développement Agricole* (CRDA), which took over the operations of the RPWI project.

program, the project installed the *Unité d'Autogestion* (UAG). This is the regional WUA support unit that is responsible for fostering the individual WUAs and providing ongoing assistance and monitoring. Another institution established at the regional level, as a subset of the WAG and inclusive of the UAG, is the Regional Health Education Team (RHET). This organization is charged with coordinating project activities in hygiene education. There is a discussion of the role played by the RPWI project in the reorganization of the regional potable water system operation and maintenance program and, finally, a brief outline of the RPWI project training program for project implementers.

Chapter IV examines the institutional interventions at the community level. This includes the creation of functional water user associations (WUAs) around each rural water point and an ongoing training program to assist the WUAs to better perform their tasks and obligations. The project also elaborated and implemented a rural hygiene education program. This consisted of the preparation of health education materials that were utilized through a collaboration with regional schools and through a project-funded program that recruited and trained 35 village health workers (VHW). The VHWs provided community-level health education and sanitation-related monitoring. Finally, as a pilot program in four communities, the RPWI project assisted in the formation of women's interest groups (WIGs) to serve as a liaison between the mainly female water users and the mainly male members of the WUAs. The WIGs have also initiated several small collective projects within their communities.

Chapter V looks at the accomplishments and experiences of the RPWI project in terms of what has been achieved at the local and regional levels and discusses how the project has contributed to the formulation of policy for potable water development at the national level. Concurrent with the program to create WUAs in central Tunisia were legislative actions that provided the legal basis for community management of potable water resources. With this enabling legislation and the visible success of the RPWI project in central Tunisia, WUAs have now been established in every region of the country. A direct offshoot of the RPWI project is the current program to develop a national strategy for the creation and monitoring of WUAs in all rural areas of Tunisia. The final section of this report examines the evolution of the RPWI project and its applied and theoretical contributions in the context of the current political orientation in Tunisia that emphasizes greater decentralization in the administration and management of rural development activities.

A. The Area[2]

The area known administratively as Central Tunisia largely corresponds to the Governorate of Kasserine, although at various times parts of adjacent governorates have been added to this core and parts of Kasserine have been omitted. At the administrative level, the project area includes the following delegations:

Governorate	Delegation
Kasserine	Kasserine Nord, Kasserine Sud, Sbiba (Hassi El Farid), Thala, Sbeitla, El Ayoun, Foussana, Haidra, Jedliane, Feriana, and Majel Ben Abbes
Gafsa	Gafsa Nord, Sened

Map 1 delimits the project area.

Geographically the area, called the High Steppes, is mostly south of, or astride, the Dorsal, the central range of the Tunisian Atlas that runs from southwest to northeast. The entire region is characterized by flat to gently undulating topography with generally linear mountainous zones rising abruptly from a plain. Southern Kasserine, although similar to the other delegations, is more rugged in narrower valley sectors, with deeply incised mountain-front stream courses and clearly defined central valley tributary drainage systems.

Elevations in the area range from 500 meters to a little over 1,000 meters above sea level, with the town of Kasserine itself at 676 meters, and other towns ranging from Sbeitla at 525 meters to Thala at 1,017 meters. Rural areas may be higher still. Tunisia's highest mountain, Jebel Chambi, at 1,544 meters, dominates Kasserine.

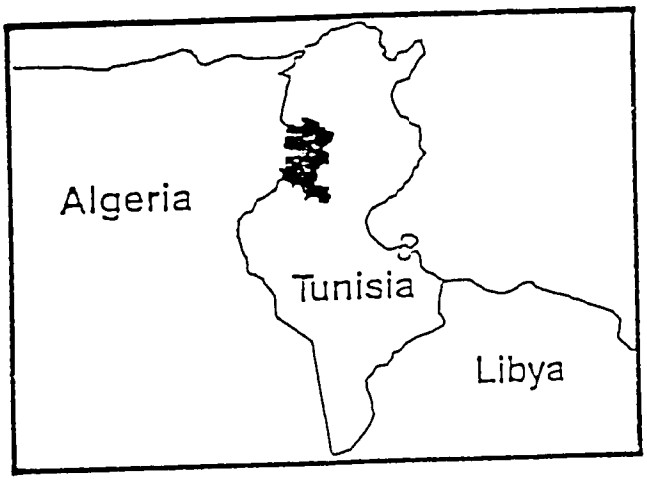
1. Regional Climate

The region is classified as continental arid, with one hot-dry and one cold-wet (humid) season. Temperatures average between 18 and 35 degrees Centigrade in the hot season, and 6

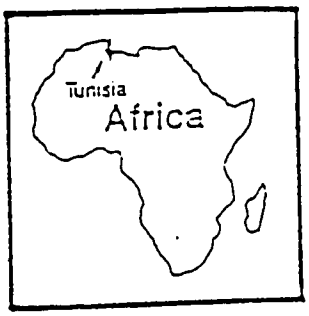
---

[2] Much of the following descriptions of the project region and of the evolution of the Rural Potable Water Institutions project are based on and quote from those sections written by Nicholas S. Hopkins in his essay "Water-User Associations in Rural Central Tunisia," which appears in Salem-Murdock and Horowitz, eds., *Anthropology and Development in North Africa and the Middle East* (particularly pages 74-79). Hydrological information is based on Scheliga 1987a, b, c.

Map 1. The Project Area



Region Map



Location Map

Legend

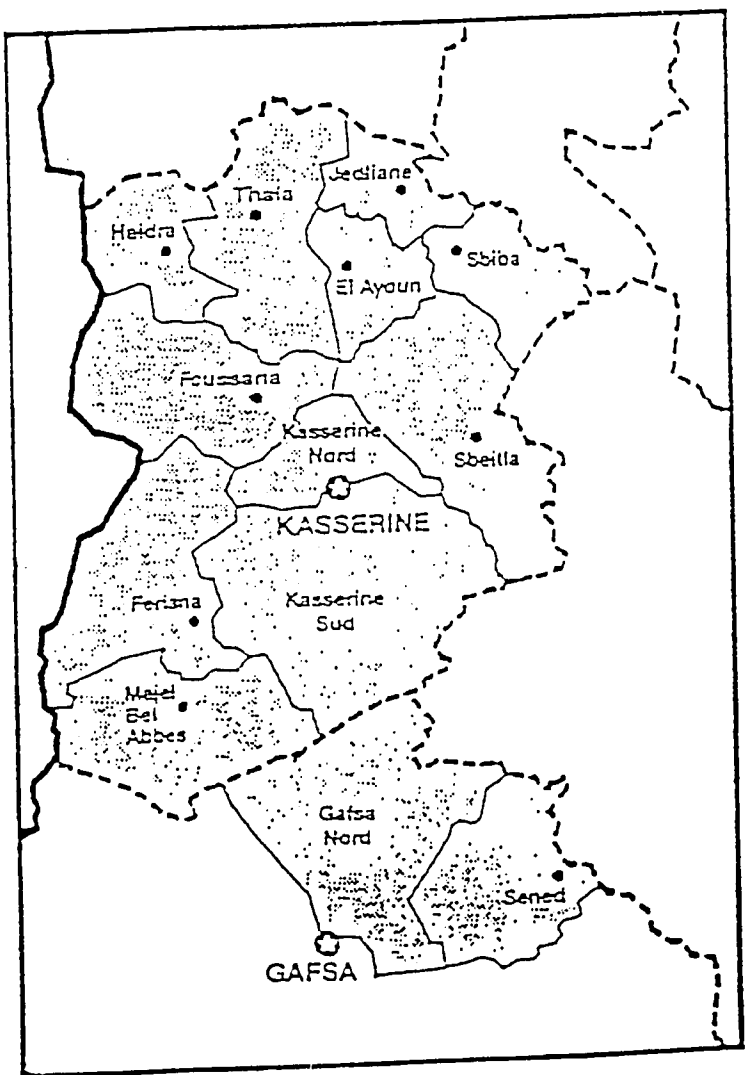
Project Area

Governorate Boundary

Delegation Boundary

Capital of Governorate

Capital of Delegation



Project Area Map

Source: Jennings et al. 1989: Appendix C, p. 105.

and 17 degrees in the cold season. Rainfall ranges between 100 and 300 mm annually (10-year record) and averages about 180 mm. (Southern Kasserine has lightly higher averages.) Precipitation falls between October and January; the rest of the year is nearly bone dry. Finally, seasonal change can be very abrupt.

2. Regional Hydrology

The project area is characterized by anticlinal and synclinal structures, with the anticlines typically forming mountainous zones and the synclines broad basins between the mountain ridges. Of most significance to hydrologic conditions are the synclinal basins of Sidi Aich and Gafsa-Sened. The basin(s) related to southern Kasserine are similar in form but of lesser magnitude.

Most streams in the region are intermittent, and their flow rates range from torrential during heavy rainfall to zero during the dry season. A few streams in the area run year-round but carry little water in summer. Winter rains, conversely, often lead to floods.

Subsurface water resources lie in a shallow aquifer and a deep aquifer. The shallow aquifer is comprised largely of relatively unconsolidated fine sand, silt, and clay with thinly interbedded coarse sands and gravel. (Deeper zones of the shallow aquifer have been noted to be of marine origin.) Thicknesses in the shallow aquifer zone range from a few meters to more than 100 meters. The shallow aquifer is considered to be undefined (phreatic) through the region.

The deep aquifer zones are related to older (Cretaceous) limestone and interbedded sandstone beds. Permeability in the limestone aquifer is related to jointing and fracturing that occurred during the formation (folding) of regional synclinal and anticlinal structures. Aquifer zones are reportedly found between 150 and 500 meters, depending upon location. Aquifer depths are also subject to local and regional faulting, which further complicates aquifer exploitation. Regionally, the deep aquifer is known to be both confined (artesian) and in hydraulic continuity with the shallow unconfined (phreatic) aquifer.

Groundwater quality generally deteriorates from east to west throughout the basin. This is particularly true of the shallow aquifer, where total dissolved solids increase to more than 4.0 g/l in the southwestern sector. Better quality waters (0.25-2.0 g/l) occur predominantly in the eastern portion of the Gafsa-Sened basin.

Water quality is therefore a major consideration in this region. This is, as mentioned, most evident in the shallow aquifer system. Suitable water is theoretically available most of the year in the eastern, western, and northern sectors, but not in the central and southern sectors. The deep aquifer, which is only partially explored, may exhibit a similar pattern. At present, however, water quality in the deep aquifer is somewhat less predictable.

Over the course of the year, many natural water points either dry up or become too saline for potable use in the summer months. Those that remain usable are either springs or some old wells said to be of Roman origin. The problems of water availability and water quality are no less serious for being seasonal in some parts of central Tunisia.

In more recent times, competing uses for water resources have exacerbated these natural scarcities. Water resources have been developed for irrigation by digging shallow or deep wells. (The water from these new irrigation wells is also used domestically.) And, some of the groundwater resources of the area have also been tapped for the coastal urban centers such as Sfax. For instance, most of the large flow from springs near Sbeitla, which once supported a major Roman town, has been piped to Sfax since around 1910.

3. Demographic and Economic History of the Region

Before the colonial period, the people of Central Tunisia were nomadic pastoralists, specializing in sheep and goats. Their normal cycle took them into the cereal-producing lands of northern Tunisia during the summer, where they helped with the harvest in exchange for grain, and into the High Steppes in winter when the pasture was at its best.

This cycle was interrupted by the economic and sociogeographical changes of the colonial period, particularly the appropriation of the best cereal lands by colonial farmers, who introduced machinery after 1925 and so no longer needed as many extra hands to reap, thresh, and transport the wheat and barley. These changes ended the seasonal migration to the north, forced the sedentarization of the pastoralists, and obliged them to explore ways to produce their own grain under less advantageous conditions.

The local dry-farming economy is now a precarious mixture of cultivation of cereals (wheat or barley) with livestock raising (sheep, goats, and cattle), and, occasionally, tree crops. It is viable only because most households have access to other income, through government employment, commercial activity, or migration to jobs in coastal Tunisia and abroad. People remain on the land, however, and remain attached to it, often explaining that they prefer to live on their own land where they are beholden to no one and can live free.

That the original tribal or communal lands were over time allocated to individuals or families has created the highly dispersed settlement pattern. House sites have rarely been chosen to maximize access to water points. Instead, people typically choose to live "on their own land" some distance away; they also commonly select sites on well-drained slopes rather than on the flat bottomlands where drainage may be poor but where drilled wells would be more likely to be successful.

The farms are small. Zghidi (1978:25) estimated that in the Hababsa zone (Rohia delegation of Siliana governorate), 60 percent of the households held less than the 25 hectares of rainfed land needed to ensure household viability. In the Bnanna II zone of Foussana

delegation (Kasserine governorate), 97 percent of land titles recorded in 1974 and 1976 were for less than 20 hectares (Hopkins 1978).

The smaller holders, especially those holding under 30 or 40 hectares, are subsistence farmers oriented to strategies of low risk/low gain. The peasant household is above all interested in survival. The way to survive is to keep expenses down, and such households rarely risk investing in improved agricultural techniques. The Hababsa survey in the early 1970s found that 56 percent of the farmers had no direct expenses for agriculture at all (Zghidi 1978). Such households rarely hire labor, and in fact are likely to assign some of their members to outside wage labor, including even migratory wage labor.

Irrigation modifies the ecological base. A number of substantial irrigated perimeters in the area, under one or another form of state control, range from colonial farms taken over by the state after independence and run as state farms, to new irrigated zones created by the state on the basis of a deep well and allotted to small and medium farmers (Zghal 1967). Throughout the area private farmers have also discovered places where water is near enough to the surface to warrant a private shallow well. Here they have established irrigated farms specializing in fruits and vegetables. This pattern is best established in Sidi Bou Zid, just to the south of the RPWI project area.

Most of the people in the area under discussion belong to one of two major tribal confederations: the Majeur in the eastern part of the area and the Freshish in the west. To the north are the Ouled Ayar, and to the south the Hammama. These confederations are themselves broken into constituent parts, the *'arsh*, and these into *fariq*, members of which even nowadays generally live contiguously, though the clustering is very loose. The various levels of tribe articulate through a patrilineal idiom. People are aware of tribal affiliations, speak of them, perhaps marry according to them, certainly reside according to them, and elect members of parliament according to them. Patterns of local cooperation among closely related households, which blur distinctions between households, are clearly a strategy of survival, since they spread the risk while sharing the work. The policy of the state since independence, however, has been to ignore tribal links, and to create new bases for social solidarity and cooperation. These links are part of the social patrimony of the people of Central Tunisia, but it is uncertain what would happen if an effort were made to use them as a basis for development.

Kasserine governorate has a population of around 300,000, two-thirds of it rural, and most of this rural population lives outside "rural agglomerations" (*douar* or hamlets). It is one of the least densely populated areas of Tunisia. (See Chapter II, Section C for a fuller description of the demography of the project area.)

B. Project Aims and Evolution

In the mid-1970s USAID began to take a special interest in Central Tunisia as a place in which to try out various approaches to rural development. Part of the rationale for doing so was an effort to find a role for USAID in a Tunisia that was rapidly becoming too prosperous

in the overall sense to qualify for aid. The argument was that Central Tunisia represented the backward interior of the country, whose poverty stood in glaring contrast to the impressive developments on the coast. Calculation of per capita income for Central Tunisia showed that the level of poverty was sufficient to justify continued aid. Furthermore, it was judged politically useful to show concern for this area whose inhabitants often complained of neglect by contrast with the coastal strip.

Plans were well under way by 1978, and a preliminary social-soundness analysis was carried out that summer by an anthropologist (Ayad 1978), one of a series of studies that included one on the role of pastoral nomadism and another on the social soundness of proposed dryland farming interventions (Hopkins 1978). Also, in May 1978 a Project Paper for the "Siliana Rural Centers Water Systems" was prepared. This project in the "High Tell" north of Central Tunisia was aimed at helping the National Water Company (*Société Nationale de l'Exploitation et de la Distribution des Eaux* or SONEDE) in developing or improving water-supply systems in a number of small- and medium-sized communities in Siliana governorate. Subsequently, in May 1980, a project paper for the "ODTC Rural Potable Water SubProject," the predecessor project to the current one, was elaborated and became the basis of a USAID activity. On 10 July 1980 the agreement between the Tunisian and American governments was signed. By this time the main thrust of the subproject was to help the newly formed Central Tunisia Development Authority (CTDA, or *Office du Développement de la Tunisie Centrale,* ODTC).

The agreement between the two governments (known as the "Fifth Amendment") described the project as follows:

> This subproject is aimed at (1) improving the access to potable water of the rural, predominantly dispersed, population of the project area, including as many of the most disadvantaged as possible; (2) testing and demonstrating under Central Tunisia conditions lower-cost technologies for providing potable water to dispersed populations; and (3) encouraging the CTDA [ODTC] to undertake water activities at sites selected through the application of an agreed set of criteria.

The document then goes on to spell out the criteria for potable water interventions, and stresses the importance of health concerns.

Access to potable water was to be improved under the project by improving a certain number of existing water points—capturing springs, and cleaning and motorizing old wells—and by drilling and motorizing new wells in areas where no other source of potable water was conveniently available. The drilling of new wells in particular was to serve as an occasion to demonstrate the use of lower-cost technologies previously unfamiliar in Tunisia. In practice this meant the introduction of a truck-mounted drill, the TH-60, and the suggestion that well sites should be chosen with respect to population distribution and the likelihood of water being available at accessible depths, rather than solely in response to political pressures, as had previously been the case.

The elaboration of a Central Tunisia potable water-point selection policy reflected the desire to apply a more rational planning methodology to the controlled use of the present and potential water resources of Central Tunisia. A Potable Water Policy was prepared by the CTDA with technical assistance provided by staff from the Regional Planning and Area Development Project located at the University of Wisconsin (University of Wisconsin 1981). The policy, designed to help the CTDA plan potable water interventions to support the regional development strategy for Central Tunisia, includes considerations to ensure water availability throughout the year, to help those with least access first, to ensure Ministry of Public Health responsibility for health education and sanitation activities, and to incorporate the CTDA as program manager. It also contains a detailed analysis of site-selection criteria, including distance/access, number of beneficiaries, cost, quantity and quality of water, drainage, proximity to other public services, accessibility, and possible damage to archaeological and historical sites. Finally, a detailed site-selection methodology was spelled out to take into consideration "extant demographic, topographical and hydrogeological factors." The methodology also specified a role for beneficiaries as participants in the selection process and postulated that the selection of sites might reflect both administrative (governmental) and social (traditional social organizational) configurations to avoid rivalry over control of sites.

Most of the 48 first-phase interventions, including 18 springs, 14 shallow wells, and 16 drilled wells, were completed and brought into use in the two years following the interim evaluation of August 1983. The average number of beneficiaries appears to be over 1,000 persons per site—highest for the drilled wells, lowest for the improved springs.

The 1983 interim evaluation of the first phase of the project investigated sites where work had been completed or was under way. It turned out that there were two gaps in the initial design. One was in the flexibility of the water-point selection criteria, which permitted too great a political influence in the actual determinations of where to drill. The need here was for more stringent (but still mutually acceptable) criteria for water-point selection in order to avoid drilling very expensive dry wells.

The other gap was in the area of management of the water points that would be created or improved. Other potable water projects had attempted to use simple technology, and they often had not worked; in some cases the hand pumps had been vandalized (Potts 1983). Because this project foresaw the use of motors to pump water—all the more complicated to run—it seemed necessary to encourage some kind of community involvement in the management of these sites. Thus one key recommendation in the evaluation report was that the users of each water point be organized into WUAs that would accept some of the responsibility for running the site.

C. The Rural Potable Water Institutions Project

USAID and the CTDA began to put these recommendations into action by incorporating these elements into a follow-on project that was designed with assistance from the Institute for Development Anthropology. This is the Rural Potable Water Institutions (RPWI) project. The

task was to design a plan that would be concrete enough to satisfy funders and other skeptics, but that would leave plenty of flexibility for local initiative. This idea was readily accepted by many USAID and Tunisian officials, who had come to see this kind of rational planning allied with decentralized management as a useful experiment or model. The RPWI project (AID project No. 664-0337) began on 30 April 1986, and funding for activities in central Tunisia ended on 30 June 1991, although project funding continues for the national strategy work through 30 June 1992.

Funding for the RPWI project was provided by both USAID and the GOT. Of the US $ 9,900,000 initially allocated for project activities, the United States appropriation was US $ 6,500,000, with Tunisia contributing the remaining US $ 3,400,000. In May 1989, an additional US $ 2,000,000 from the United States P.L. 480 Title I assistance program was transferred to the project. The provision of supplementary funds was a recommendation of the February 1989 mid-term evaluation of the project. The evaluation concluded that because of exchange rate fluctuations and water system construction activities that had exceeded anticipated costs, the project would be unable to complete the planned number of systems without additional funding. Half of the P.L. 480 funds were used to complete the RPWI project in central Tunisia and the rest went toward the current program to develop a national strategy for the creation and support of rural community WUAs.

