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9. ABSTRACT

Compiles extensive background information on three proposed projects to supply relatively inexpensive potable water to three Syrian rural communities. The report profiles the three project target areas, detailing population, population growth rate, living conditions, current water use patterns, ethnic composition, social structure, and other socio-economic information. The report then summarizes the essential scope and purpose of each project. This discussion covers the optimum placement of the water fountains, financial cost/benefit of the project, and procedures for selling the water. It is noted that the target populations should be regularly informed about the project's progress. Next, the project's benefits are delineated; these include a significant reduction in the cost of purchased water, more convenient locations for water buyers, and an overall decrease in the incidence of gastrointestinal disease related to the consumption of poor quality water. Appended tables contain present and projected population data for the target areas and include some technological specifications regarding fountain construction.

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SOCIAL SOUNDNESS ANALYSIS
OF THE
KASRAH/JARAWAN, TURAIF AND SHARQI-KOKAB/EL HOL
RURAL WATER SUPPLY PROJECTS

DEIR EZ-ZOR AND HASAKEH PROVINCES

SYRIA

I. ASMON

OCTOBER 1978

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I. INTRODUCTION

The proposed Kasrah/Jarawan, Turaif and Sharqi-Kokab/El Hol rural water supply projects are located in three regions which exhibit very different ecological and agro-economic conditions:

i. the Euphrates Valley, with irrigated cotton, wheat and sugar-beet cultivation (Kasrah and Turaif projects);

ii. the semi-arid Jarawan plateau (average annual precipitation- mm), with a semi-nomadic sheep and barley economy; and

iii. the Sharqi-Kokab plains, which enjoy a somewhat higher precipitation (mm/year) and are utilized mostly for dry-farming of wheat.

The regions are shown in Diagrams 1 and 2. Section II discusses their salient ecological and socio-economic characteristics. The analysis is based on data gathered during September 1978 in 14 villages. The methodology used was a discussion with the village chief or with randomly selected inhabitants regarding average village conditions, coupled with a more in-depth interview of one randomly selected family per village.

II. PROFILE OF THE BENEFICIARIES

A. Demographic Characteristics

1. Number of Beneficiaries -- Kasrah/Jarawan project

Table 1 shows that in the Euphrates Valley this project will benefit about 17,000 present inhabitants. In the badia (semi-arid plateau) of Jarawan the project will have about 4,600 direct beneficiaries (inhabitants of villages served with public fountains). This number should be augmented by about 30%, or 1400 persons, to account for people not surveyed. Thus the total number of direct beneficiaries is about 23,000. To this should be added about 2,300 indirect beneficiaries, who will obtain water by truck from the Jarawan terminal at shorter distance and lower cost than at present.

2. Number of beneficiaries -- Sharqi-Kokab/El Hol project

Table 2 shows that Ministry of Housing estimates put the number of inhabitants in the Sharqi-Kokab/El Hol area at 17,450. To this should be added at least 15%, or 2600 persons, for the many small villages not accounted for (the list includes 50 villages, while Ministry of Interior records put the number of villages in the region at 86). Thus the Ministry of Housing figures imply at least 20,000 inhabitants in the region (during the winter, when few persons are away).

Table 2 also shows that estimates of local persons put the number of inhabitants in the same 50 villages and their environs at 25,000. Field observations suggest that 25,000 may be a closer estimate of the total number of direct beneficiaries, i.e. people living within about 4 km of the water mains, who will be able to carry water by animals. To this should be added about 10,000 indirect beneficiaries, i.e. persons from surrounding villages who will be able to draw water from the project by vehicles at much lower costs than at present. The Sharqi-Kokab plains are much more densely settled than the Jarawan plateau, so that the number of indirect beneficiaries is correspondingly larger.