The major activities of the RPWI project included the following:

1. **Technology transfer activities.**

- establishment of a water point selection methodology
- creation of 30 new boreholes and civil works
- extension of four existing potable water systems
- a pilot project of house connections in one community

2. **Institutional development at the regional level**

- improved planning and coordination for the Water Affairs Group (WAG)
- creation and operation of the *Unité d'Autogestion* (UAG), or WUA support unit
- creation of the Rural Health Education Team (RHET)
- reorganization of the regional support program for water point operation and maintenance (O&M)
- training of project administrators

3. **Institutional Development at the community level**

- creation and initial support of community Water User Associations (WUAs)
- recruitment and training of Village Health Workers (VHWs)
- creation of Women's Interest Groups (WIGs)

From the outset the RPWI project employed a multi-disciplinary, equity-based approach to a development sector—rural potable water supply—that has in the past been dominated by technical and engineering concerns. In this project, as much if not more attention was paid to the development of human institutions that would operate and support the water systems than to the creation of the systems themselves. Social science methodology and expertise were crucial, indeed central, to the project design and implementation. The project was executed by a broad mix of Tunisian engineers, social scientists, and health education specialists. All were committed to the community-participation focus of the project and they, together with regular, short-term expatriate assistance from individuals with a similar range of credentials, made the central Tunisia project a laudable success-story and provided a development model that is rapidly being disseminated to other regions and development sectors throughout Tunisia. The rest of this report documents the activities performed, lessons learned, and achievements attained by the large number of institutions and individuals who collaborated on this innovative and successful project.

CHAPTER II. TECHNOLOGICAL ACCOMPLISHMENTS OF THE RPWI PROJECT

A. Water-Point Selection Methodology

1. Introduction

One of the objectives of the RPWI project was to continue the work begun under the previous CTDA Rural Potable Water SubProject to develop or improve the potable water supply for small- and medium-sized needy communities in central Tunisia. The GOT- and USAID-approved RPWI project paper included funding for 30 new boreholes (with a goal of 26 productive wells) and their associated civil works, four extensions of existing water systems, and a pilot project to establish house connections in one community. One difference between the RPWI project and the previous potable water activity was that the new water systems would be located following a mutually agreed upon set of selection criteria. Although four of the boreholes were completed before the new methodology was prepared (see Table 2.8), the results of the Water Resource Mapping Study were available in early 1987 and were employed in the selection of 26 of the 30 borehole sites developed by the project.

The previous potable water project had developed a general strategy for the selection of water points. The selection policy incorporated a detailed technical analysis that covered the quantity and quality of the water resources, the number of beneficiaries, distance and access, drainage, and cost. The policy also considered year-round water availability and equity.

The policy as implemented, however, resulted in the creation of wells in areas where the water table was relatively high. Further, the flexibility in the interpretation of the technical considerations permitted what was, in retrospect, too great a political influence on the siting decisions.

The need, therefore, was to develop a clear, standard method for site determination that combined technical, economic, and social factors, and that did so in a reasonably clear and mutually acceptable fashion.

USAID and the CTDA turned to the Institute for Development Anthropology, which, through the SARSA Cooperative Agreement,[3] contracted a series of specialists in 1985-1987 to examine the available information and to craft that data into a workable site-selection methodology. The work began with a hydrogeologist who assessed the limits of the known aquifers and the existence of shallow and deep wells throughout the region. Shortly thereafter,

---

[3] Contract No. DAN 1135-A-00-4068-00, between Clark University, the Institute for Development Anthropology, and the Agency for International Development, Bureau for Science and Technology, Office of Rural and Institutional Development, Division of Rural and Regional Development (AID/S&T/RD/RRD).

IDA contracted with a demographer to review census information and determine cartographically where population was clustered and what population trends might be predicted in the region. About the same time, an economist undertook analyses of the costs of operating wells of different depths with various types of pumps and the possibilities of supporting well operation from local funds. Finally, an anthropologist qua regional analyst synthesized these different data sets and interpretations into a standard method for the determination of prospective water sites.

Importantly, the hydrogeologic and population data were mapped onto transparent sheets that could be overlaid one on another in order to examine different questions. This cartographic work was directed in the field by Professor Mohamed Fakhfakh of the University of Tunis Geography Department. The work brought together a great deal of existing but scattered information, which then had to be standardized and updated. Also, the fieldwork enabled development of detailed ethnic maps that would allow analysts to assess which groups might be cooperative with or antagonistic to each other.

It is easy to underestimate the value of the cartographic exercise. The simplicity of the overlying transparent maps is their great advantage. Anyone, whether in the headquarters or a field office, whether a trained technician or not, can manipulate the maps and understand—indeed, see—why and how particular decisions are being made. The maps are the physical expression of technical information presented in a way that encourages participation by making the information pictorially available to everyone.

The alternative approach is to technologize—that is, computerize—the process. While this approach is technically feasible and certainly simplifies the task of updating information, it has the tremendous—and often unappreciated—disadvantage of cutting many people out of the decision-making process, for only those people in the home office who have computer training are able to use digitized maps easily. The project considered this question, and decided *for* maps, *not* against computers. And, it decided for maps on the grounds that more people could be more involved in the process.

This section will now take up the various technical studies performed for the water-point selection methodology. In order, we will review the hydrogeologic studies, the demographic studies, the economic studies, and then their synthesis. Finally, the section will look at the consequences of developing a simple, clear approach to the delimitation of water-point development.

2. Hydrogeology[4]

The hydrogeologic (ground water) characteristics of a site—presence of an aquifer, water quality, and depth—are primary considerations for the location of individual wells. These

[4] This section is based on the reports of the hydrogeologist John Scheliga. (See Appendix 1: List of Documents.)

characteristics cannot be changed by political, socioeconomic, financial, or other considerations. Either there is sufficient water of acceptable quality at a reasonable depth, or there is not. The survey of hydrogeologic conditions, therefore, determines all potential sites where wells *might* be sited, and constitutes a first and necessary step in selecting potable water sites.

a. Available Resources

Hydrogeologic information for establishing project decision-making criteria and the selection of specific well construction sites includes:

- The extent of known aquifers within the region.
- Depths to and thicknesses of regional aquifers.
- Hydraulic characteristics of the regional aquifers (e.g., static water levels, production capacities).
- Water quality within the regional aquifers.
- Locations of existing water wells, along with operational information (flow, water quality, maintenance problems, and the like).

Much of this information was available in map or tabular form, or both, from publications and data files of GOT agencies. In particular, *Direction de Ressources en Eau* (DRE) offices in Kasserine and Gafsa held summary information on all well construction and test information conducted in the project area. The DRE office in Gafsa, for example, collects all data in the region on standardized forms, interprets these data, and produces water-quality, water-level, and other maps such as aquifer thicknesses and aquifer depth. Indeed, for specific ground water information, the DRE in Gafsa is a most complete, accurate, and responsive source. Finally, individual offices of CTDA maintain up-to-date information on wells in their respective delegations.

Although the information was available, much of it was not systematized. Deep-well data, for example, were listed under the local geographic or hydrogeologic (groundwater basin) names. The BIRH numbers were indicated after the names, which can make it cumbersome to locate individual wells on project maps with only the BIRH number. More importantly, summary data were not compiled for each water point, although they were available from different sources. A data base that comprised descriptive characteristics—depth, aquifer zone, static water level, date constructed, flow, water quality, operational problems—was therefore necessary in order to facilitate project decision making. With this data base on computer, new or overlooked information could be added without continually retyping tables.

A comparison of the information on wells in the Kasserine and Gafsa-Sened regions points out the need to verify office data in the field. Of the 248 wells in Kasserine, 27 were not

productive, 63 were abandoned, and the rest—158—were being used for potable water, irrigation, and industry. Of the 45 wells in the Gafsa-Sened region, all were considered productive and in operation; none were considered either unproductive or abandoned. This disparity, it would appear, was the result of different reporting systems rather than different success rates, and subsequent planning would require verification of the operational status of all wells.

Because the rate of well drilling has increased significantly in recent years, all information must be updated. In the Kasserine region, the earliest well (BIRH no. 1423/4, abandoned) dates to 1924. In the 45 years until 1970, approximately 119 wells were drilled, which represents two and a half wells every year over the entire period. In the 1970s, more than three and a half wells were drilled each year, for a total of 36; in the 1980s, 112 wells—more than ten a year. Similarly, in Gafsa, where the oldest well dates to 1931, only 8 wells were drilled in the 30 years until 1960. Nine wells were drilled in the 1960s—about one a year. Only 4 wells were drilled in the 1970s, but 24 wells were drilled in the early 1980s.

The hydrogeologist, who had made a field survey of the project area in September 1985 under an Indefinite Quantity Contract held by IDA,[5] reviewed and analyzed all the available information. Surface reconnaissance was made along the entire lengths of major highways, secondary highways, and several rural roads.

On the basis of the documentary review and the field survey, the hydrogeologist gave instructions for the cartography of the shallow and deep aquifers in the project zone and for the mapping of existing water points, along with certain key descriptive information (e.g., date of well, viable source or dry source, water flow, water quality). These hydrogeologic maps were made for the entire project area.

Maps 2, 3, 4, and 5 illustrate this work. Map 2 is a Landsat image of the region; map 3 is an IGN topographic map. They provide a visual picture of the topography of the zone. (The photocopied reproductions included here are illustrative only, for they do not capture the detail of the original.) Map 4 depicts the deep aquifer (and the water quality therein) along with the existing boreholes. Map 5 delimits the shallow aquifer and locates shallow wells and piping systems in the area.

b. Findings

Hydrogeologic conditions in the project area are complex and only generally understood in many places. Under such conditions, there is an inherent probability of 10 to 20 percent that wells will fail even in relatively well-known sectors. To maximize the benefits of the project, therefore, a conservative approach to the location of well sites was taken.

---

[5] IQC Contract No. PDC-1096-I-00-4160-00, Work order 8.

A conservative approach strictly limits the possibility of "exploratory" wells, defined at that time as any well drilled or constructed more than four kilometers beyond a location where a deep aquifer of potable water is known to be present. (Subsequently, a stricter, three-kilometer limit was adopted as the norm.)

Further, for cost reasons, the project at first set a maximum depth of 200 meters for wells in areas of known aquifers. This depth, however, was not appropriate throughout the project area, as potable water resources (aquifer zones) range in depth from 100 to 350 meters. The single 200-meter limit could lead to overdrilling in locations where the aquifer is known to lie at a depth of less than 150 meters and to no drilling in areas where the aquifer lies deeper.

One solution to this physical constraint of aquifer depth was to vary the number of wells that could be drilled to each depth. For example, 10 wells might be drilled to 100-150 meters, 15 wells to 150-200 meters, 5 wells to 200-350 meters. This solution involved drilling the same number of wells and only slightly more linear meters of wells—a maximum of 6,250 meters vs. 6000 meters (for 30 wells down to 200 meters). New criteria were established and the project agreed to finance wells both shallower and deeper than the 200-meter mark. This more flexible approach would satisfy more potential water users at little additional cost to the project.

These two determinations are critical contributions to the overall strategy of water-point selection: first, that any well be within a stipulated (3 kilometer) distance of the *known* limit of an aquifer; and, second, that the depth of a particular well could vary with the need and resources in the area.

3. Demography[6]

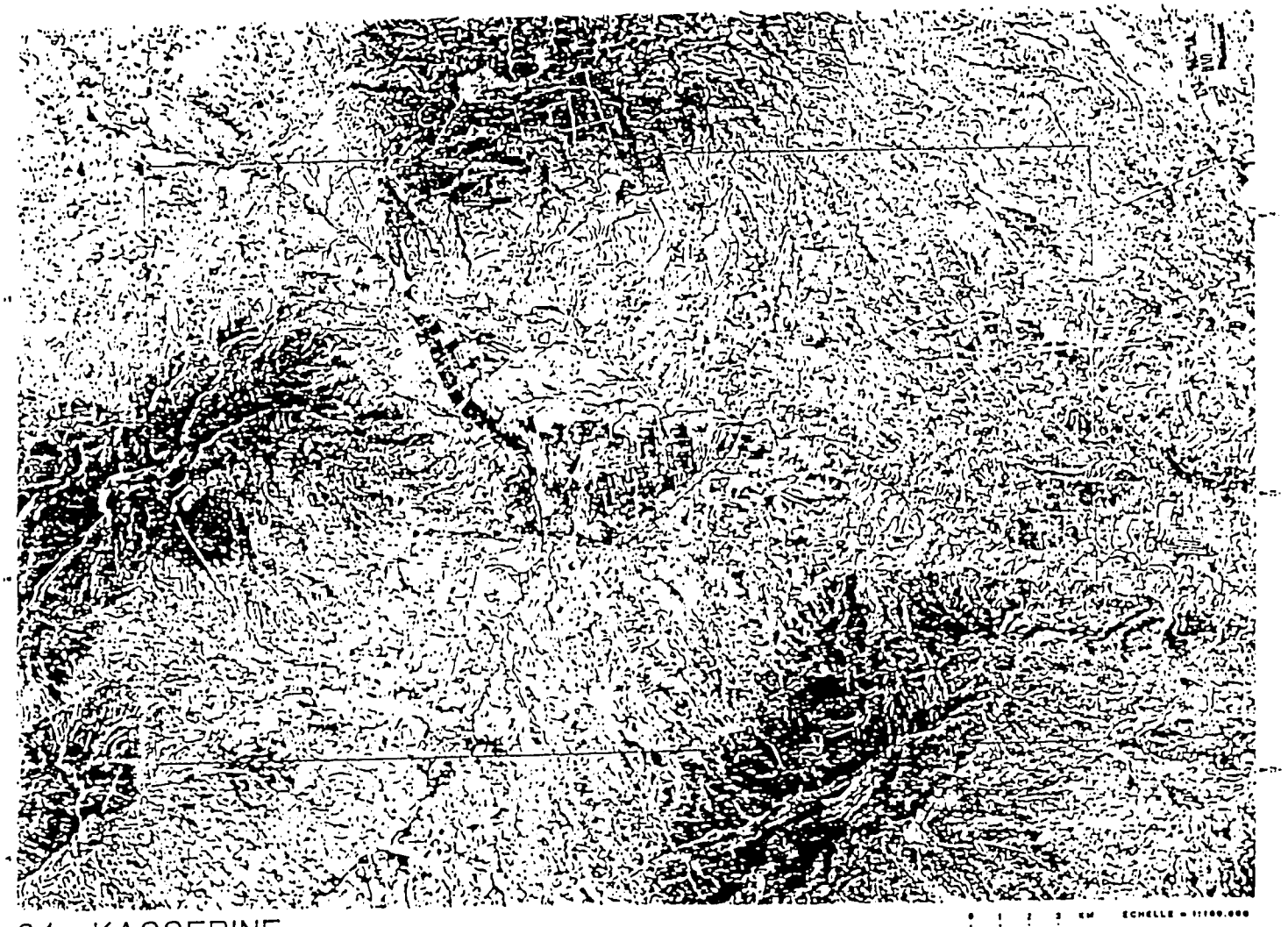
Knowing how people disperse across the landscape now and at some future time is a critical element in the equation to determine the adequacy of the present (and future) water supply. Hydrogeology tells us where the water is; demography tells us where the people are and will be. These elements, together with a mapping of existing water points, tell who has—and who needs—better access to water.

The demographic snapshot of the central Tunisia area shows a low-density (34 inhabitants per square kilometer), largely rural (70 percent) area, with a relatively fast growth rate (2.5 percent), low in-migration, and a slow but accelerating urbanization.

The total population of Kasserine and Gafsa governorates in 1984 was 335,330 (Table 1). Population densities were low everywhere except in the delegation (administrative area) that

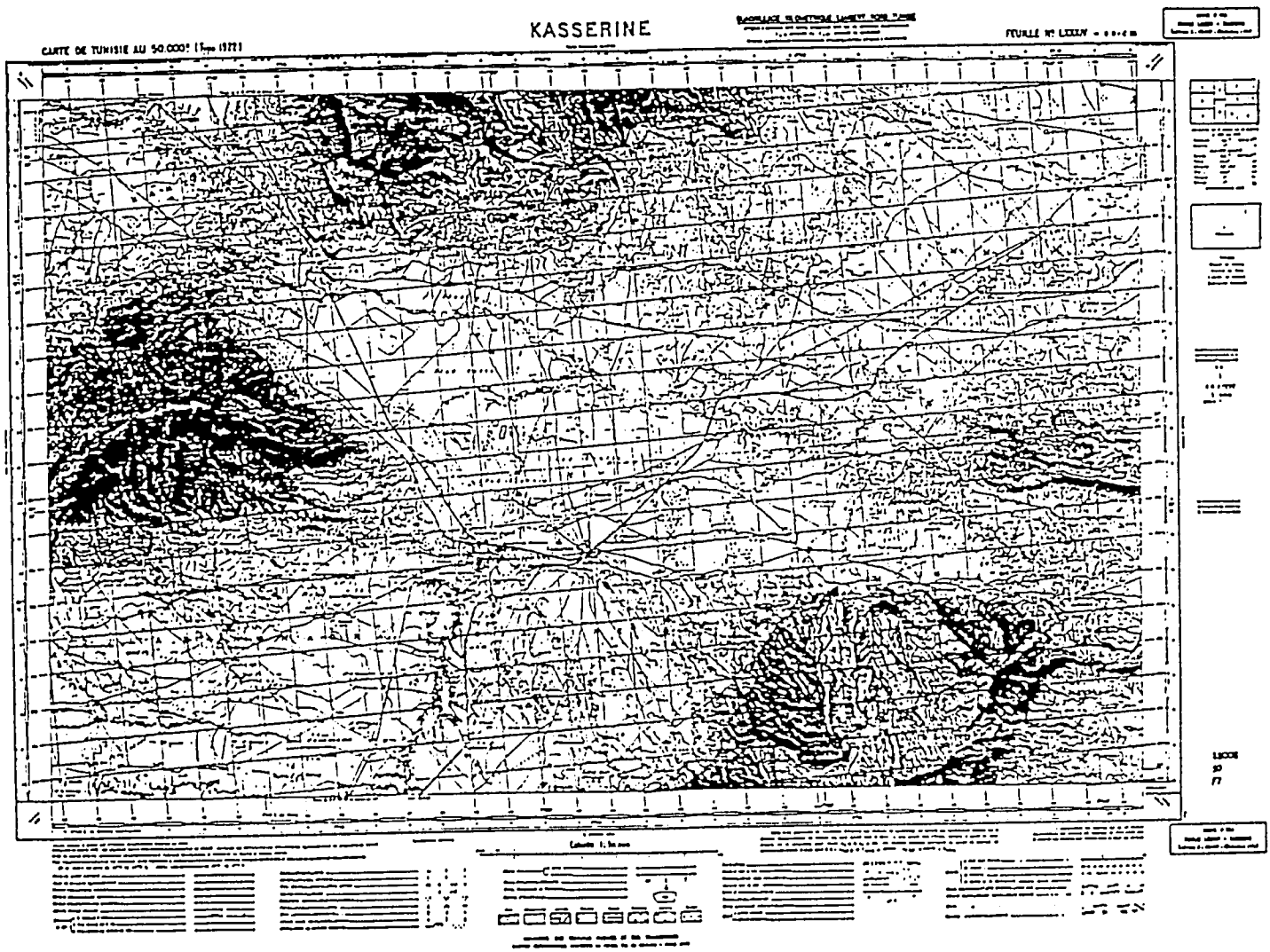
[6] This section is based on the report of Raymond Gervais, *Population and Water in Central Tunisia*, Institute for Development Anthropology, Binghamton, N.Y., March 1987. Details on the method of analysis and the references used are available in that report.

Map 2 Landsat image of Kasserine

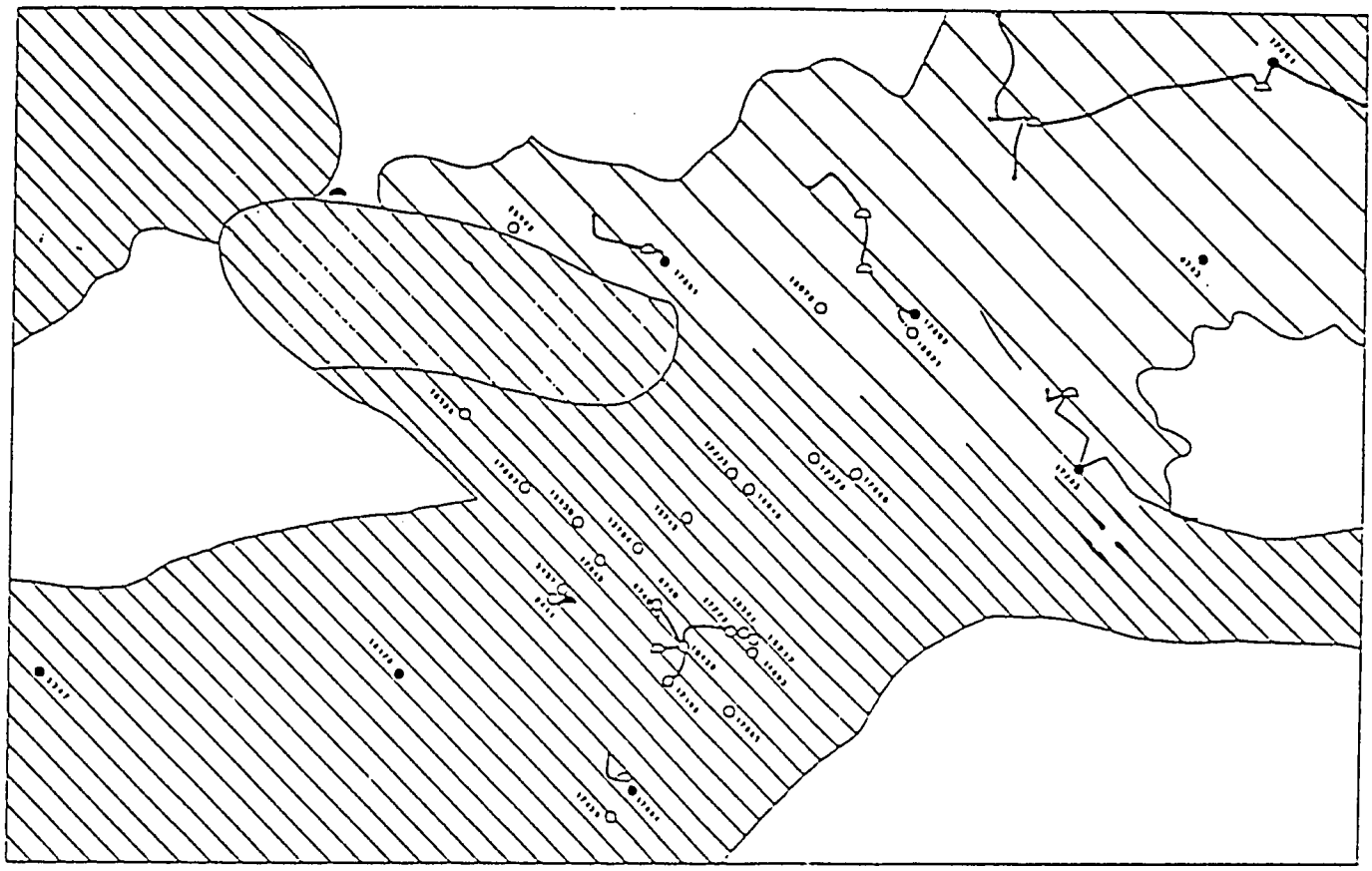


84. KASSERINE

Map 3 IGN Topographic Map (Kasserine)



Map 4. The Deep Aquifer (Kasserine)



EAU

RESSOURCES PROFONDES

	RESSOURCES FAIBLES	RESSOURCES IMPORTANTES
1		
2		
3		
4		

1 REGION SEC < A 1.5g DE SEL/LITRE

2 REGION SEC ENTRE 1.5g ET 3g DE SEL/LITRE

3 REGION SEC > A 3g DE SEL/LITRE

4 RECONNAISSANCE A ENTREPRENDRE PAR FORAGES

FORAGE

FORAGE POUR L'EAU POTABLE RURALE

RESERVOIR

BORNE-FONTAINE

CONDUITE D'EAU

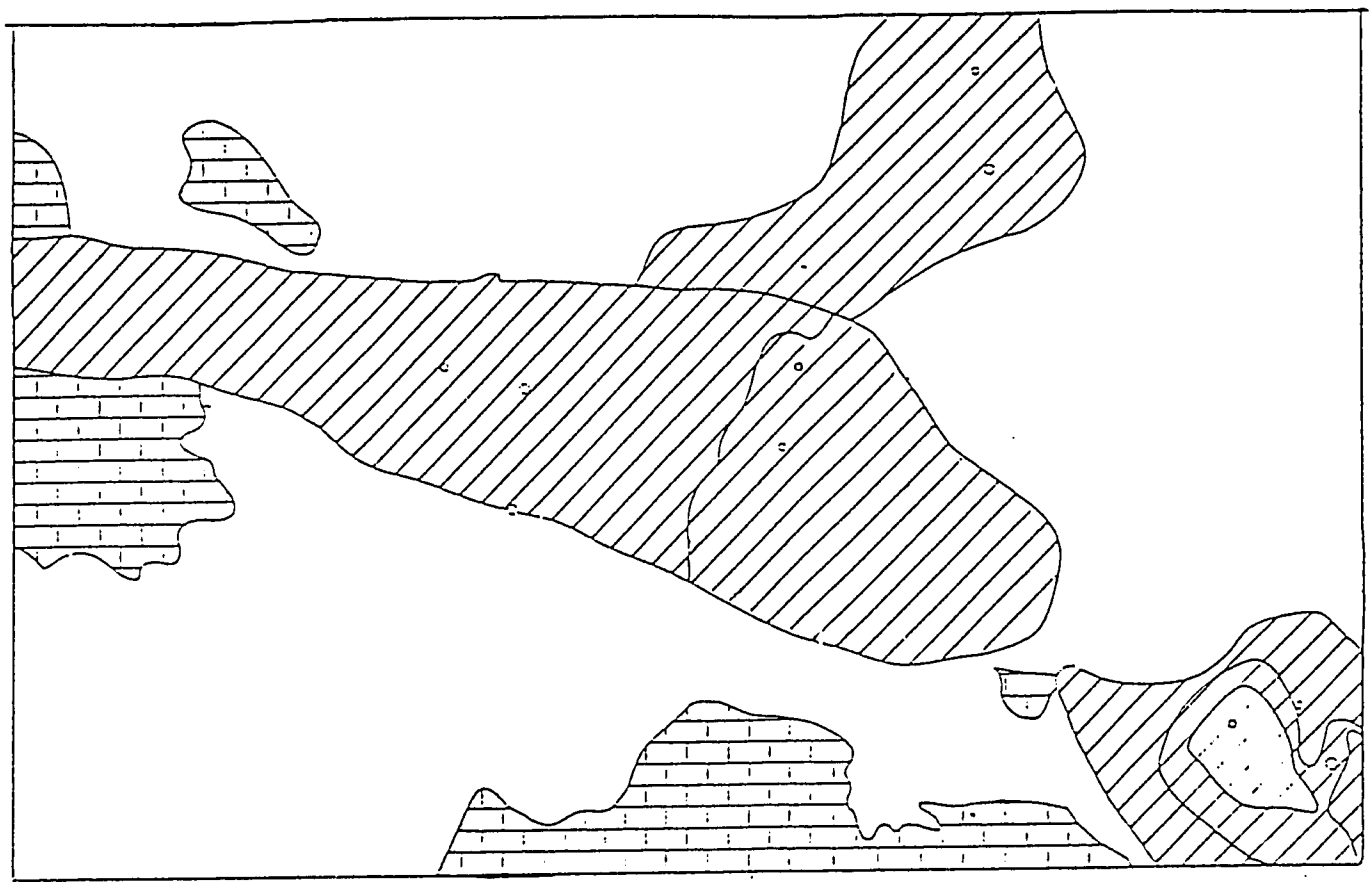
CONDUITE D'EAU PROJETEE

RESERVOIR PROJETE

BARRAGE

Source: IDA.

Map 5. The Shallow Aquifer (Kasserine)



EAU

RESSOURCES SUPERFICIELLES

	RESSOURCES FAIBLES	RESSOURCES IMPORTANTES
1		
2		
3		
4		

1 RESIDU SEC < A 1.5g DE SEL/LITRE

2 RESIDU SEC ENTRE 1.5g ET 3g DE SEL/LITRE

3 RESIDU SEC > A 3g DE SEL/LITRE

4 AFFLEUREMENT CALCAIRE

NOMBRE DE PUITS DE SURFACE
PAR ZONE DE CONCENTRATION

- DE 0 A 20
- DE 20 A 40
- DE 40 A 60
- DE 60 A 80
- > 80

Source: IDA.

includes Kasserine town. Similarly, the growth rates in the previous decade averaged about 2.5 per cent in all but the more urban delegations.

The population of all delegations except Kasserine Nord and Feriana is overwhelmingly rural (Table 2). Moreover, most of the rural population lives in dispersed, isolated settlement rather than in small rural agglomerations. This distribution of population across the arid landscape only underscores the need for—and difficulties with—providing adequate water points to the rural people.

The region's relatively rapid population growth rate (2.5 percent) is a result of high fertility and moderate-to-low mortality, since the region has a small net out-migration (-1.5 percent for Kasserine governorate in 1984).

Fertility rates in the area are relatively high—6.9 in Kasserine and 5.3 in Gafsa over the period 1979-1981—but appear to be falling. The most likely causes are that young women are staying in school longer and therefore postponing marriage. Further decline in fertility rates is unlikely, however, because the regional economy remains rooted in settled agriculture, which has higher labor requirements per household than pastoralism.

Mortality rates had to be imputed because of the inadequacy of death statistics: the reporting rate is only about 65 percent, and surely much less in rural areas. Nonetheless, demographers believe that mortality has been falling in recent decades as Tunisia's health care and general level of welfare have improved.

Importantly, morbidity rates in the study area imply that mortality due to simple communicable disease, especially water-related disease, remains high (Table 3). The incidence of reported illnesses is moderate for a developing country (150 per 1,000). But much illness surely goes unreported in the more rural areas, such as central Tunisia. Even so, the available statistics show that water-borne diseases comprise at least half of the total reported illnesses. Child diarrhea, often caused by contaminated drinking water, is high.

To take these factors—fertility, morbidity and mortality, and migration—into account in the population projections requires development of alternative scenarios based on different rates for births, migration, and death. Table 4 gives the assumptions for each of the three projections; Table 5 presents the possible 20-year populations for the region. Regionally, the results are all similar in that the total population will increase about 70 per cent to some 504,000 inhabitants. At the level of the delegation, however, the distribution of population throughout the region can vary greatly. Scenario 3, for example, assumes that migration flows will increase by 50 percent each five years, which has dramatic consequences for Gafsa Nord.

Table 1. Population Characteristics by Governorate and Delegation

	Population Size 1975	Population Size 1984	Annual Growth	Area (sq km)	Density
Tunisia	5572193	6975450	2.53		
Kasserine Governorate	238499	297959	2.5	8260	36
	(study delegations)				
Kasserine North	25071	50290	8.04	93	543
Kasserine South	18244	17181	-.07[1]	843	20
Hassi El Ferid	11157	11987	.80	1028	12
Sbeitla	38051	48536	2.74	1134	43
Sbiba	22084	27954	2.65	462	60
Jedliane	10655	11051	.41	281	39
El Ayoun	9553	13483	3.9	412	33
Thala	32506	34959	.8	812	43
Haidra	9347	9750	.47	472	21
Foussana	25099	31409	2.52	846	37
Feriana	22356	26048	1.7	912	29
Majel Ben Abbes	11891	15311	2.85	955	16
Gafsa Governorate[2]	(236014)	(297959)	(2.7)	(1615)	(23)
	(study delegations)				
Gafsa North	9900	14421	4.27	905	16
Sned	19010	22950	2.11	710	32
Total (Gafsa delegations)	28910	37371	2.89	1615	23
Total (study area)	267409	335330	2.55	9875	34

[1] The negative growth rate is due to boundary changes. After the 1984 Census, the Delegation of Hassi El Farid was created from the Kasserine South secteurs of Hassi El Farid, Hechim, Kamour and Khanguet Jazia. The boundary between Kasserine North and Kasserine South was redrawn, increasing the size of the latter.

[2] Figures are adjusted to account for boundary changes between the 1975 and 1984 censuses.

Source: Gritzinger 1987c:8.

Table 2. Population Distribution by Settlement Pattern for Delegations, 1984

	Urban Population[1]		Rural Population			
			Agglomerated[2]		Isolated[3]	
	Number	Percent	Number	Percent	Number	Percent
Kasserine North	47606	80.4	4288	7.2	7319	12.4
Kasserine South	0	0.0	1530	7.6	18715	92.4
Sbeitla	12022	24.8	2609	5.4	33905	69.9
Sbiba	3255	11.6	1020	3.6	23679	84.7
Thala	11767	33.7	3754	10.7	19438	55.6
Feriana	14400	55.3	614	2.4	11034	42.4
Foussana	0	0.0	6533	20.8	24876	79.2
Jedliane	0	0.0	1948	17.6	9103	82.4
Haidra	0	0.0	1870	19.2	7880	80.8
Ayoun	0	0.0	508	3.8	12975	96.2
M. Ben Abbes	0	0.0	1621	10.6	13690	89.4
Kasserine Total[4]	89050	29.9	26295	8.8	182614	61.3
Gafsa North	0	0.0	2105	14.6	12316	85.4
Sned	3887	16.9	2280	9.9	16783	73.1
Gafsa Delegations Total	3887	10.4	4385	11.7	29099	77.9

[1] Administrative centers.

[2] Settlements consisting of more than one compound.

[3] Settlements consisting of only one compound.

[4] Hassi El Farid is included with Kasserine North and South.

Source: Gritzinger 1987c:9.

These demographic projections are useful both at the broad strategic level and for more narrow operational purposes. A strategic look at the longer term—15 to 20 years ahead—shows that the region's population will be much larger, regardless of the assumptions about fertility, mortality, and migration. Inexorably and inevitably, a population growing at 2.5 percent per year doubles in 28 years. The need for more water points in the future is clear.

The demographic projections are more immediately useful in determining where need is—and will be—greatest. Present and projected populations can be mapped, and these maps overlaid on the hydrogeologic maps of water resources.

Table 3. Rate per Thousand of Selected Water-Related Diseases Reported in Kasserine Governorate and Delegations Sned and Gafsa North of Gafsa Governorate, 1985[1]

Disease	Kasserine	Delegations Sned Gafsa North
Child Diarrhea[2]	177.4	117.1
Adult Diarrhea[3]	16.3	11.1
Amoebiasis	0.6	0.8
Urinary Infection	20.0	nd

[1] Does not include El Ayoun Delegation.

[2] Population aged 0-4 years.

[3] Population 5 years of age and over.

nd = no data

Source: Gritzinger 1987c:12.

In fact, the SARSA project introduced three simple innovations into this standard demographic analysis. First, it actually mapped the current population distribution. Thus the statistics were given spatial representation. Second, the project took into account patrilineal (i.e., family) and ethnic ties in local areas (Map 6). Thus, it was possible to assess at a glance not just the adequacy of water provisioning but also the probable patterns of cooperation and antagonism—a most important consideration where the creation of WUAs is a primary aim. And, third, the project drew up another set of maps for transport routes (Map 7).

Table 4. Assumptions of Three Population Forecasts for Central Tunisia, 1984-2004

	Projection 1	Projection 2	Projection 3
Sources of projections	Ministry of Planning	Created	Created
Characteristic	Most Probable	Limited Growth	Severe Migratory Outflow
Base Population	Adjusted 1984 Census	Adjusted 1984 Census	Adjusted 1984 Census
Mortality	Fall 1986-1991 -6.7 % 1991-1996 -5.7 % 1996-2001 -5.7 % 2001-2004 -6.6 %	Rapid Fall*	Remains at 1984 level
Fertility	Total Fert. Rate declines 1986-1991 -1.5 % 1991-1996 -3.0 % 1996-2001 -1.5 % 2001-2006 -3.6 %	Rapid Fall	Remains at 1984 level
Migration			
General	1984 Level	No migration	Doubles every 10 Years
Intergov.	Based on 1979-1984.	None	Strong migration to Tunis
Intragov.	n.a.	None	Strong urbanization to Kasserine and Gafsa
Internat.	n.a.	None	No Migration

n.a. Not available.

Source: Gritzinger 1987c:13.

---

*Life expectancy increases for Kasserine from females 62.5 and males 61.25 in 1984, to females 72.5 and males 71 in 2004.

Table 5. Population, Growth Rates, and Densities for Three Scenarios, Year 2004

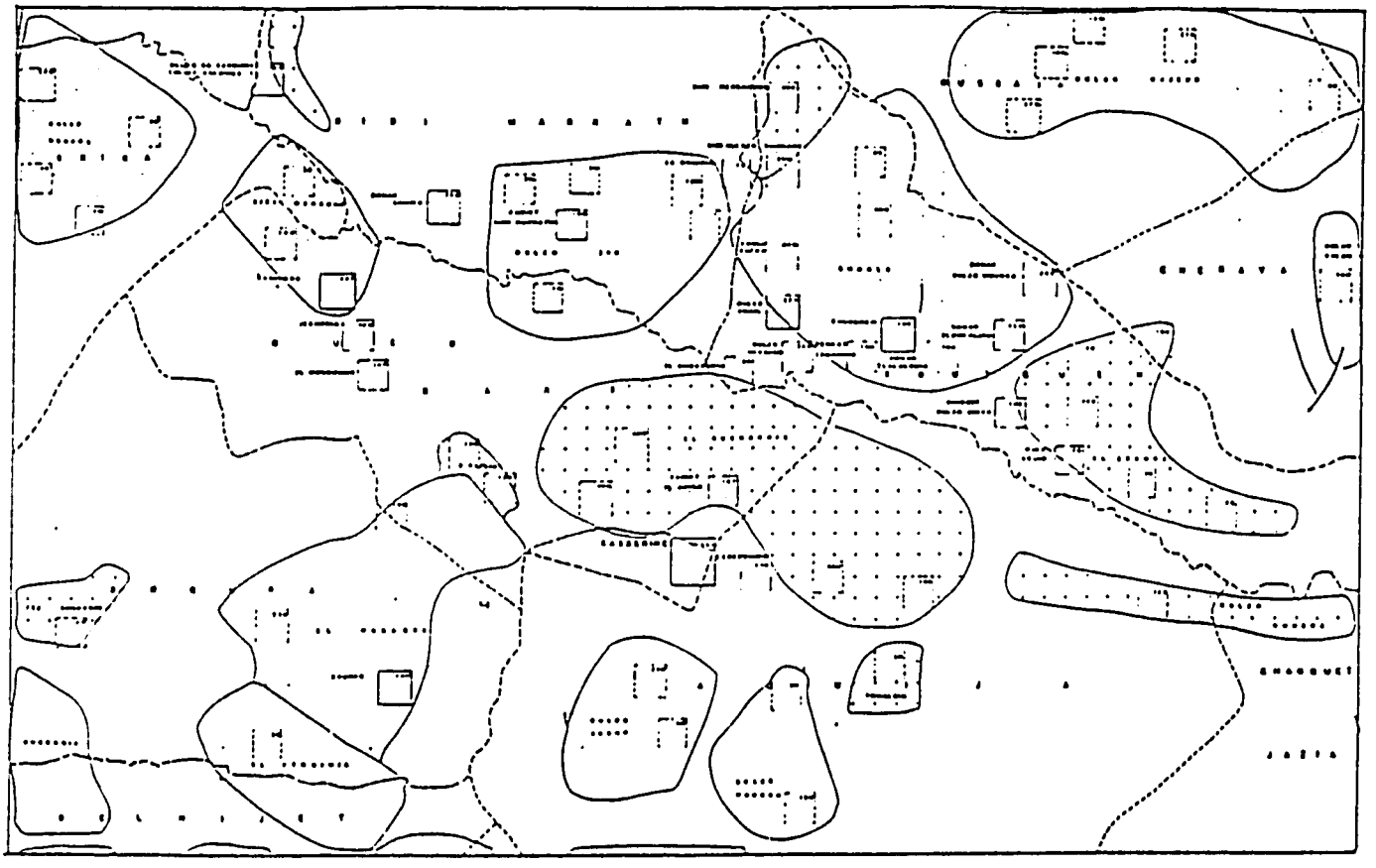
Delegation	Popul. 1984	Projection 1	2	3	Growth Rates 1	2	3
Governorate of Kasserine[1]							
Kasserine N.	50290	104337	88341	120925	3.7	2.9	4.5
Kasserine S.	17181	23972	29159	17854	1.7	2.7	.2
Hassi El Ferid	11987	16654	20290	12522	1.7	2.7	.2
Sbeitla	48536	89890	84109	95171	3.1	2.8	3.4
Sbiba	27954	47363	46844	47305	2.7	2.6	2.7
Jedliane	11051	18731	18513	13805	2.7	2.6	2.7
El Ayoun	13483	22026	22492	21214	2.5	2.6	2.3
Thala	34959	53751	59715	45979	2.2	2.7	1.4
Haidra	9750	18367	17676	18802	3.2	3.0	3.3
Foussana	31409	50201	53891	45332	2.4	2.7	1.8
Feriana	26048	36672	45763	25908	1.7	2.9	0.0
Majel Ben Abbes	15311	24607	26190	22512	2.4	2.7	1.9
Total	297959	506571	512983	492329	2.7	2.7	2.5
Gouvernorate of Gafsa							
Gafsa N.	14421	14075	24222	0	-.1	2.6	**
Sned	22950	36464	38122	31830	2.3	2.6	1.6
Total	37371	50539	62344	25975	1.5	2.6	-1.8
Grand Total	335330	557110	575327	518304	2.6	2.7	2.2

[1] The populations of Kasserine North and South and Hassi El Farid have been adjusted from the 1984 census figures to account for creation of the latter delegation after the census, and redrawing of the boundary between the former two delegations.

** Not applicable.

Source: Gritzinger 1987c:14.