3. Migration pattern

i. The Euphrates Valley: population pressure on the limited irrigated land causes on the average one person per family to periodically seek work in urban centers or abroad. These are, however, typically young men who go without their families for short periods, so that less than 5% of the population is away from the villages on the average. Permanent emigration with the families is insignificant.

ii. The Jarawan plateau: in this area, the economy of which is based primarily on sheep and barley,

from February to May (when the fields around the villages are growing cereals) a large part of the population -- perhaps over 50% -- migrates with the sheep to pasture areas. During the summer, if the harvest was good few people seek outside employment; during a poor crop year a part of the population seeks temporary employment in the irrigated areas or in urban centers, but a part always stays to tend the sheep. Very few persons emigrate permanently with their families.

iii. The Shargi-Kokab plains: This wheat-growing area, in which sheep are only a side activity, exhibits a truly migrant-worker economy. For up to 7 months during every summer nearly half the population migrates, mostly to the cotton areas of the Khabur valley, where they work as sharecroppers (for 40% of the harvest) or as farm hands. Often entire families migrate and in many cases almost entire villages. However, in the winter the inhabitants return; cases of permanent emigration are rare.

4. Rate of population growth

The rate of population growth between the 1960 and 1970 population censuses was 2.8% per annum for both Deir ez-Zor and Hasakeh provinces. Owing to the lack of significant

permanent emigration, the above rate may be taken as the prevailing one in the project areas.

5. Family size

The size of the nuclear family ranges from 2 to 35 persons (the latter consisting of a man, four wives and thirty children). The modal family size is around eight persons.

6. Habitation pattern and density

i. The Euphrates Valley: the traditional habitation pattern is dispersed, each family living on its irrigated plot. The current tendency, however, is to move up to houses built along the paved road which skirts the irrigated areas; in this way the farmers save some cultivable land while gaining better access to services. Provision of piped water along the paved road is expected to accelerate this tendency. As a result, the new villages are 0.5-1 km wide and several km long.

ii. The Jarawan plateau: here each "village" is really a cluster of groups of houses dispersed over an area 2-3 km in diameter. The plateau is sparsely settled; villages in general cannot be seen from each other.

iii. The Sharqi-Kokab plains are much more densely settled; there are villages or house groups whichever way one looks. Each village consists of a compact group of houses and is surrounded by satellite villages -- smaller

compact house groups -- which are used during the agricultural season.

B. Economic Characteristics

1. Economic pursuits

As stated above, the Euphrates Valley economy is based on irrigated cotton, wheat and sugar beets. The economy in the Jarawan area is based on sheep and barley, and in the Sharqi-Kokab area on rainfed wheat and seasonal migrant work.

2. Farm size and cropping pattern

i. The Euphrates Valley: families have on the average 20 - 25 irrigated dunums (1 dunum = about 1000 m2). The range is from 10 to 100 dunums. In addition, they may cultivate 100-200 dunums of barley on the plateau. A 25-dunum plot may consist of about 12 d irrigated wheat, 10 d cotton and 3 d sugar beets. In addition, there is a house vegetable garden (about 0.5 d) and some fruit trees.

ii. Jarawan: The land belongs to the government, which rents for a nominal sum (1 SP/dunum) up to 450 dunums per family to effect land distribution. The land is cultivated without fallow. about 75% of the land is in barley and 25% in wheat.

iii. Sharqi-Kokab: The average family rents from the government 200-300 dunums for 0.50 SP/dunum. Only half the land is cultivated during any one year, to conserve its fertility. The land is mostly in wheat.

3. Method of cultivation

All land is prepared by tractor. Cereal harvesting is performed by combine, except on very small plots. Cotton is picked by hand.

On the Jarawan plateau, the inhabitants -- who are sheepherders by orientation -- rent the land to a tractor/combine operator who furnishes all the work and inputs and gives them 30% of the harvest. In the Sharqi-Kokab area the inhabitants function more as farm operators: They generally pay for custom ploughing, provide the seed and obtain harvesting services for a negotiated percentage of the yield.

4. History of cultivation

Pump irrigation started in the Euphrates Valley about 80 years ago. Tractor cultivation became generalised about 25 years ago in the Sharqi-Kokab area and 15 years ago on the Jarawan plateau. Cotton was introduced since 1940 and sugar beets in 1975. Thus, not withstanding its traditional look, the area has accepted many important innovations.

5. Yields

i. The Euphrates Valley: wheat is seeded at the rate of 26 kg/d and yields about 260-300 kg/d. Cotton yields 200-250 kg/d and sugar beets about 2000 kg/d.

ii. Jarawan plateau: the seeding rate is about 13 kg/dunum and the yields average 40-50 kg/d, showing that barley cultivation is truly marginal.

iii. Sharqi-Kokab: seeding rate is also about 13 kg/d and yields average about 90 kg/d.