Map 6. Population Distribution with Ethnicity



ADMINISTRATION

FRONTIERE INTERNATIONALE (NON OFFICIELLE)

LIMITE DE REGION ECONOMIQUE

LIMITE DE GOUVERNORAT

LIMITE DE DELEGATION

LIMITE DE SECTEUR

KASSERINE CHEF-LIEU DE GOUVERNORAT

THALA CHEF-LIEU DE DELEGATION

CHERAYA CHEF-LIEU DE SECTEUR

LIMITE DE LA ZONE D'ETUDE

POPULATION

POPULATION AGGLOMEREE

50 200 500 1000 3000 10000 30000

50 400 2000

AGGLOMERATION SECONDAIRE

AGGLOMERATION PRINCIPALE

COMMUNE URBAINE OU VILLE

SOURCE: I.N.S. (1984)

AUTRES AGGLOMERATIONS RECONNUES SUR LE TERRAIN EN 1987

NOMBRE D'HABITANTS

POPULATION DISPERSEE (ESTIMATION)

DENSITE AU KM²

>100

DE 35 A 100

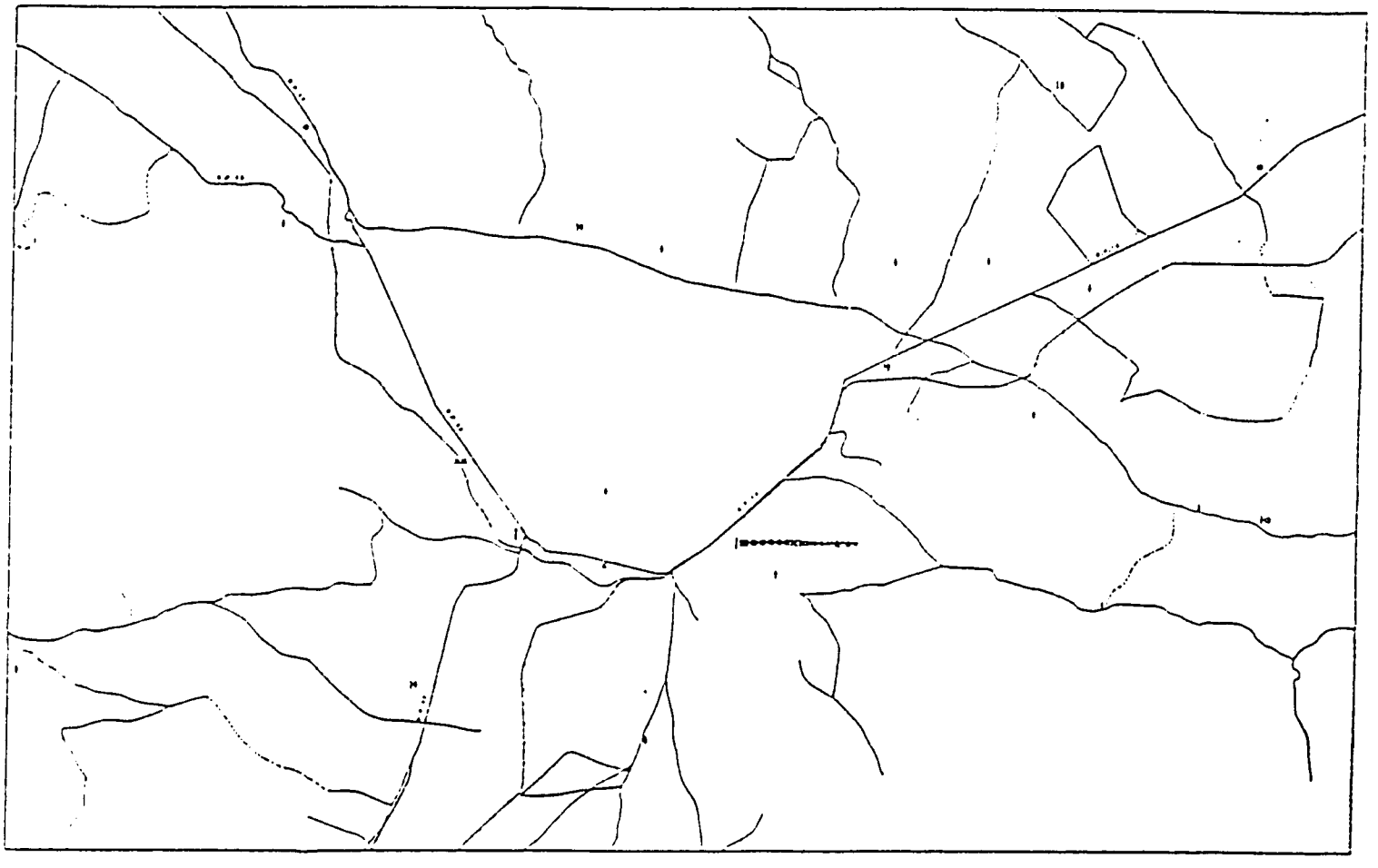
DE 6 A 35

MOINS DE 6 HABITANTS

SOURCE: ENQUETE SUR TERRAIN

Source: IDA.

Map 7. Transportation Routes



INFRASTRUCTURES ET EQUIPEMENTS

INFRASTRUCTURES DE COMMUNICATION

- VOIE FERREE METRIQUE
- ROUTE DE GRAND PARCOURS (ROUTE NATIONALE)
- ROUTE DE MOYENNE COMMUNICATION (ROUTE REGIONALE)
- AUTRE ROUTE BITUMEE
- PISTE IMPORTANTE RECONNUE:
- TRONCON SUR
- TRONCON PROBABLE

SOURCE: ENQUETE IMAGES

EQUIPEMENTS SANITAIRES

- HOPITAL REGIONAL
- HOPITAL DE CIRCONSCRIPTION
- DISPENSAIRE
- CENTRE DE SANTE DE BASE

EQUIPEMENTS SCOLAIRES

- LYCEE OU COLLEGE D'ENSEIGNEMENT SECONDAIRE
- 1 ECOLE PRIMAIRE
- 5 ECOLES PRIMAIRE

EQUIPEMENTS ECONOMIQUES

- 1 USINE
- 5 USINES
- CENTRE DE COLLECTE D'ALFA
- HUILERIE
- SOUK HEBDOMADAIRE

EQUIPEMENTS TOURISTIQUES

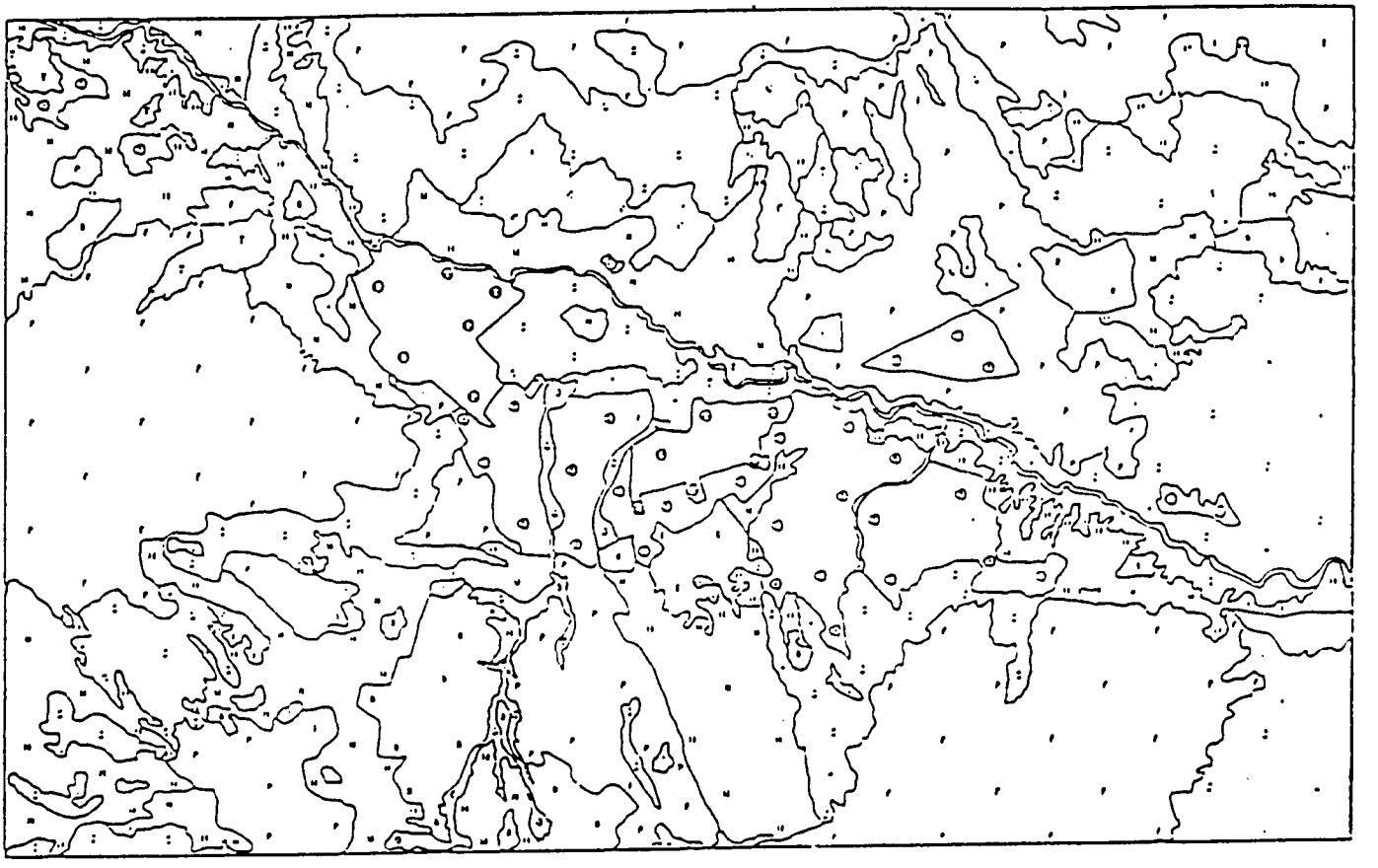
- HOTEL A 3 ETOILES
- HOTEL A 2 ETOILES
- HOTEL A 1 ETOILE

AUTRE

- RUINE IMPORTANTE

Source: IDA.

Map 8. Land Use



OCCUPATION DU SOL

- 1 FORET EN GRANDE PARTIE DEGRADEE
- 5 ALFA PLUS OU MOINS DENSE ET AUTRES FORMATIONS STEPPIQUES
- 11 CULTURES ANNUELLES SEC (CEREALES PLANTES FOURRAGERES)
- 11 CULTURES ANNUELLES IRRIGUEES (CEREALES PLANTES FOURRAGERES)
- 3 ARBORICULTURE FRUITIERE SEC A DOMINANCES D'OLIVIERS
- 12 ARBORICULTURE FRUITIERE IRRIGUEE A DOMINANCES D'OLIVIERS
- C PARCELLES DE CACTUS
- P POLYCULTURE
- T TERRES INCULTES, TERRAIN STEPPEUX, AFFLEUREMENTS ROCHEUX, SOLS SALES, ETC.
- E ESPACE BATI (AGGLOMERATIONS IMPORTANTES)
- O LIT D'OUED IMPORTANT

SOURCE: ENQUETE IRAGES

Source: IDA.

Thus, it was possible to study the distribution of population in relation to both existing water points and transport. Accessibility is an important concern in regional planning, as many families haul water in donkey-drawn cart-cisterns.

The SARSA project also drew up a set of agricultural land use maps (Map 8). These maps proved very difficult to design because, for example, what is pastoral land one year may be agricultural land the next. It was nonetheless important to do these maps for the wider planning effort, because irrigation is one use of water.

The development of the demographic maps along with the development of the hydrogeologic maps provided a complete set of tools for the analysis of water-point selection. No less importantly, these tools were clear visual aids accessible to almost anyone, be it a farmer or a high government official. And these accessible and comprehensible maps proved to be a most effective manner of presenting what otherwise would have been seemingly abstract, disembodied—even denatured—arguments. Because everyone could manipulate the map overlays, everyone would—and did—come to very similar conclusions.

4. Economics[7]

The economic analyses ask of a hypothetical water point whether well drilling will meet water demand at a reasonable cost and how much it will cost to operate a well over the course of a year. These are standard analyses intended to determine which, if any, aspect in water-point development will greatly increase costs if that consideration proves to be wildly different from the original assumptions.

a. Cost-Benefit Analysis of Well Point Development

Table 6 presents the assumptions of the economic water-point development models. The outcome variable is the minimum water flow needed to satisfy demand, assuming that the pump is operated for six hours a day. Demand, in turn, is determined by the population density (two levels: 25 and 50 persons per square kilometer) within a radius of the water point (either 4 or 7 kilometers) multiplied by current water needs (for humans only or with animals).

Under these assumptions, cost-benefit analyses were done for ten water-point development models: three well depths (125, 175, and 275 meters); three numbers of beneficiaries (200, 300, and 1,230 families); and the so-called New Mexico model of water distribution from a 175-meter well. The costing is straightforward, as it is based on actual construction and operation costs in Tunisia, and assumes a conventional 15-year project timeline and a 15 percent social discount rate. In a conservative approach benefits are limited to the time saved in water hauling, a portion of which can be put to productive employment.

---

[7] This section draws heavily from the reports of the economist consultant, Robert Reeser. (See Appendix 1 for titles of the reports and publication dates.)

All well models but the deepest (275m) serving the least people (200 families) are at least on the verge of being economic (Table 7). The shallow well (125m) serving most people (1,230 families, which is a population density of 60 persons per square kilometer within a 7-kilometer radius of the well point) has an internal rate of return of almost 35 percent. Under these conditions, even the New Mexico model of water distribution is feasible. Thus, even with a conservative estimate of benefits, deep-well potable water-point development appears to be a sound investment.

b. Operating Costs of Wells

The other question posed in the economic analysis is whether people will be able to pay the costs of operating the well point. The elements in this analysis are, naturally enough, the costs, the population, and their purchasing power. At the current average population density of 25 people per square kilometer, 1,500 persons (about 200 families) live within a three-kilometer radius of a well point. Each person uses, on average, 47 liters per day, or about 500 cubic meters per week. A pump that delivers six liters per second would have to operate four hours per day for six days a week to meet this demand. The operating and maintenance (O&M) costs for this period are roughly 3,300 TD (Tunisian dinar) per year, or about 300 TD per month. This works out to 1.5 TD per family per month, assuming 200 families in the area.

Such O&M costs are not onerous when one realizes that many families already pay at least 1.5 TD per month to water haulers. Thus, the proposed WUAs should, in this analysis, be able to collect enough money in fees to cover fuel and oil, and some smaller items. The additional cost of the pump operator's salary, however, could be covered only if higher fees were charged.

5. Synthesis[8]

Identifying sites for wells in Central Tunisia is not a problem. More sites may be identified, proposed, and lobbied for in a year than there is money available for drilling. Even finding good sites does not require a lot of rigorous analysis.

Moreover, there are various ways of selecting among potential sites. Politics is one way. Local groups pressuring for wells in their areas, and officialdom allocating them as rewards for loyalty or to curry favor, may result in reaching as many people as planners can with explicit models. Alternatively, the hydrologists, following their own agenda of aquifer research, cost minimization, ease of drilling, or whatever, can come up with a program that incidentally gets water to many needy people. Or, simply allocating two of the 30 USAID-funded wells to each

---

[8] This section abstracts from the synthesis report by Gordon Appleby, *Criteria and Methodology for the Delimitation of Water-short Areas in Central Tunisia,* Institute for Development Anthropology, Binghamton, NY, April 1987.

Table 6. Water Needs for Current and Projected 2004 Populations of Hypothetical Communities

	4 km Radius		7 km Radius	
Area (km^2)	50.3		153.9	
Current Population				
at density 25	1258		3848	
at density 50		2515		7695
Current Water Needs (m^3/day)				
Human only (31 lcd)	39	78	119	239
Human and animal (47 lcd)	59	118	181	362
In 2004 (assuming population growth at 3 percent per year)				
Population	2274	4542	6956	13897
Water Needs (m^3/day)				
Human only (31 lcd)	70	141	216	431
Human and animal (47 lcd)	107	213	327	653
Water flow needed, 6 hrs pumping per day	5.0	9.9	15.1	30.2

Source: Gritzinger 1987c:18.

Table 7. Economic Indicators of Ten Benefit-Cost Models of Deep Well Potable Water Development

Well Depth (meters)	Number of Families Benefited								
	200			300			1230		
	NPW	B/C	IRR	NPW	B/C	IRR	PW	B/C	IRR
125	4	1.05	16.1	39	1.47	24.9	93	1.65	34.8
175	-10	.89	12.6	25	1.26	20.5	79	1.51	29.7
175 New Mexico Model	-5	.95	14.0						
275	-38	.69	7.7	-3	.98	14.5	51	1.28	22.6

Notes: Assume discount rate of 15 percent per year, 15 year project period. NPW = net present worth, B/C benefit/cost ratio, IRR = internal rate of return.

Source: Gritzinger 1987c:19.

of the 14 project *secteurs* and letting the secteur chiefs decide where to drill, might also come close to meeting project objectives.

Each of these selection modes would help resolve the water scarcity of central Tunisia, but none would do it optimally in terms of equity and efficiency. For that, well point selection must be made according to explicit, rational criteria. These criteria must include: sufficient water scarcity to justify a well, sufficient population to be able to carry the costs of operating the well, and sufficient water resources of good quality to meet that need.

Figure 1 presents a decision tree that outlines how these criteria enter into the selection decision. Essentially, one looks first at the population distribution, then, in order, one assesses need, economic viability, and water quantity and quality.

In other words, each decision rule is effectively a recommendation. Put in this format, one would make the following recommendations:

Recommendation 1. Drill a well only if at least 200 families are within 3 kilometers or the equivalent travel time, which is about one hour one way.

Recommendation 2. Apply a flexible 200-meter cutoff, being open to exceeding it a bit. Drill five wells up to 350 meters, where the odds are good of hitting deeper-lying water. Do not drill a well where all evidence points to the aquifer being deeper than 200 meters, unless it is one of the five selected deep-well sites.

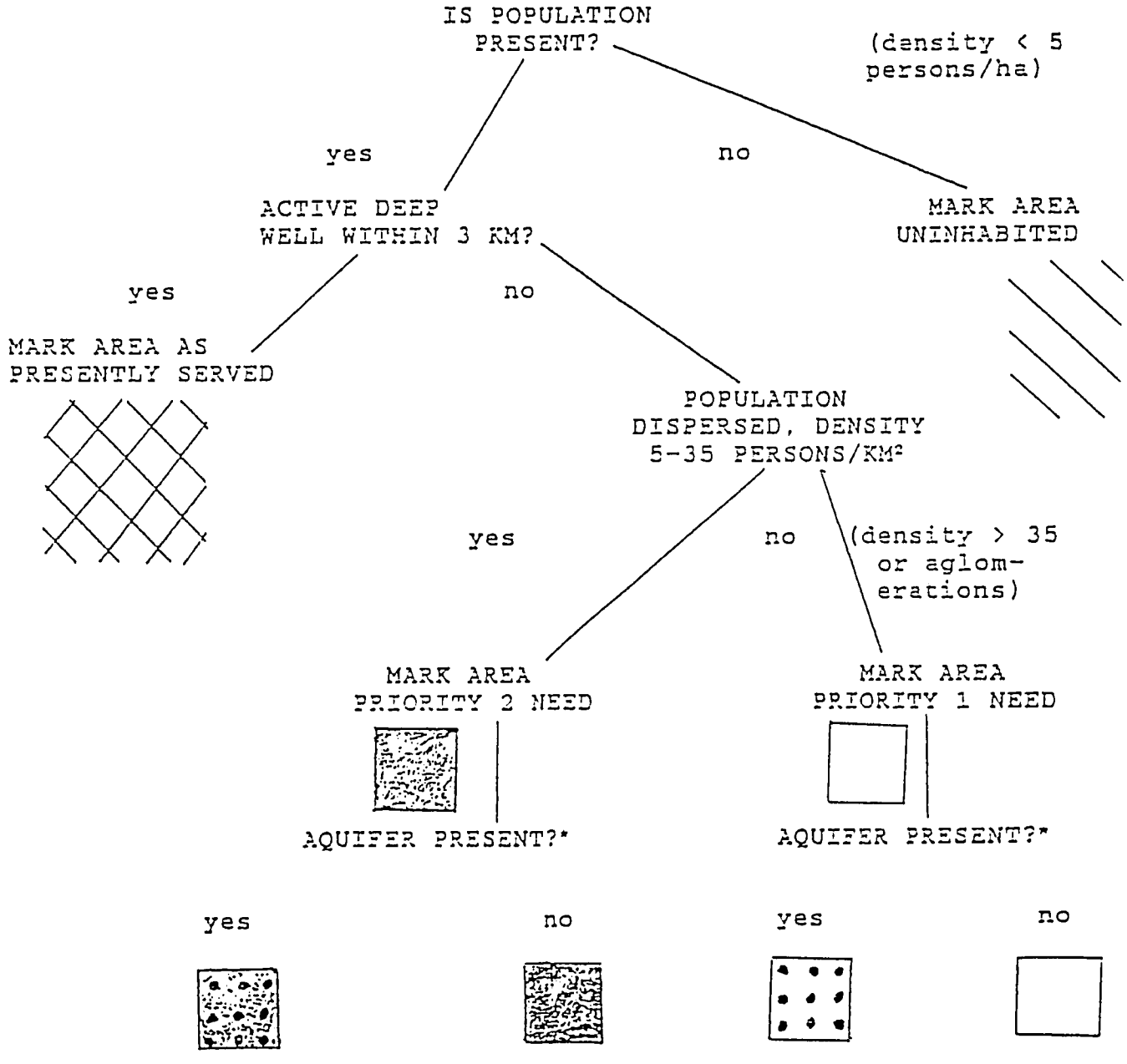
Recommendation 3. Do not drill if there is a high probability of total dissolved solids greater than 3.0 grams per liter, without providing for desalination.

Recommendation 4. Classify well sites for environmental soundness, noting where environmental safeguards are necessary (e.g., against erosion or overgrazing).

Sites passing these requirements must then be prioritized for development. The most "scientific" way of doing this requires an economic benefit-cost study for each site. Alternatively, sites may be ranked on the basis of the size of the population served—the greater the number of beneficiaries, the higher the rank. This easily understood ranking permits the bureaucracy to explain to the public why wells are being drilled elsewhere than at their site.

The SARSA project graphically drew the factual reality for each recommendation or decision rule on a thematic map. (The rationale and use of the maps is discussed in the next section.) A series of maps was created: of topography, of shallow and of deep aquifer and water-points, of population (with ethnicity), and of transport routes. Each map is drawn on a large plastic sheet, so that the maps can be laid over one another in order to depict the actual field situation. In other words, the abstract decision tree is given physical manifestation by the thematic map series.

Figure 1. Protocol for Identifying Central Tunisia Water-Short Areas on Thematic Maps



NOTES: Overlay "working" blueprint copy of population map onto deep aquifer sheet and mark according to the protocol.

* "Aquifer Present" denotes aquifers mapped as "Ressources Important" residu sec less than 3 gm/liter.

Source: Gritzinger 1987c:26.

Once selected and ranked, sites for development *must* be field verified. The cartographic information on which the decisions are made is tremendously helpful but neither infallible nor completely accurate. Further, conditions change over time, so that decisions may be made on the basis of out-of-date information. And, too, site inspection provides the only real way of checking the environmental soundness of the proposed water point. Finally, field verification provides an initial opportunity to work with the local population toward the creation of a water users association. A participatory approach to water-point development would be nullified if all the important decisions were taken in an office without any local consultation.

6. Conclusion: The Use of Thematic Maps[9]

The technique of land-use and location planning via thematic map overlays is relatively recent. Ideally, the spatial data should be accompanied by models and other analytic decision tools. These may be as basic as the decision criteria derived from the hydrographic, demographic, and economic analyses as done here, or they may include complex computer simulation models. In recent years, digital map data bases linked to computer decision models have been becoming affordable. The RPWI project nonetheless opted for the simpler method of hand-drawn maps and straightforward decision criteria because, in the context of Central Tunisia, this approach was more accessible to more people and, no less importantly, it used only local resources.

The 1:50,000 thematic maps compiled by Professor Fakhfakh and associates as part of this project represent a major addition to the Central Tunisia planning data base.[10] They consist of June 1984, Landsat V base images and six transparent overlays: (1) topography, (2) land use, (3) infrastructure, (4) shallow aquifer, (5) deep aquifer, and (6) population distribution. The maps are intended as an initial tool for delineating water-short areas. The population, infrastructure, and land use data came mainly from reconnaissance field surveys. Data on groundwater was obtained from the *Direction des Ressources en Eau* (DRE).

The thematic maps have proved valuable to CTDA and others for several reasons. First, most maps of the region are partial and old. Second, the thematic maps can be used for planning other services and such infrastructure as schools, roads, dispensaries, and market centers, in addition to potable water planning. In fact, the new maps constitute the nucleus of a geographic information system that could be computerized.

---

[9] This section is based, in large part, on Section V of *Central Tunisia Water Resources and Population Mapping Study: Summary Report* by Douglas Gritzinger, Institute for Development Anthropology, Binghamton, NY, December 1987.

[10] For more details on methodology, see Professor Mohamed Fakhfakh et al., *Projet eau Potable en Tunisie Centrale: Cartographie des ressources en eau et population,* Institute for Development Anthropology, Binghamton, NY, 1987.

As elegantly simple a solution to the problem of water-point selection as the maps are, they still have limitations. Imprecision is the greatest limitation. For reasons of cost-effectiveness, the RPWI project did not strive to create the most accurate maps possible. A scale of 1:20,000 or less would have provided more accurate and complete data, but would have been far too expensive. Further, air photos offer much more precise data than Landsat images, but again at far higher cost. The maps' scale of 1:50,000, the use of Landsat V images, and doing ground reconnaissance data collection, were cost compromises made to obtain a usable *and* affordable product.

The maps' population, groundwater, and land-use data are imprecise both for budgetary reasons and because of their very nature. First, the population density could be estimated only roughly by reconnaissance survey. Second, agricultural land use, which should at least qualitatively be apprehended in siting deep wells, is variable not only from one year to the next but also over the course of any year. Grain acreage, in particular, varies with each year's rainfall. Distinguishing between pasture and grain fields is therefore difficult, for in wet years pastures may be planted in wheat and barley. Third, groundwater mapping of shallow and deep aquifers is inherently approximate. Aquifer extent and quality can only be inferred from data on the limited number of wells piercing it. Fourth, deep well locations are mapped precisely, but shallow wells are too numerous for accurate display. Thus one cannot ascertain definitively from the maps a locale's sources of water and severity of water need.

In sum, the thematic maps can be used for identifying settlement areas that appear to be water short and for which there may be tappable groundwater. They are an important advance, for they are accessible to almost everyone. This accessibility eliminates a great deal of the political influence that heretofore characterized much well-point decision-making in Central Tunisia. Nonetheless, once well sites are proposed, further field study must be done to verify their feasibility and environmental impacts, and to rank the sites. This field verification sets the stage for the institutional development steps of the RPWI project process, which includes the creation of community water user groups and the regional mechanisms to support them, topics discussed later in this report.

B. Construction Achievements

The civil works accomplished by the RPWI project included the drilling of 30 new boreholes and their associated equipment and distribution systems; the extension of four existing systems; and the completion of one pilot project to install potable water connections to individual houses in one community. The initial budget for these construction activities was:

• drilling of 30 new boreholes	US $ 1,619,000
• equipment of wells and distribution system	US $ 1,290,000
• extension of four existing systems	US $ 678,000
• house connection pilot project	US $ 380,000
Total Construction costs	US $ 3,977,000

The funds initially appropriated for construction activities were insufficient to complete all of the planned actions. The cost overruns were due to fluctuations in international exchange rates and higher-than-anticipated expenses in the drilling of new boreholes. The original budget was based on two hypotheses that proved incorrect as the project got under way, both from the earlier USAID-funded potable water subproject. These were that the average well depth would be 200 meters, and that the cost per meter would be 215.9 TD. When the RPWI project began to follow the new water point selection criteria that prioritized drilling in areas of greatest need, the well depth at several sites rose to nearly 500 meters, with an average depth of 259 meters. The need to drill deeper, plus an inflationary rise in the per meter cost of approximately 50 percent between 1985 and 1989, from 215.9 TD per meter to 321.5 TD per meter, meant that supplementary funds would be required to finish all of the planned structures. The February 1989 mid-term evaluation (Jennings et al 1989) of the project recommended that additional funds be allocated. In May 1989 an arrangement was worked out between the United States government and the government of Tunisia whereby US $ 2,000,000 were transferred from the US-sponsored P.L. 480 Title I assistance program to the RPWI project in Kasserine. The terms of the agreement specified that half of this money was to be spent on the remaining construction activities by the RPWI project and the other half was to go toward technical assistance in the development of a national strategy for the creation and support of rural WUAs.

The RPWI project's construction of potable water systems can be separated into three phases. Through all of the construction phases the drilling of boreholes, the civil works of pump house and reservoir construction, and the installation of piping and distribution facilities were carried out through contracts with individual construction companies. Most of these were private-sector firms, but some of the wells were drilled by the parastatal *Régie de Sondage Hydraulique* (RSH), utilizing the drilling equipment purchased under the earlier USAID-supported potable water project in the region.

In the first construction phase of the RPWI project, before the employment of the new selection criteria based on the water resources mapping survey, the CTDA, following the procedures utilized in the earlier potable water subproject, directly supervised the construction of four water systems. Beginning in January 1988, a private sector architecture and engineering firm, *Architecture Urbanisme Ingeneering* (AUI), was engaged to oversee the handling of contracts with individual firms and to share the construction supervision tasks with the CTDA. Through the end of 1990, AUI submitted monthly reports detailing construction progress on the next 15 potable water systems that were built, as well as the extension of two existing distribution systems and the house connection project at Khmouda II. Starting in January 1991, when the RPWI project began using the P.L. 480 program funds needed to terminate the construction program, the CTDA resumed direct supervision of contracting and quality control.

Greater detail concerning the individual construction activities and the actual costs of the actions completed before the additional appropriation of P.L. 480 Title I program funds is contained in the following table:

Table 8: Construction activities performed by the RPWI project

Borehole Location	Governorate	Total Cost in DT (US$1 = .92DT)	Pop.	Comment
Chabiba	Gafsa	75,549.535	900	Prior selection
Bouibet	Kasserine	62,131.020	1,050	Prior selection
Dhouaouda	Kasserine	125,451.000	1,140	Prior selection
Boulaaba	Kasserine	57,456.910	890	Prior selection
Zannouche	Gafsa	235,257.280	2,700	
Jadida	Gafsa	171,358.200	1,050	
Ouled Boualleg	Gafsa	100,396.290	1,000	
Ouled Zid	Gafsa	191,991.090	1,200	
Biadha	Gafsa	168,672.000	1,100	Negative
Ouled Ahmed	Kasserine	115,353.823	1,150	
Koudiet Tricha	Kasserine	77,970.000	2,000	Negative
Karouchoun	Kasserine	106,104.200	950	
Nadhour	Kasserine	114,691.500	1,220	
Serg Lahmar	Kasserine	121,158.000	1,230	
El Bnenna	Kasserine	227,000.000	2,200	
Fidh El Methnan	Kasserine		1,500	P.L.480 program
El Hazza	Kasserine	141,503.000	1,850	
Magsem Abdessadok	Gafsa	168,107.000	1,400	
Menzel Gammoudi	Gafsa	163,404.000	950	
Boukef Lafrache	Kasserine		920	P.L.480 program
Henchir El Kheima	Kasserine		950	P.L.480 program
Dhraa Jdid	Kasserine		900	P.L.480 program
Kontira	Kasserine		1,700	P.L.480 program
Henchir Gallal	Kasserine		920	P.L.480 program
Khanguet Sgallas	Kasserine		950	P.L.480 program
Boughanem	Kasserine		900	P.L.480 program
Toualbia	Kasserine		750	P.L.480 program

Boulahnach	Kasserine		1,050	P.L.480 program
Alim	Gafsa		1,100	P.L.480 program
Ouled Saleh	Gafsa		950	P.L.480 program
System Extensions				
Alleg Rasso	Kasserine	96,358.000	1,100	
Majel Akrout	Kasserine	98,000.000	950	
Garaa	Kasserine		950	P.L.480 program
Sray	Kasserine		1,020	P.L.480 program
House Connections				
Khmouda II	Kasserine	120,000.000	1,300	

The Rural Potable Water Institutions project successfully completed all of the construction objectives that were included in the original project design. The project, and the previous USAID-supported potable water subproject, greatly increased the percentage of the rural population served by improved potable water systems in the Kasserine and north Gafsa regions. Although the financial cost of the construction interventions was higher than initially anticipated, this was due to hydrogeological constraints and not improper management of project funds. In fact, by employing a new, sophisticated site selection methodology, the project made optimal use of the funds spent for potable water system construction.

CHAPTER III. INSTITUTIONAL DEVELOPMENTS AT THE REGIONAL LEVEL

A. The Water Users Association Concept[11]

The Rural Potable Water Institutions project aimed not only to install the necessary infrastructure for the provision of potable water to dispersed rural populations, it also sought to institutionalize the social organization necessary to ensure that those populations have continued access to water. In other words, the aim of the project was to create both the physical and the social infrastructure necessary for the installation and continued operation of the wells. That social infrastructure is the WUA.

Several approaches to the local operation and maintenance of wells are possible. One extreme would be a highly centralized, government-operated system of salaried well-pump operators who relate to regional supervisors who, in turn, control fuel, parts, and supplies for operation and oversee repair services and parts distribution. The other extreme would be a very decentralized, locally operated system of WUAs that control the pumping operation and are individually responsible for well and pump maintenance. Between these two poles, one can find a number of permutations of the two systems. The solution that has evolved in the Tunisian context combines elements of both, effectively marrying locally organized WUAs to the existing bureaucratic structure in an innovative and workable manner.

In sum, development of a WUA program entailed three levels of consideration: the local level, which involved people's attitudes toward the state and themselves; the regional bureaucratic level, which involved overlapping domains of activity and hence a real need for bureaucratic coordination; and the national level, where legislation had to be passed that would enable local groups to have juridical personality and thus be able to conduct their own affairs. This chapter briefly examines the local and national considerations involved in the creation of WUAs and then details the RPWI project's development of regional institutions to foster and support community WUAs.

1. Local Considerations in Developing WUAs

At the local level, WUAs are a new phenomenon that represent a new mentality. First, as has been mentioned earlier, the dispersed rural population has settled certain areas of central Tunisia in only the last few generations. This population of former Berber nomads is ı̄ rcely independent and strongly oriented toward family and, today, toward their lands. Moreover, this

---

[11] This section is based largely on the work of Nicholas Hopkins, who led the effort to establish water user associations in central Tunisia for the Institute for Development Anthropology. The particular reports used in this synthesis appear in Appendix 1, List of Documents.

population has in recent years evolved a distinctive strategy vis-à-vis the Tunisian state. As the Tunisian sociologist Brahim Bouzaiane[12] has written:

> Confronted by the technical-bureaucratic strategy of state institutions, rural communities have put into effect a strategy that has two principal elements:
>
> [1.] a strategy of assistance that consists of using to the maximum all aid provided by the State and of always asking for more; and
> [2. nonetheless,] a strategy of subversion that consists of using the resources made available by the PDR for other ends. One of the ways of avoiding a rupture [between national and local interests] is the evolution of a development policy defined by the rural communities themselves. *This participatory policy* does not signify the abandonment of the rural communities to themselves. Rather, it *signifies the establishment of a dialectic rapport of proposals and negotiations between the dynamic rural populations and the state institutions.* [Emphasis in original.]

The program for developing WUAs had, therefore, to recognize both the fierce independence of families and their strong familial ties on the one hand, and the way in which these local groups make urgent appeals for assistance from an often compliant state.

The development of WUAs also involved a national political consideration in that the necessary legislation to establish WUAs as legally responsible bodies did not exist in the mid-1980s. In the view of Tunisian legal and political advisors, legal empowerment of the WUAs to conduct their own financial matters—a fundamental function of such organizations—would require a parliamentary law and presidential signature.

2. National Enabling Legislation

The Government of Tunisia passed the necessary enabling legislation for local WUAs in 1988, three years after the initiation of the RPWI project. This legislation, based on similar laws for the agricultural sector, gave formal juridical personality to the theretofore quasi-formal water-user groups. Thus, for example, it defined the procedures to be followed for a WUA to gain formal legal recognition; it established the composition of the governing body of the WUA; and it laid out rules of operation for the associations.

Specifically, as the midterm evaluation of the RPWI project notes (Jennings et al. 1989:32),

---

[12] "Réactions des communautés rurales aux modèles proposés par le Programme de Développement Rural (P.D.R.)," in Revue Tunisienne de Sciences Sociales, No. 82-83, 1985, pp. 29-74; citation here pp. 68-69. Author's translation.

Articles 153, 154, and 155 of the Water Code (Law 87-35 of July 6, 1987) were revised. These articles concern (a) water management and, in particular, the institutions entrusted with this task; (b) the GIH [Groupement d'Intérêt Hydraulique] (Article 153); (c) the WUAs (Article 154); and (d) the master bylaws of these associations and the deadline for settling areas. . . .

[Further,] to standardize procedures and facilitate supervision of the GIH and WUAs by the government, the GOT adopted a series of decrees, in particular:

- Decree No. 87-1261, of October 27, 1987, on the organization, establishment, and operation of WUAs;
- Decree No. 87-1262, of October 27, 1987, on the organization and operation of the GIH; and
- Decree No. 88-150, of January 12, 1988, on the approval of master bylaws for WUAs.

Basically, these decrees concern the development of self-management of the various water points installed by the GOT. Users are encouraged to establish a legal entity, with appropriate powers to manage the water points and collect funds necessary for normal operation, including small repairs. Major corrective maintenance and preventive maintenance are to remain the responsibility of the GOT, which must indeed help, establish, support, and develop the WUAs.

One problem that has resulted from the national legislation authorizing community WUAs is that it created a cumbersome system for financial accountability, based on operating procedures standard for government agencies. This issue (taken up in the final chapter) symbolizes how the arguments about WUAs have changed over time, in part because of project initiatives.

At the same time that the national legislation was being drafted, the RPWI project was engaged in an institutional development program designed to improve the elaborate and complicated system of Tunisian state organizations that are involved in the provision of potable water to the rural population. The introduction of community WUAs was the principle institutional development conceived to meet the project's social objectives, but these local organizations require regional institutions to promote, monitor, and support them.

B. Improved planning and coordination for the Regional Water Affairs Group (WAG) or *Groupement d'Intérêt Hydraulique* (GIH)

The Water Affairs Group (WAG) is ultimately responsible for the development of regional water resources. This committee, headed by the Governor and composed of representatives from the regional institutions and agencies with interests in water-related affairs,

existed before the RPWI project, but it was reactivated with new responsibilities and roles by the 1988 legislation. In addition to overseeing the water point site-selection process, the WAG legitimizes the creation and operation of the WUAs. As a regional representative of the national government, the WAG submits the official demand for the establishment of new WUAs, and it authorizes the annual operating budgets for existing WUAs.

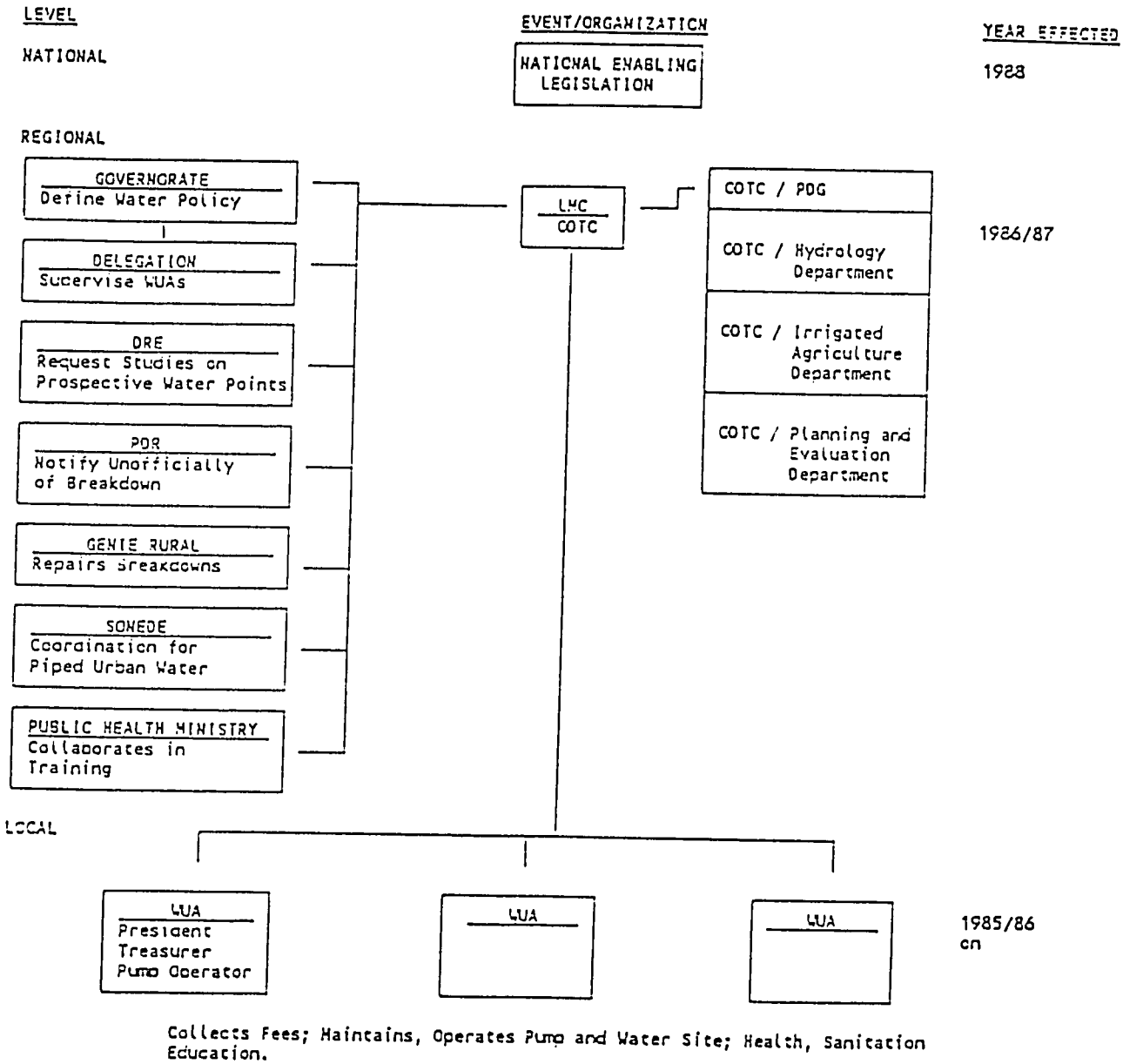
The regional agencies who comprise the WAG are those listed at the regional level in Figure 2. The Delegation administrators and the PDR (*Programme de Développement Rural*) are under the direct supervision of the Governorate. The Governor's office, through the PDR, is responsible for paying the salaries of pump operators and funding water system construction and maintenance as part of the national potable water program, *Lutte Contre la Soif*, operating in rural areas. In addition to the Governorate administration and CTDA (the other major actor in the rural potable water sector, whose responsibilities are discussed in detail below), numerous other organizations are also involved in potable water in rural central Tunisia. DRE (*Direction de Ressources en Eau*, a division of the Hydrology Department) is responsible for the engineering and construction of wells and for tracking hydrological information. SONEDE, the parastatal organization responsible for the provision of water in urban sectors nationwide, also plays a role in some rural areas where its water conduits are tapped to supply community WUAs. Other state institutions that participate in the development of water points include the Education Ministry and the Health Ministry, who are charged with carrying out nonformal training of rural populations. By making the WAG responsible for oversight of the WUA program, the RPWI project revitalized the regional committee and sought to promote better communication and coordination between state agencies.

C. Creation and Operation of the *Unité d'Autogestion* (UAG), or Regional WUA Support Unit

To carry out its functions, the WAG relies upon the technical agencies that are directly involved with development actions in the rural areas. In central Tunisia, the *Office de Développement de la Tunisie Central* (ODTC, CTDA in English) had a broad mandate to coordinate all development initiatives in the region, and had established divisions for each sector. CTDA had a Department of Hydrology, which collaborated with the Division of Water Resources, and a Department of Irrigated Agriculture Management (*Direction d'Aménagement Hydro-Agricole* or DAHA), which coordinated with the Ministry of Agriculture. In addition, CTDA had a Department of Planning and Evaluation in charge of compiling and analyzing data on water points. CTDA and its departments discharged these responsibilities until 1990, when the *Office* was absorbed by the *Commissariat Régional du Développement Agricole* (CRDA), which now has these functions.

One of the first actions of the RPWI project, taken in 1986, was the administrative creation of a special unit within the CTDA to handle WUA affairs: the Regional WUA Support Unit (*Unité d'Autogestion*, UAG). The UAG was designed to coordinate the program to create and support WUAs and to act as the intermediary between the rural population and the administrative agencies that make up the regional WAG. Essentially, the strategy was

Figure 2. The Organizational Context for Water User Association Development in Central Tunisia



administratively to create a special unit within CTDA that was specifically charged with the formation of local water-user committees. These committees were "pre-associations" in recognition of the facts that: (1) they were a new phenomenon in the area and so would require careful nurturing; and, (2) they lacked the necessary national legal charter. The strategy, therefore, entailed promoting local water user groups *at the same time* that action would be taken at the national level to establish the enabling legislation or proclamation. (Figure 2 depicts some of the complexity of this situation.)

The UAG, indeed the entire RPWI project, was founded on the principle that community participation was essential to the operation of effective potable water supply systems and that this could be achieved best with a social science perspective and methodology. A Tunisian sociologist was hired as the UAG director. Four assistants, all with some previous training in sociology or social work, completed his staff. The UAG uses anthropological methodologies and analysis to identify the water user community, understand the relationships that exist within the group, and devise mechanisms to support and guide the new associations.

The formation of local water user groups was guided by then-proposed legislation for *Associations d'Intérêt Collectif* (AIC), which were intended for agricultural development. The UAG or WUA Support Unit of CTDA would help the *Associations de Consommateurs de l'Eau Potable* (ACEP) to obtain legal status and would assure coordination between the ACEP and other government agencies.[13] Further, because the AIC legislation foresaw the election of an administrative council for each AIC, the UAG would oversee any local elections and register the results with the corresponding administrative officials. In order to effect these elections, the UAG would likely have to convene a general meeting of residents near each water point in order to establish rules for the elections and the eligibility of residents in those elections.

The Regional WUA Support Unit was established to take up a number of tasks. The original Unité mandate included:

1. Assisting the AICs with preparation of their annual budgets and with administrative management more generally. The aim was to set up a healthy financial management system at the outset in order to help avoid the sorts of problems that can cause local groups to self-destruct. The UAG could help the local committee to determine water charges and set up accounting books for fees paid and expenses incurred. In the longer term, the Unité could assist in the development of a local financial system that itself paid the pump operator and covered maintenance and depreciation costs.

---

[13] At the outset of the Rural Potable Water Institutions project, pre-associations were referred to in French as *Associations de Consommateurs de l'Eau Potable* or ACEPs. This term was subsequently superseded by the term *Association d'Intérêt Collectif* (AIC), which already had currency in agriculture. The change in terminology occurred because the enabling legislation for water user associations was to be based on existing legislation for irrigation; the alteration represented an effort to standardize terminology.

2. Collaborating with representatives of the Ministry of Public Health on maintaining the hygienic status of each water point and of domestic water supplies more generally. The aim here was to reduce the incidence of water-borne diseases. In effect, the point was to emphasize that having sufficient water is not enough: those supplies must be clean if they are to be consumed and individuals are to stay healthy. Getting across this fundamental idea could usefully employ Public Health personnel integrally in the water-point development.

3. Working closely with agents of the Rural Development Program (PDR), which was charged with the repair of broken pumps and the payment of the pump operators. An aim here was to begin to wean the WUAs from their near-total dependence on the government program and its agencies by having the WUAs begin to take over responsibility for minor repairs and maintenance. (PDR would, in the near term anyway, have to continue to be responsible for major repairs, because the WUAs would have neither the funds nor the skills necessary for this work.)

4. Working with the civil engineering departments to ensure that the design of the water point incorporated whatever features were necessary for hygienic operation. This collaboration involves several matters. First, the use of donkey-drawn water carts means that the mobile cisterns should be filled at some distance from the water storage tank. This can be done by incorporating into the design a flexible tube from the tank that can be swung into position over the mobile cistern for filling. Second, people often want to water their animals at the water point. This expectation is best dealt with by constructing a separate watering trough at some short distance from the water-storage tank. Third, facilities for doing laundry might be included in the engineering design of the water point, so that women might have access to the area. And, fourth, the UAG might have to insist that the engineers premise the development of a new water point on the prior organization and operation of an effective WUA. (Ultimately, of course, the potable water design might incorporate something along the lines of the "New Mexico model," where water is piped individually to houses. But this was a long-range option.)

5. Holding training sessions with the WUAs. In the first instance, the Unité might deal with the presidents of the WUAs in order to inculcate an understanding of administrative and financial matters. Subsequently, other categories of WUA members might be given training—in pump maintenance, in financial controls, and what not. Each of these training sessions would, of course, provide an ideal opportunity for the exchange of information and experiences among WUA members.

6. Monitoring and evaluating the success of the WUA program. The concerns here would include how new or improved water points changed people's behavior, how health improved because of better quality water and more effective public education, what conflicts arose between potable water and irrigated agriculture, and the ability of the population to pay fees. This activity implied a fairly large data collection and analysis effort.

The WUA program as originally envisioned was feasible but ambitious. It basically involved creating a new form of rural social organization that could interact with the state. The

creation of the UAG was a highly successful and innovative aspect of the RPWI project. The institution was the embodiment of the project's objective to combine the technical and social aspects of rural potable water supply development. The UAG has emerged as a model used not only in the creation and support of WUAs in other areas of Tunisia, but also for the implementation of other development activities that require community participation, such as forest and pasture improvement programs.

D. Creation of the Rural Health Education Team (RHET)

Another imaginative and productive component of the RPWI project was the establishment of a regional Rural Health Education Team (RHET) to implement an integrated health and hygiene education program. This inter-ministerial committee, composed of experts with different disciplinary backgrounds, was created to cooperate on the design and implementation of strategies to improve basic health and hygiene for rural inhabitants. Individuals that comprise the RHET include representatives from the Ministry of Public Health, the Ministry of Social Affairs, the Ministry of Education, and the entire UAG staff, as emissaries of the CTDA (and later, the CRDA). Assistance in the RHET program development and in the training of basic health and hygiene education techniques was initially provided by expatriate consultants from The PRAGMA Corporation and the WASH project.

To date, the RHET has engaged in the conception, realization, and monitoring of a wide range of programs aimed at improving water point sanitation and rural hygiene. The five principal arenas of activity include:

1. Implementation of a female Village Health Worker (VHW) program.

2. Introduction of a basic hygiene education program into the regional primary schools.

3. Identification and construction of community water and sanitation-related improvement projects.

4. Initiation of a pilot project to establish Women's Interest Groups (WIGs).

5. Development of the training materials needed to assure the success of RHET interventions.

Through the creation of the inter-agency RHET, the RPWI project sought to take advantage of community participation in the water supply sector by introducing a basic water sanitation and health education program. This component of the project addressed a fundamental element lacking in strictly technically-oriented potable water development programs. The success of the RHET approach provides another model for future potable water supply programs.

E. Reorganization of the regional support program for water point operation and maintenance (O&M)

The regional potable water system maintenance program in the Kasserine Governorate was reorganized following the 1989 mid-term evaluation of the RPWI project. Through most of the 1980s, there were four different maintenance crews for potable water systems in the Kasserine region, directed by three different agencies. Before the reorganization, the PRD and the CRDA each financed and directed its own maintenance team. In addition, the CTDA operated two maintenance crews. One was internal and composed of CTDA employees, and the other team was supplied by a local, private-sector firm that was contracted with RPWI project funds. The division of responsibilities between the four teams was undefined and often chaotic. It was unclear who was supposed to maintain which systems.

Beginning in 1990, the Rural Potable Water Institutions project engaged several consultants from the U.S.-based WASH project and a Tunisian firm, *Societé d'Applications Hydraulique* (APLICO), to help arrange the regional maintenance program. The plan that was implemented in early 1991 involved the creation of a single *Arrondissement d'Entretien et de Maintenance* (AEM) under the direction of the CRDA/Kasserine. Part of the task was simplified by the merger of the CTDA into the CRDA in 1990, but it remained a complicated procedure to work out the staffing and operation of the new organization that is cofinanced through contributions from the Governor's *Programme Régional du Développement* (PRD) and the CRDA. The new structure of the arrondissment means that there are still multiple maintenance teams available to respond to system breakdowns, but the duplication of efforts has been eliminated by controlling the operation out of a single office.

F. Training of project administrators.

To expand the capabilities of the regional authorities implementing the project's institutional changes, the RPWI project funded a series of targeted training programs for its staff. The training programs took place in the United States and in other Third World countries, notably Egypt. The training program was designed to expand the capabilities of the CTDA staff and their coworkers in other regional agencies. Training trips conducted included:

- a two-week trip to New Mexico to observe the application of a program for individual house connections in an area of dispersed settlement, for the CTDA director and the head of the potable water program;

- a session at the University of Pittsburgh's management training workshop, for the CTDA's Director of Planning and Evaluation and the Regional Agricultural Development Commission's head of the DRE;

- two weeks at the American University in Cairo to observe examples of rural development and women's community participation in improving sanitary conditions, for two UAG agents and two other CTDA field agents;

- a three-week training program at IDA in Binghamton, New York, and elsewhere on computer applications, for the chiefs of the CTDA Department of Planning and Evaluation and Department of Accounting;

- a second three-week visit to community water organizations in both New Mexico and upstate New York, for Kasserine and Kairouan officials charged with supporting WUAs;

- a one-month workshop at the University of California at Davis on health education communications, for a member of the RHET.

The training activities gave the RPWI project personnel knowledge of newly developed techniques to perform their diverse tasks and provided comparative experiences that helped define the approaches undertaken in Central Tunisia. The opportunity to compare and contrast community water systems in such diverse areas as semiarid New Mexico and temperate upstate New York enhanced an understanding of the similarities and differences between Tunisian and American approaches.

G. Conclusion

From the outset, the RPWI project had two aims: to promote local WUAs and to forge stronger ties and coordination between the government agencies charged with different aspects of water distribution in the area. The institutional developments undertaken at the regional level were designed to facilitate these goals, and by June 1991, the completion date for USAID funding, the regional agencies were better prepared to implement the RPWI project objectives. The creation of the regional WUA support unit was perhaps the most innovative intervention of the program, and this unit has been successful in creating functional WUAs and in strengthening the ties between various government agencies. Despite these important linkages, it warrants mention that overlapping bureaucratic responsibilities continue to create confusion and to slow reaction to existing problems. The Unité has been important as a defender of and facilitator for the WUAs. But no unit—particularly one so new, with so few personnel, and staffed by social scientists at that—can eliminate all the difficulties that may arise in the field.

Development within CTDA of the regional WUA support unit that could link with other government agencies was almost completely carried out by CTDA staff. The Institute for Development Anthropology, the USAID-funded WASH project, and Pragma, Inc. provided only periodic short-term technical assistance to CTDA under the RPWI project. The expatriate consultants were relatively few in number, and the fact that the same consultants often returned to provide assistance helped to maintain continuity. Their role has been limited to advising CTDA staff on the resolution of issues and on future directions. The CTDA staff, on the other hand, has been completely responsible for the implementation of that advice.

CHAPTER IV. INSTITUTIONAL DEVELOPMENT AT THE COMMUNITY LEVEL

A. Principles for Membership, Organization, and Functions of WUAs

The landscape of central Tunisia is littered with the remnants of earlier governmental interventions that did not work out. Cisterns to collect rainwater, wells with handpumps, and even motorized wells either have been abandoned or are not working as efficiently as planned. In some cases the technology was poor; in others the governmental intervention was "rejected" by the people—notably the case with handpumps, which were often vandalized. For this dispersed population, torn between traditional affiliations and modern structures, with changing economic and social needs and modest amounts of disposable income, some new kind of social organization around the new water points had to be envisaged.

For the Rural Potable Water Institutions Project, a water user association (WUA) is simply a grouping of local potable-water consumers. Precisely who within a range of the water point may belong to the association is an empirical question. People who live near a particular water point depend primarily and perhaps even exclusively on that well, and are eligible for membership in the local WUA. People who reside farther away may use that well and, perhaps, some other wells in addition. The explanations for well preference are various—more water or better water, either year-round or seasonally; lower or no fees for water collection; and gender considerations (girls typically go mostly to wells frequented only by other girls, while men and boys go to other wells that furnish larger volumes of water). Whether and where to draw the membership line for local collective action is a matter best left to the local citizens.

Typically, each WUA has at a minimum a president, a treasurer, and a pump operator. The president coordinates pump operation with the community, the treasurer oversees payments, and the pump operator maintains the motorized pumping of water and collects the fees, which are forwarded to the treasurer. (It is important to separate these two functions for reasons of accountability.) In the Tunisian context, the pump operator is a salaried employee of the *Programme de Développement Rural* or PDR, but is supposed to be paid by the WUA over the long run.

Other officers can be added in time, e.g., a secretary or an assistant treasurer. A board of concerned citizens can be set up to assist the core WUA committee. In time, various operating committees can be established if they appear warranted, for instance, an operations and maintenance committee, a community relations committee, a health committee, a financial committee. In order to keep things simple at the outset, however, a WUA need establish only two oversight posts—president and treasurer—and one technical or operational post—the pump operator.

Whatever the composition of the WUA, the roles of the organization are several. The WUA should:

1. Collect money to cover the costs of operating and maintaining the well, including the costs of fuel and oil, the operator's salary, and basic maintenance costs.

2. Undertake the hygienic maintenance of the pumping station area, which will often entail some collaboration with the government engineering office that determines the siting of storage tanks and water taps, as well as animal watering and laundry areas.

3. Undertake a program of local health education, in cooperation with the government health agencies, in order to maintain the hygienic status of the water point and to avoid contamination of water once it is taken home for storage.

4. Assure observation of the regulations established for the water point and arbitrate disputes that may arise over the amounts of water allotted to any individual or over the means of transporting that water.

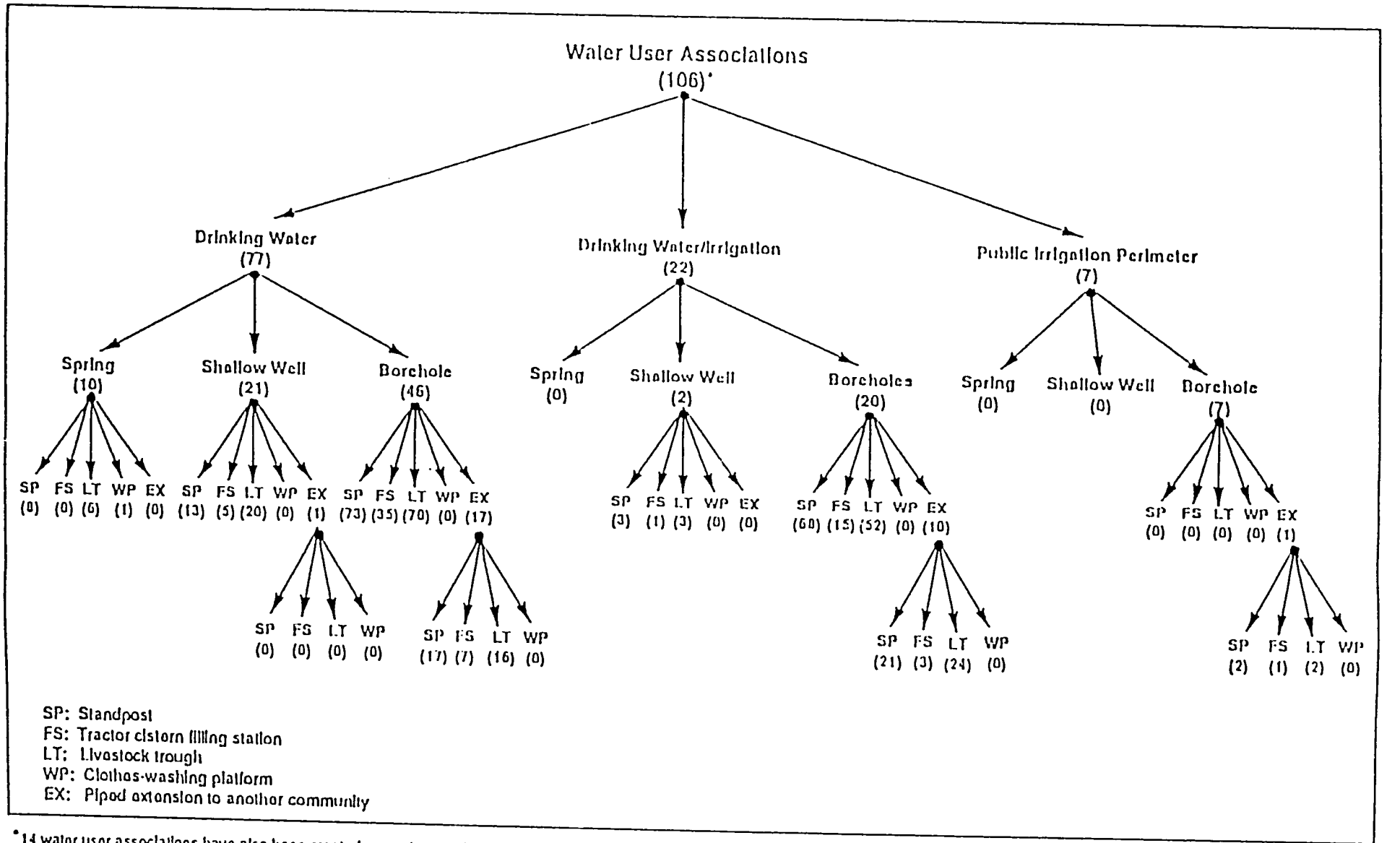
B. Creation of WUAs in Central Tunisia

Water user associations were being established even as the new Rural Potable Water Institutions project was being designed in 1985. At first, a Tunisian consultant and later, the first head of the Unité, established a pattern of consulting with local leaders in order to set up local potable water committees. As a result, at the start of the Rural Potable Water Institutions project in 1986, 70 quasi-formal associations with a president, a treasurer, and a meeting room were already in existence. Some of these associations had administrative recognition, particularly in Sbeitla, where the delegate strongly supported the program. Many were collecting funds from large water haulers in order to cover fuel and oil costs. Nonetheless, a large number of the groups depended on government services for repair work, for pump operators' salaries, for accounting services, for conflict resolution, and for health services.

By 1988, the Unité oversaw 104 WUAs, with an average of 120 families (or 720 people). By this time, it was beginning to initiate training courses for WUA leaders in administrative and financial management, as well as in health and sanitation. Further, in that year, it was able to begin to regularize WUA meetings, which theretofore had been rather fitful in their schedules.

By 1989, the CTDA zone alone had approximately 120 WUAs (Figure 3). These associations varied greatly in their roles, in their technology, and in their infrastructure. Importantly, although the project emphasized rural potable water, the WUAs dealt with various uses of water, not only for drinking, but also for irrigation—and for both drinking and irrigation. Moreover, there was now a wide range of technologies—from captured springs, through shallow wells, to deep bore holes—as well as a highly variable infrastructure at the different water

Figure 3. Types of Water User Associations



*14 water user associations have also been created around extensions, creating a total of 120 WUAs.

Source: Jennings et al. 1989:37.

points, which could include standposts, tractor-cistern filling stations, livestock watering troughs, and laundry platforms. The heterogeneity among WUAs meant that the Unité had to devise different strategies for working with each type of association.

The RPWI project was highly successful in its program to foster and support WUAs. At the completion of the project in June 1991, 136 WUAs functioned in Kasserine governorate. Of these, 100 have completed all required legislative actions and the remaining 36 are in the final stages of becoming legally recognized. Similarly in the region of Gafsa, RPWI project activities in the northern areas have been extended throughout the rest of the governorate, where there are now 86 WUAs operating.

Rural WUAs function as local public service utilities for community members. The one pilot project to install house connections in the village of Khamouda II is an example of the potential WUAs possess. This community is unique in Tunisia in that it operates and maintains its own system of metered water distribution to individual households. The Khamouda II WUA records the water consumed at each connection and collects a per cubic meter fee based on a calculation of system operation and maintenance costs. The convenience and health benefits associated with potable water connections to individual households are obvious. The existence of other WUAs ready and willing to take over the operation and management of community water systems is likely to lead to the development of more projects such as Khamouda II.

C. Recruitment and training of Village Health Workers (VHWs)

Under the guidance of the Regional Health Education Team (RHET), the RPWI project recruited and trained 35 women from different communities to promote basic health and hygiene education and sanitary treatment of potable water. These village health workers (VHW or *Animatrice de Base*) made repeated visits to more than 1,000 households to consult with family members on practices related to water, vaccinations, treatment of diarrhea, and other health topics. The VHWs conducted community seminars with materials developed by the project, and they kept personal journals on community health issues that were used to prepare monthly reports for the RHET. Although the village health workers stopped receiving a stipend from the RPWI project at its conclusion, many of the women who were trained as VHWs have continued to promote improved health practices in their communities.

D. Creation of Women's Interest Groups (WIGs)

The creation of Women's Interest Groups (WIGs) in Kasserine Governorate was undertaken to give women a mechanism to express their opinions and concerns directly to the primarily male-dominated WUAs. In addition, the WIGs provide a conduit for health education training and a platform for various community projects. The informal associations were initiated following the 1989 mid-term evaluation of the RPWI project that found the program lacking in its ability to provide outreach services to rural women. Two women, a Tunisian graduate student intern and an American consultant, were engaged to work with the UAG to establish the

WIGs and to work with community women on small projects of their choosing. Examples of WIG activities include communal gardens, poultry and small livestock rearing, weaving associations, and plans to construct washing platforms near the water supply facilities. Although the program to establish WIGs is still in the early stages of development, the concept has been well received by women in several communities and it is likely to spread as evidence of their success becomes known elsewhere.

CHAPTER V. THE CURRENT SITUATION AND LESSONS LEARNED

Both the Government of Tunisia and the United States Agency for International Development consider the Rural Potable Water Institutions project in Kasserine and Gafsa governorates to be a success, for the project achieved its stated objectives, and provides a model for development interventions in other parts of Tunisia and perhaps elsewhere. The project was designed to address specific problems that had plagued earlier rural potable water programs in Central Tunisia. These included water point selection utilizing political criteria rather than uniquely on the basis of need, waste of both energy and water, a high frequency of water system breakdowns, and a lack of health education programs to ensure hygienic use of potable water. To solve these problems the RPWI project instituted an equity-based site selection methodology and reduced water system operation inefficiencies by promoting community participation through the creation of WUAs. These associations also became the focus of a variety of health education interventions. The RPWI project visibly reveals the effectiveness of, and the need for, community participation and local management of local water resources. Additionally, the project accomplishments demonstrate that the social sciences should take a central position in the design and implementation of rural development policy.

To conclude the descriptive discussion of various project activities made earlier in this report, this final chapter will briefly examine the positive and negative aspects of the RPWI project within a broader development context. The positive contributions include the project's social/community orientation; the high degree of collaboration achieved between various project participants; and the role the project played in helping to define a national, rural potable water sector development policy. Specific problems encountered by the RPWI project include the occasional lack of importance placed on the need for local and regional political support; the failure to institute a convenient financial management system for individual WUAs; the lack of appropriate on-going monitoring and evaluation mechanisms; the project's tendency to establish a degree of dependency on outside financial assistance that has caused some project activities to falter once funding was completed; and the failure to assist CRDA/Gafsa to create a WUA support unit to take over WUA support upon project completion.

A. Successful Project Components

1. Project Philosophy

The social and community orientation of the project, rather than a strictly technical, engineering emphasis, is, without doubt, a crucial element contributing to the RPWI project's success. The project stressed community participation and achieved it to a remarkable degree. The results of this approach are evidenced by an appreciable change in the functioning of rural potable water systems affected by the project. Before 1986 the GOT, responsible for the provision of potable water throughout the nation, encountered numerous problems in its attempt to meet the needs of rural populations. The RPWI project recognized that although outside support would continue to be needed to install and maintain potable water systems, specific operations could be more efficiently handled by the local population. It was also known that

community involvement would be more effective if the new responsibilities were mutually accepted rather than simply imposed. To gain this local acceptance the RPWI project implementors involved water user community members in the entire WUA process, from the identification of association members to the involvement of community members in the design of new potable water systems. This approach now accounts for an appreciable change in the rural population's attitude toward the provision of potable water and concrete improvements in terms of water and fuel conservation and number of system breakdowns.

Although the concept of community involvement in the creation and operation of rural WUAs was an integral part of the original RPWI project design, its application evolved over the project years. A brief comparison of the Kasserine area experience with that encountered in Kairouan governorate, the other central Tunisian region that began a rural WUA program in the mid-1980s, shows that community development programs of this type require ample resources and staff to implement their programs, for the governorate-level support units for the creation of WUAs have evolved similarly in both Kasserine and Kairouan. In Kasserine, CTDA established the unit with donor support; in Kairouan, the provincial governor mandated the unit. In both cases, it turned out that the initial small unit was inadequate to the task. Thus, both units have grown larger, have been given more resources, and have better defined their range and style of community development activities.

The staffing of the units in Kasserine and Kairouan has converged, despite quite different beginnings. CTDA in Kasserine, with the support of the USAID RPWI project, began its program with a strong emphasis on social science and on the social aspects of organizing WUAs. Indeed, the Unité initially faced—but quickly overcame—significant skepticism about the contributions social scientists might make to water-point development. Meanwhile Kairouan, working without outside support, began a similar program with one of its senior technical staff, an engineer, and over time, it broadened its activities to include a range of social issues. Although Kairouan has managed to find technicians capable of dealing effectively with the social tasks of organizing WUAs, most observers agree that such talents are rarely identified with engineers. The experience of both governorates shows the need for persons trained in social and in technical fields. Ideally, therefore, the support unit should be multidisciplinary.

The example of Khamouda II reflects the RPWI project's success in fostering community participation in potable water system management. This community is unique in Tunisia in that it alone is responsible for the provision of potable water through individual house connections. While Khamouda's nucleated settlement pattern contributed to its selection as the recipient of a pilot project to install house hook-ups, the program could not have succeeded without the community's participation and acceptance of responsibility. Community labor and financial contributions were required for system installation and subsequent operation. Operating since March 1991, the health and hygiene benefits of the project are obvious as numerous households have connected and constructed kitchens, showers, and toilets. These added benefits have been totally self-initiated and the facilities installed without external financial assistance.

2. Collaboration Between Project Actors

The RPWI project achieved a rare degree of cooperation and collaboration between CTDA personnel, private consultants, and donor officials, without the possible antagonism between Tunisian implementors on one side and USAID-supported controllers and inspectors on the other. A hard-working and creative core group within the CTDA was responsible for planning and implementing the RPWI project. CTDA was assisted by a small group of expatriate consultants, primarily from the Institute for Development Anthropology (IDA) and AID's Water and Sanitation for Health (WASH) project. The opportunity to consult regularly with these individuals and take advantage of their comparative experience kept the program on track and helped generate enthusiasm. Much of the success must also be attributed to USAID's dedication to the RPWI project and the concepts it stood for, which remained strong throughout the five-year-long project. Finally, as the project moved from the Kasserine-based stage to the development of a national strategy for WUA creation and support (see below), the German development bank *Kreditanstalt für Wiederaufbau* (KfW) linked its potable water development program to the trajectory outlined by the RPWI project. The RPWI project's ability to generate this type of collaboration and support is a reflection of sound project design and successful implementation.

3. Role of the RPWI project in the definition of a national strategy

The success achieved in creating functioning WUAs in central Tunisia sparked interest at the national level, where the changing political and economic climate is moving toward greater decentralization. The agency responsible for most of the water systems in rural Tunisia, *Génie Rural* (GR) of the Ministry of Agriculture, announced its intention to promote a national strategy for the creation of WUAs, and instructed the governorate-level GR offices (*arrondissements*) to begin organizing communities to assume some degree of responsibility for operating and maintaining water systems. USAID supported this decision by rebudgeting $1 million of RPWI project funds to develop and implement an Action Plan to help the GOT develop an operational national strategy. Another major bilateral donor involved in the installation of potable water systems in rural Tunisia, the German *Kreditanstalt für Wiederaufbau* (KfW), expressed its support for the WUA concept and stipulated that associations would be formed in communities where KfW-funded water systems were planned and in others already operating. WUAs now exist in all rural governorates of Tunisia and the government is committed to extending community management of local water resources.

By 1991, the concept of community WUAs for potable water points has proved workable. In large measure, the recurrent costs of fuel and small repairs to operate these water points are covered by the community associations rather than by the government. Although collection of monthly water fees is a problem in some of the WUAs, many of the associations have a small surplus of funds. On the other hand, the salary of the pump operator is still paid by the government at most of the wells. Thus, while some issues remain unresolved, many that were at the forefront only five years ago have now receded in importance.

units, the importance of local political support, and the capacity for WUAs to serve as a model for other community development activities. The Action Plan has addressed many of these issues, and some of the answers are becoming clearer precisely because there is now comparative experience with the formation and support of WUAs in different regions of Tunisia.

B. Problems Encountered by the RPWI Project

1. Need for Adequate Political Support

Political support for the WUA program is crucial for its success. If Kairouan has managed to succeed despite its limited resources, much of the reason is the full and visible support of the governor and a broad range of technicians and officials in the governorate. This support included, for example, a governorate-wide conference on the WUA program in early 1989. In all governorates, the most important locus of support is at the level of the delegate (*délégué*). Where the delegate is visibly and actively behind the program, it moves forward. In delegations where that support is lacking, little can be accomplished. In Kasserine major efforts were not made to enlist such local political support. In this governorate and in others that have started WUA programs, certain delegates have continued to provide fuel subsidies for water system operations. While their financial support for constituents may be expedient politically, it introduces regional inequalities and undermines the effectiveness of the WUA program. The RPWI project failed to acknowledge that the entire Tunisian government administration should get behind the WUA concept early in the program. Where local political support was attained, the community WUAs have assumed responsibility for water system operation and management. These areas have shown concrete advancements in water and fuel conservation and reduced system breakdowns, while communities that continue to receive fuel subsidies have few incentives for resource conservation. Finally, the scarcity of financial resources for development interventions at all levels in Tunisia means that government funds still being used to operate rural water systems cannot be applied toward other community development actions.

2. Difficulties with the WUA Financial Management System

Political support is needed also to reduce the intricacies required by the national legislation authorizing WUAs. The difficulties encountered with the individual WUA financial management system as outlined in the legislation demonstrate this point. The experiences of the RPWI project have indicated two problem areas that will require political action to resolve. One is that the financial management system being introduced is extremely cumbersome and nearly unworkable as designed. The other is that the law treats the money collected by community members as if it were money belonging to the government, a bureaucratization of the WUAs that undermines the concept of financial autonomy and largely defeats the purpose of turning the water systems over to the communities.

The financial management system the UAG has attempted to set up for each WUA is identical to the model set forth in the national-level WUA legalization documents. Theoretically, this model is based on the system followed by agricultural WUAs surrounding the irrigation schemes around Gabes and other southern regions. Under this system there is a person in each delegation who is named the Register of Receipts and another who is the Register of Expenses. These people keep a record of income and outgo for each WUA and are in contact with the local representative of the Ministry of Finance, who is responsible for retaining all WUA funds between transactions. Most of the Registers in the Kasserine region are field extension agents for the CRDA, although there are also several individuals who work for the Ministry of Health and the Ministry of Social Affairs. The job of Register is in addition to their usual duties, which in the case of the extension agents may frequently take them into the rural areas and away from their delegation headquarters during the day. The main difficulty with the system is that it is unwieldy given the relatively small amount of funds regularly manipulated by the WUAs and the frequency with which access to the money is needed. The process of trying to locate the Register of Receipts every time money is collected, or trying to locate both the Register of Expenses and the Ministry of Finance representative every time a purchase is required, is time consuming and difficult. For the most part, the individual WUA officers have found it easier to hold on to most of the money themselves. In this way they can easily buy fuel or other immediately needed items to keep the water systems operating. Very few WUAs have actually begun to use the financial management system in place.

An effective WUA financial management system should provide WUAs with easy access to their funds, allowing for smooth water system operation while institutionalizing checks and balances for proper accounting and monitoring. The degree of independent action WUAs take in the management of their local water resources, an essential element for sustainable, cost-effective resource management, is largely determined by the degree of independent control they exert over the funds they collect. A WUA cannot improve the management of local water resources unless it controls the finances that are required to run the system. This is a philosophical, as well as an operational, consideration that the RPWI project never properly addressed. The project introduced the WUA concept without the totality of conditions necessary to allow it to stand on its own and mature. The general view is that the financial management law imposes far too complex a procedure on small rural community associations that handle only tiny sums of money. Blame can be cast either on a lack of foresight about the problems this would cause, or on a continued reluctance on the part of some officials to relinquish the government's control over the provision of potable water. What is now clear, however, is that political decisions and actions are needed if the government is to shift from a position of control to one more appropriate to the spirit of the WUA program where its role is limited to the provision of support and monitoring.

In short, the focus of questions about local WUAs has shifted from their viability to the manner in which government can best assist them. Answers to the current questions are not entirely clear, although some answers are taking shape now that a comparative experience can be examined.

3. Inadequate Monitoring and Evaluation

The UAG has been unable to establish an adequate monitoring and evaluation system. In part, this problem is linked to the difficulties encountered in the WUA financial management system, but fault also lies with the Planning and Evaluation unit of CTDA. Monitoring and evaluation is necessary to direct assistance from regional authorities, to measure the impact of the WUA program and learn from past experiences, and to prevent abuse of the associations. The Unité has repeated contact with the WUAs and could have implemented a data collection (and possibly also a data analysis) system. This has not been done, in part because the UAG staff were already seriously overburdened with the job of creating and supporting WUAs. In addition, it would appear that the UAG staff were unprepared to design and implement an adequate baseline survey questionnaire. The outcome was that despite repeated suggestions from consultants and evaluation teams, who even provided possible questionnaire forms, neither the UAG nor the Planning and Evaluation unit ever implemented a monitoring system. In the spring of 1989 the chief of the Planning and Evaluation Unit was transferred to another region of Tunisia. During the time since that event, which has included the incorporation of CTDA into CRDA, a replacement was slow to be named, and, once installed, this individual never really assumed day-to-day direction of the UAG and its program. This responsibility has remained under the chief of the Public Irrigated Perimeter unit, who continues to be overburdened with other activities. In consequence, much surveillance activity is necessarily anecdotal rather than systematic, and it is difficult for the CTDA to assess the status of individual WUAs and how WUA needs vary according to the different types of associations that it serves. In addition, the Unité director quit his post in December 1989, and the position has not been filled. Although day-to-day work continues, the leadership vacuum has caused real problems, especially for the design and implementation of a monitoring and evaluation system.

4. Dependence on Outside Financing

The RPWI project could not have achieved its considerable successes without the $10 million invested in the development of potable water resources and institutions in the central Tunisia region. As often occurs with such large infusions of money, however, a dependence on these funds can develop and counteract the participatory philosophy behind the establishment of community WUAs. Generally the RPWI project was implemented in such a manner that this has not been a significant problem, but a brief comparison between similar programs in Kasserine and Kairouan governorates shows some situations where a dependence on outside funding may have hindered the growth of a self-reliant spirit at both the regional support unit level and within the WUA communities.

The UAG and other CTDA staffers have been relatively well-supported by the RPWI project, while other Kasserine governorate officials and GOT ministry representatives have had to deal with perennially underfunded budgets. The collaboration between agencies involved in the Kasserine regional health education team (RHET) has been difficult at times because of jealousies over resources such as vehicles. Collaboration between the WUA support unit, Ministry of Health, and governorate officials has been more forthcoming in Kairouan where

there has not been outside financial support and all of the agencies involved in rural potable water provision are underfunded. While instances of inter-agency squabbling cannot be directly linked to feelings of jealousy about the distribution of resources, it is a consideration that should be taken into account when projects of this type call for collaboration between organizations.

With the completion of USAID financial support for Kasserine-based activities in June 1991, the WUAs' dependence on project financing for activities not directly associated with water system functioning has become apparent. The women's interest groups (WIGs), the village health worker (VHW) program, and community-initiated programs to construct showers and latrines, have all more or less stalled for the time being. The WIG program has not advanced since the departure of the expatriate consultant who had been working with the women's groups. Since the VHWs stopped receiving their 30 DT per month incentives in June, a few have continued to work on health issues in their communities, but the overall program is at risk of collapsing. Finally, there is no evidence of new plans for community watering troughs, showers, or latrines since the USAID-supported small project fund was completed. All of these programs were started late in the project cycle, following the 1989 mid-term evaluation's recommendation that more emphasis be placed on women's issues. It is perhaps too soon to declare that their relatively inactive status at present is due to their dependence on outside funding, for they simply may have not had enough time to become established. When compared with the situation in Kairouan governorate, however, where there is a growing, self-initiated momentum and demand for similar programs, it becomes possible to ask whether the Kasserine region WUAs were too reliant on project stimulus. More time is needed to see whether these programs will become active again on their own. It may be necessary to start over and work with the community groups, reorienting them toward self-initiated action and emphasizing the possibilities to be realized through community participation.

5. Involvement of the Gafsa Regional WUA Support Unit

The RPWI project included a number of interventions in the North Gafsa and Sened delegations of Gafsa governorate (see Chapter III for construction achievements). These northern delegations have geographic and socioeconomic characteristics similar to Kasserine governorate, and they fell within the range of operations of the CTDA. WUAs were created around water points throughout CTDA's range, and the new boreholes and distribution systems that were constructed with project funds in Gafsa followed the new site-selection methodology. When the CTDA merged with the CRDA/Kasserine in early 1990, construction of several systems in the Gafsa region proceeded with RPWI project funding, but the supervision of WUAs in the Gafsa delegations passed to representatives of the *Génie Rural* (GR) division of CRDA/Gafsa. Although they were familiar with the WUA concept from earlier collaboration with the UAG, those within GR/Gafsa who were responsible for the new associations did not have the same degree of training as the UAG members or the resources to properly conduct their supporting role. Given these restraints, the Gafsa personnel have done a remarkable job of instituting a regional support program, partly because of the enthusiasm for the WUA program shown by the northern Gafsa communities. It was impossible to predict the CTDA/CRDA merger and the subsequent change in WUA support responsibilities, but GR/Gafsa's task would

have been easier had they been more closely involved with the UAG and the RPWI project from the beginning.

C. Conclusion

The philosophy underlying the establishment of WUAs is that the best method of managing isolated public water points is self-management by the users. If the users take on responsibility for the water point, they will ensure that it works well, whether from the technical, health, or financial viewpoint. This will prevent wastage and breakage, so the system will last longer. If the users take on responsibility for the water point—especially by contributing money for its functioning—the system becomes "theirs."

The development of WUAs, which was an embryonic notion in 1983-1984, has gradually occurred, not only in Kasserine, but in other governorates also. Thus, the administrative structures needed to coordinate the WUA program are becoming more clearly known. At the same time, the needs of the WUAs—for financial and administrative management, for health and sanitation, for operation and maintenance, for water allocation decisions, and the like—are now being met to an extent not known before. Ultimately this collaboration of government and the people, based on the premise of greater local self-reliance for the management of these systems, can lead to a stronger local political and economic base and hence to a stronger, more participatory democracy, which, though not a direct aim of the Rural Potable Water Institutions project, will be an indirect and important consequence.

In the meantime, the WUA initiative has already scored impressive gains. As one consultant, writing in 1986, noted, there were still many concerns about the formation and operation of local WUAs.

> But considerable progress has been made in the last two years. One only has to see the contrast between water points where the Water User Association is fairly well implanted and those where there is none (dirty sites, broken taps, complaints) to appreciate the scale of the progress. The Kasserine experience stands as something of a pilot experience in Tunisia, and it should continue to be exemplary (Hopkins 1986b:8).

In fact, as this brief discussion indicates, the Kasserine experience did continue to be exemplary, and so helped shape the Tunisian program for WUAs. Today's concerns center not on the viability of WUAs but on the modalities of government assistance and support, on how government and its agencies and personnel should relate to these grassroots organizations. Because of the assistance lent to CTDA in support of its Local Management Unit for WUA development, the Kasserine experience continues to provide—as it has for the past five years—meaningful and pertinent guidelines for the government on how to go about rural development. It has led directly to the formulation of a national strategy to create and support WUAs throughout rural Tunisia.

APPENDIX I

LIST OF RPWI PROJECT PERSONNEL

RPWI Project Personnel

CRDA / Kasserine

Mr.	Ali Boudabbous	Commissaire du CRDA
Mr.	Ridha Fekih	Ancien Commissaire du CRDA et ex-P.D.G. de l'ODTC
Mr.	Rahoui Hamdan	Ancien Commissaire du CRDA
Mr.	Mosbah Hadji	Directeur du Projet (Chef d'Arrondissement P.P.I.)
Mr.	Mohamed Sakri	Ancien Directeur du Projet
Mr.	Mokdad Missaoui	Ancien Chef d'Arrondissement Planification
Mr.	Abderrazek Chihi	Chef d'Arrondissement Entretien et Maintenance
Mr.	Mounir Mgarrech	Chef d'Arrondissement Genie-Rurale
Mr.	Ridha Ben Abdallah	Chef d'Arrondissement D.R.E.
Mr.	Moncef Hussein	Ancien Chef du Service Eau Potable
Mr.	Belgacem Khessassia	Ancien Directeur du U.A.G.
Mr.	Taoufik Gharsalli	Chef de Secteur U.A.G.
Mr.	Lazhar Laabidi	Chef de Secteur U.A.G.
Mr.	Moktar Aouiti	Chef de Secteur U.A.G.
Mr.	Mohsen Themri	Chef de Secteur U.A.G.
Mlle.	Denise Harrison	Consultant, U.A.G.

Equipe Regional d'Education Sanitaire / Kasserine

Mr.	Ammar Mraihi	Educateur Sanitaire Regional
Mme.	Fatma Guesmi	Technicien Superieure
Mr.	Mohsen Felhi	Technicien Superieur
Mme.	Radudha Omri	Infirmiere
Mlle.	Cherifa Saadaqui	Nutrisioniste

CRDA / Gafsa

Mr.	Dhiab Abdelli	Chef d'Arrondissement Genie-Rurale
Mr.	Ibrahim Ben Ali	Chef de Section Materiel
Mr.	Bekri Jounaidi	Chef de Section AIC
Mr.	Mohamed Hedi Tlili	Section AIC
Mme.	Kid Najoua	Bureau Etude
Mr.	Mohamed Salah Miled	Controle Travaux
Mr.	Nasser Brahmi	Controle Travaux
Mr.	Salah Melki	Controle Travaux

USAID / Tunis

Mr.	George Carner	Directeur
Mr.	Fritz Weden	Ancien Directeur
Mr.	James Phippard	Ancien Directeur
Mme.	Nancy Tumavick	Ancien Chef, Gestion des Projets
Mlle.	Diana Putman	Ancien Chef du Projet
Mr.	William Egan	Ancien Chef du Projet
Mr.	Hafid Lakhdhar	Assistant du Projet
Mr.	Chedli Zarg el Ayoun	Assistant du Projet
Mr.	Mohamed Ali Hassairi	Assistant du Projet

APPENDIX II

LIST OF DOCUMENTS

SARSA/RPWI PROJECT DOCUMENTATION

Appleby, Gordon
1987 Criteria and Methodology for the Delimitation of Water-short Areas in Central Tunisia. Binghamton, NY: Institute for Development Anthropology. April.

Fakhfakh, Mohamed
1987 Project Eau Potable en Tunisie Centrale: Cartographie des Ressources en Eau et Population (du Gouvernorat de Kasserine et des Délégations de Gafsa Nord et d'Es Sened). Binghamton, NY: Institute for Development Anthropology. May.

Gervais, Raymond
1987 Population and Water in Central Tunisia. Binghamton, NY: Institute for Development Anthropology. December.

Grimm, Curt
1990 Report on Trip to Tunisia for the Action Plan to Develop a National Strategy for the Creation and Monitoring of Water User Associations. Binghamton, NY: Institute for Development Anthropology. 14 September-10 October.

Grimm, Curt, and Mohamed Salah Redjeb
1992 Cost - Benefit Analysis of WUA Creation and Support. Binghamton, NY: Institute for Development Anthropology. January

Gritzinger, Douglas
1987 Central Tunisia Thematic Maps: User's Guide. Binghamton, NY: Institute for Development Anthropology. August.

1987b Cartes Thématiques de la Tunisie Centrale: Guide d'emploi. Binghamton, NY: Institute for Development Anthropology. December.

1987c Central Tunisia Water Resources and Population Mapping Study: Summary Report. Binghamton, NY: Institute for Development Anthropology. December.

1987d Etude pour la Cartographie des Ressources en Eau et de la Population en Tunisie Centrale: Informatisation des Transparents Thématiques et Utilisation de PC Paint Plus. Binghamton, NY: Institute for Development Anthropology. December.

Gritzinger, Douglas, and Nasri Ezzedine
1987 Central Tunisia Water Resources and Population Mapping Study: Deep Aquifer Wells Data Base. Binghamton, NY: Institute for Development Anthropology. December.

Hopkins, Nicholas S.
1986a Les Associations d'Usagers de l'Eau Potable dans la Tunisie Centrale, et la Nouvelle Unité d'Autogestion au sein de l'ODTC. Binghamton, NY: Institute for Development Anthropology. August-September.

1986b The Present State of Water User Associations in Central Tunisia. Binghamton, NY: Institute for Development Anthropology. 24 September.

1987 Cellule d'Autogestion: Progress Report. Binghamton, NY: Institute for Development Anthropology. January-February.

1987b Local Organizations in Central Tunisia: Water User Associations and the Autogestion Unit. Binghamton, NY: Institute for Development Anthropology. July.

1988a Trip Report to ODTC, January 25-30. Binghamton, NY: Institute for Development Anthropology. 25-30 January.

1988b Trip Report: The Water User Associations in Central Tunisia. Binghamton, NY: Institute for Development Anthropology. September.

1988c Trip Report: Water User Associations: Legalization, Subsidies, and Other Issues. Binghamton, NY: Institute for Development Anthropology. 13-20 December.

1990 Water-User Associations in Rural Central Tunisia. *In* Anthropology and Development in North Africa and the Middle East. Muneera Salem-Murdock and Michael M Horowitz, eds. Pp.74-94. Boulder, CO: Westview Press.

Hopkins, Nicholas S., and William M. Turner
1983 Interim Evaluation: Rural Potable Water Subproject. Binghamton, NY: Institute for Development Anthropology.

Reeser, Robert M.
1987 Economics of Water Point Development in Central Tunisia. Binghamton, NY: Institute for Development Anthropology. August.

1988a Computer Analysis of Sites for Water Point Development: Updating and Application. Binghamton, NY: Institute for Development Anthropology. February.

1988b Irrigation Use of Excess Water from Potable-Water Wells. Binghamton, NY: Institute for Development Anthropology. March.

Scheliga, John T.
1987a Reconnaissance Water Resources: Survey of Sened and Gafsa North Delegations and Southern Kasserine. Binghamton, NY: Institute for Development Anthropology. July.

1987b Enquête de Reconnaissance sur les ressources en eau des délégations de Sened et Gafsa Nord et du sud de Kasserine. Binghamton, NY: Institute for Development Anthropology. July.

1987c Groundwater Recharge Enhancement: Study Design for the Vicinity of Sbiba, Kasserine Governorate, Republic of Tunisia. Binghamton, NY: Institute for Development Anthropology. September.

WATER AND SANITATION FOR HEALTH (WASH) PROJECT DOCUMENTATION

List of Tunisia Reports - Kasserine Activities Only

TAS 014 : Health Education Technical Assistance

WASH Field Report Number 255 (Also available in French)
"The Health Education Program of the Rural Potable Water Institutions Project in Tunisia" March 1989 by Pamela Pine

TAS 017 : Mid-Term Evaluation of the Rural Potable Water Institutions Project

WASH Field Report Number 256 (Also available in French)
"Mid-Term Evaluation of the USAID/Tunisia Rural Potable Water Institutions Project" July 1989 by Lee Jennings, Ridha Boukraa, Mohamed Frioui, Richard Swanson, Sereen Thaddeus, Alan Wyatt

TAS 057 : Consultancy in Water Systems Design

WASH Field Report Number 279 (Also available in French)
"Engineering Design Considerations : Tunisia Rural Potable Water Institutions Projects" November 1989 by Alan Wyatt

WASH Field Report Number 298 (Also available in French)
"A Re-Examination of Costs and Benefits of Rural Water Supply Projects in Central Tunisia" April 1990 by Alan Wyatt

Trip Report July 1989
"Consultancy on Water System Design" by Alan Wyatt

TAS 068 : Task Planning for the Unite d'Autogestion

WASH Field Report Number 277 (Also available in French)
"Health and Hygiene Education and Women's Involvement in the Tunisia Rural Potable Water Institutions Project" November 1989 by Sereen Thaddeus

WASH Field Report Number 276 (Only available in French)
Plan de Travail de l'Unite d'Autogestion" September 1989 by Lee Jennings, Sereen Thaddeus, Alan Wyatt

TAS 069 : Action Plan for Water Users Associations

Trip Report May 1990
"Finalization of the Action Plan for the Development of the National Strategy to Create and Monitor Water Users Associations in Tunisia" by Lee Jennings

TAS 117 : Socio-Economic DataBase

WASH Working Paper (not numbered) (Only available in French)
"Projet des Institutions d'Eau Potable dans les Zones Rurales de la Tunisie" December 1989 by Mona Fikry

WASH Working Paper Number 92 (Only available in French)
"L'Utilisation et l'Economie de l'Eau Potable : Etude de Cas dans le Gouvernorat de Kasserine" February 1991 by Mona Fikry

TAS 130 : Consultancy on Operation and Maintenance Cost Estimates

WASH Working Paper Number 84 (Also available in French)
"Technical Assistance for Water System Maintenance in Kasserine, Tunisia" April 1990 by Alan Malina

WASH Working Paper Number 89 (Only available in French)
"Assistance Technique pour l'Entretien des Systèmes d'Eau à Kasserine, Tunisie : Deuxième Mission" July 1990 by Alan Malina

WASH Working Paper (Not Numbered) (Only available in French)
"Assistance Technique pour l'Entretien des Systèmes d'Eau à Kasserine, Tunisie : Troisième Mission" September 1990 by Alan Malina

WASH Working Paper (Not Numbered) (Only available in French)
"Assistance Technique pour l'Entretien des Systèmes d'Eau à Kasserine, Tunisie : Quatrième Mission" September 1990 by Alan Malina

WASH Field Report Number 340 (Only available in French)
"Assistance Technique pour l'Entretien des Systèmes d'Eau à Kasserine, Tunisie : Cinquième Mission" July 1991 by Alan Malina

TAS 138 : Health Education and the Development of Women's Interest

WASH Field Report Number 307 (Also available in French)
"Technical Assistance and Planning for Health and Hygiene Education and Women's Involvement in the Tunisia Rural Potable Water Institutions Project" May 1990 by Elaine Rossi

WASH Working Paper Number 83 (Only available in French)
"Deux Journees de Reflexion au CRDA/Kasserine le 27 et 28 Fevrier 1990 pour les Collaborateurs Concernees par le Projet des Institutions d'Eau Potable dans les Zones Rurales" March 1990 by Elaine Rossi and Lee Jennings

WASH Field Report Number 324 (Also available in French)
"Lessons Learned from the Experiences of the Kasserine Regional Health Education Team 1987 - 1991" July 1991 by Sumana Brahmam, Elaine Rossi, and RHET Team Members

TAS 190 : Design of Evaluation Workshop for RHET and Follow-Up to Task 138

Trip Report
"Technical Assistance and Planning for Health and Hygiene Education and Evaluation for the Tunisia Rural Potable Water Institutions Project" October 1990 by Elaine Rossi

WASH Working Paper Number 90 (Only available in French)
"Rapport sur l'Atelier de Travail : Elaboration du Cadre de l'Evaluation des Projets de l'Equipe Regionale de l'Education Sanitaire" October 1990 by Mona Fikry and Elaine Rossi

List of Tunisia Reports - Action Plan Activities Only

TAS 174 : Development of a Training Program for WUAs

Training Guide (Only available in French)
"Guide du Formateur : Sous-Regisseurs - Programmes de Formation a l'Intention des Membres du Conseil d'Administration des Associations d'Interet Collectif en Tunisie" September 1991 by Belgacem Khessaissia, Lee Jennings, Tahar El-Amouri

Training Guide (Only available in French)
"Guide du Formateur : Usagers - Programme de Formation a l'Intention des Membres des Associations d'Interet Collectif en Tunisies" September 1991 by Tahar El-Amouri, Belgacem Khessaissia

Training Guide (Only available in French)

"Guide du Formateur : Presidents - Programme de Formation a l'Intention des Membres du Conseil d'Administration et des Usagers des Associations d'Interet Collectif en Tunisie" September 1991 by Belgacem Khessaissia, Lee Jennings, Tahar El-Amouri

TAS 178 : Training Materials for Pump Operators

Training Guide (Only available in French)

"Guide de Formation pour les Gardiens Pompistes" (Draft version) September 1990 by Michelle Moran, Moncef Maalel

TAS 183 : Training Materials for Hygiene Educators

Training Guide (Only available in French)

"Guide du Formateur : Programme de Formation pour les Educateurs Sanitaires" (Final Draft for Review) January 1992 by Elaine Rossi, Adel Guettat

Trip Report (Only available in French)

"Revision du Guide de Formation en Education Sanitaire" August 1991 by Tahar El Amouri

TAS 189 : TOT for Community Organization Specialists

This task used the training materials produced under TAS 174 in January 1991, and the revisions have been incorporated in the training guides.

Trip Report (Only available in French)

"Rapport sur l'Atelier de la Formation de Formateurs pour les Specialistes de l'Organisation Communautaire 9 - 19 Janvier 1991 - Kairouan, Tunisie" January 1991 by Tahar El Amouri, Belgacem Khessaissia, Dick Wall

TAS 214 : Improving Training Skills of Engineers and Technicians

Under this task, the training materials produced under TAS 178 were used during a TOT held in June 1991.

Trip Report (Only available in French)

"Rapport sur l'Atelier sur la Formation des Formateurs pour les Gardiens Pompistes des AIC 27 Mai - 8 Juin 1991" June 1991 by Tahar El Amouri, Moncef Maalel, Belgacem Khessaissia

TAS 224 : TOT for Hygiene Educators

This activity is taking place from February 3 - 21, 1992. Under this task, the materials produced under TAS 183 will be used and revisions made to the training materials.

TAS 226 : Water System Policy and Procedures Manual

Several Trip Reports produced under this activity, all of them entitled : "Politiques et Procedures pour l'Entretien et la Maintenance des Equipments des Points d'Eau Publics"

January 1991 by Alan Wyatt, Alan Malina, Moncef Maalel
June 1991 by Alan Wyatt, Alan Malina, Moncef Maalel
September 1991 by Alan Wyatt
November 1991 by Alan Malina

TAS 244 : Social Marketing for WUAs

WASH Field Report Number 344 (Also available in French)
"The Development of a National Communications Strategy and Action Plan for the Promotion of WUAs in Tunisia" September 1991 by Jamil Simon

TAS 325 : Refresher Workshops for Community Development Specialists and Pump Operators

Trip Reports will be produced from these workshops which took place from January 13 - 18 (Pump Operators) and from January 27 - 31 (Community Organization Specialists)

TAS 333 : Preparation of the WUAs Procedures Manual

Participants will be drafting their sections during the month of February. Fred Rosensweig will meet with the authors in Tunisia during the period of March 9 - 20 to review the drafts and to make revisions. The report will be finalized during May - June 1992.

TAS 343 : Health Education Awareness and Planning Workshop

This activity is scheduled to take place from February 24 - March 6, 1992. A Trip Report will be produced.

IRRIGATION SUPPORT PROJECT FOR ASIA/NEAR EAST (ISPAN) DOCUMENTATION

Hopkins, Nicholas, Richard Huntington, and Mohamed Salah Redgeb
1990 A Comparative Study of Approaches to Creating Water User Associations for Potable Water in Rural Tunisia. SARSA II/ISPAN draft report. 15 October.

Jennings, Lee, Tahar El Amouri, Mohamed Frioui
1991 Analyse Institutionelle. ISPAN Report No. 43. November

Rosensweig, Fred, Lee Jennings
1991 Mid-Term Review of the Action Plan to Develop the National Strategy to Create and Monitor Water User Associations. ISPAN Report No. 42. October

OTHER DOCUMENTATION

Ayad, Carole Steere
1978 Social Soundness Analysis of Potable Water Interventions in the Central Tunisia Rural Development Project Zone. Tunis: USAID.

Bouzaiane, Brahim
1985 Réactions des Communautés Rurales aux Modèles Proposés par le Programme de Développement Rural (P.D.R.). Revue Tunisienne de Sciences Sociales. No. 82-83:29-74.

Hopkins, Nicholas S.
1978 Elements for a Social Soundness Analysis of the Agricultural Elements. Tunis: USAID.

University of Wisconsin
1981 Update Regional Planning and Area Development Project. University of Wisconsin. Winter.

Zghal, Abdelkader
1967 Modernisation de l'agriculture et populations semi-nomades. The Hague: Mouton.

Zghidi, Mhammed
1978 Monographie de Hababsa (Gouvernorat de Siliana): Etude socio-économique d'un secteur rural. Tunis: Ministère du Plan.

APPENDIX III

IDA PROJECT STAFF

Muneera Salem-Murdock, Codirector

Michael M Horowitz, Codirector

Curt Grimm, Codirector (National Strategy Activities)

NAME	TECHNICAL SPECIALTY	MISSION	DATES
Hopkins, Nicholas	Social Economist	Evaluation of potable water projects in Central Tunisia	Sept. 1983
Turner, William	Water Engineer/ Drilling Manager	Evaluation of potable water projects in Central Tunisia	Sept. 1983
Davis, Susan	Anthropologist	Employment study	July 1985-Sept. 1985
Salem-Murdock, Muneera	Anthropologist	Household dynamics and the organization of production in Central Tunisia	July 1985-Sept. 1985
Hopkins, Nicholas	Social Economist	Rural Potable Water Institutions Project design	Aug. 1985
McPherson, Laura	Rural Development Specialist	Rural Potable Water Institutions Project design	Aug. 1985
Scheliga, John	Hydrologist	Rural Potable Water Institutions Project design	Aug. 1985
Wright, Ian Michael	Economic Anthropologist	Rural Potable Water Institutions Project design	Aug. 1985
Boyle, W. Philip	Development Advisor	Project design regional and rural planning and development	Oct. 1985-Nov. 1986
Larson, Barbara	Anthropologist	Tunisia project monitoring and evaluation	Jan. 1986-July 1987
Hopkins, Nicholas	Social Economist	State of water user associations in Central Tunisia	Aug.-Sept. 1986

Appleby, Gordon	Regional Planner	Water-point selection methodology	Feb-Apr. 1987
Derriennic, Yann	Administrator	Water-point selection methodology	Nov. 1986-May 1987
Fakhfakh, Mohamed	Economic Geographer	Water-point selection methodology	Nov. 1986-May 1987
Gervais, Raymond	Demographer	Water-point selection methodology	Sept.-Nov. 1986
Gritzinger, Douglas	Economist	Water-point selection methodology	July 1987-Aug. 1988
Hopkins, Nicholas	Social Economist	Water-point selection methodology	Jan.-Feb. 1987; June-July 1987
Horowitz, Michael	Anthropologist	Water-point selection methodology	Sept.1986-Aug. 1988
King, Geoffrey	Remote Sensing Specialist	Water-point selection methodology	Dec. 1986-Jan. 1987
Reeser, Robert	Water Resource Economist	Water-point selection methodology	Nov. 1986-May 1987
Salem-Murdock, Muneera	Anthropologist	Water-point selection methodology	Sept. 1986-Aug. 1988
Scheliga, John	Hydrologist	Water-point selection methodology	Nov. 1986-May 1987

Reeser, Robert	Water Resource Economist	Computer analysis of sites for water point development	July 1987
Scheliga, John	Hydrologist	Groundwater recharge enhancement study	July 1987
Hopkins, Nicholas	Social Economist	Review of Central Tunisia Development Authority	Dec. 1987; Dec. 1988
Barnes, Roger	Environmental Policy	Rural Potable water institutions training program	Jul. 1988
Doan, Peter	Microcomputer Trainer	Training session on microcomputing and rural development monitoring and evaluation	Oct. 1988
Grimm, Curt	Anthropologist	Training session on microcomputing and rural development monitoring and evaluation	Oct. 1988
Gritzinger, Douglas	Economist	Training session on microcomputing and rural development monitoring and evaluation	Oct. 1988
Salem-Murdock, Muneera	Anthropologist	Training session on microcomputing and rural development monitoring and evaluation	Oct. 1988
Barnes, Roger	Environmental Policy	Rural potable water institutions training program	July-Aug. 1989
Grimm, Curt	Anthropologist	Rural potable water institutions training program	July-Aug. 1989

Hopkins, Nicholas	Social Economist	Rural potable water institutions training program	July-Aug. 1989
Moudoud, Ezzeddine	Regional Planner	Rural potable water institutions training program	July-Aug. 1989
Walker, Mark	Hydrologist	Rural potable water institutions training program	July-Aug. 1989
Grimm, Curt	Anthropologist	Design and initial implementation of an action plan for the national strategy to create and monitor water user associations in Tunisia	Feb. 1990;
		Oversight of pilot project monitoring KfW sites in 6 regions	Sept.-Oct. 1990
Hopkins, Nicholas	Social Economist	A comparative study of Approaches to Creative WUAs for Potable Water in Rural Tunisia	Sept.-Oct. 1990
Huxley, Frederick	Anthropologist	Pilot project monitoring KfW sites in 6 regions	Sept.-Oct. 1990 June 1991 Feb. 1992
Boukraa, Ridha	Sociologist	Pilot project monitoring KfW sites in 6 regions	Sept.-Oct. 1990 Feb. 1991, June 1991 Feb. 1992
Redjeb, Mohamed Salah	Economist	Cost-Benefit Analysis of WUA Creation	Oct. 1991
Grimm, Curt	Anthropologist	Cost-Benefit Analysis of WUA Creation	Oct. 1991