6. Livestock

On the Jarawan plateau, every family keeps on the average about 70 sheep. In the Kasrah and Sharqi-Kokab regions the average is much lower -- perhaps 20-30 head per family -- and in many villages only few people possess sheep. Every family owns 2-4 donkeys and a dozen or two of chickens. A few horses are found in Jarawan, and some cows in certain villages of the Euphrates Valley.

7. Total family income

i. The Euphrates Valley: annual family cash income (from sheep, cotton and sugar beets) averages about SP 5000. In addition, there is auto-consumption of wheat worth about SP 2000, as well as of vegetables and fruits. Outside work is not an important factor in family income.

ii. The Jarawan plateau: most income is obtained from the sheep. Total family income averages SP 5000 annually, with a range of SP 3000 to SP 10,000.

iii. The Sharqi-Kokab region: total annual income (from wheat, sheep and outside work) also averages about SP 5000 for a family of eight, with a range of SP 3000 to SP 10,000.

Thus the average rural income is about $200 per capita in the Euphrates valley and $160 per capita in the non-irrigated areas. The spread in family income is mostly a function of family size; there is remarkably little difference in living standards among different families.

8. Living conditions and diet

The rural inhabitants live in mud-brick houses with few household possessions other than mattresses, pillows, blankets and kitchen utensils. Bread is the diet staple; per capita consumption of wheat is about 300 kg annually. This is supplemented by clarified sheep butter (samen) in the sheep-growing areas and by vegetables and fruits (in season) in the irrigated areas. Meat is rarely consumed, usually upon the arrival of guests. Purchased items of daily consumption are mostly limited to tea, sugar, coffee and cigarettes.

The above facts and figures paint a picture of truly minimal living standards. The inhabitants of the project area are definitely among the poorest of the Syrian rural poor.

C. Social Characteristics

1. Ethnic/religious composition

All inhabitants of the project area are Arab-Speaking Sunni Moslems. Within the project areas there are no minorities.

2. Social Structure

The inhabitants of the Sharqi-Kokab area belong to two major groupings, the Hawaatne and Jbur; the situation is probably similar in the other project areas. Every village is usually composed of one clan, and all its inhabitants related to some degree; no village is composed of mutually exclusive groups.

3. Origin and orientation

The inhabitants of the Kasrah and Turaif areas are descendants of people who have lived in the Euphrates Valley as irrigators since times immemorial. The Sharqi-Kokab inhabitants are relatively recent arrivals who have settled in the area about 40 years ago as rainfed-wheat cultivators

(ahl al-Karab, i.e. "people of the plough"), for when sheep are only a side occupation. In contrast, the inhabitants of the Jarawan area are semi-nomads (ahl al-ruah , i.e."shepherd-folk"), for whom sheepherding is the major occupation, and who still spend the winter season in tents following the pastures.

4. Village authority structure

In every village of more than minimal size there exists a village chief or mukhtar (exterally, "an elected one"). In the Jarawan area, where a large part of the population migrates during the spring season to the pastures, there exists a second mukhtar in charge of this group. The mukhtar is a person from village; the office is for life, and usually passes from father to eldest son or to another male kin. The main responsibilities of the mukhtar are:

i. register births, marriages and deaths;

ii. act as judge and mediator in intravillage matters (often with an informal group of elders, which numbers from a few to 15 or more according to the importance of the case);

iii. represent the village in affairs with other villages -- again, often with a delegation of elders; and

iv. receive government officials and other guests.

5. Male/female economic roles

Women take part in agricultural work, as well as perform the housework and child care. In most cases it is women who bring the water as well.

6. Communication between villagers and water authorities

The Ministry of Housing and Utilities has well-established contacts with the project beneficiaries and is well appreciated by them, especially in the Jarawan area where its trucks distribute free water regularly to most families. Ministry functionaries were well-known in all of the villages visited. Communication is facilitated by the fact that almost all local Ministry personnel -- including the senior engineering and management staff -- is native to the Deir ez-Zor and Hasakeh provinces, and some employees originate from the project areas themselves.

7. Tradition of community works

In the Euphrates Valley irrigated areas, some pumps are privately owned, while others are owned by collectivities of farmers, many of which have functioned for 70 years or more. In the latter case, there exists a tradition of cooperative work for cleaning the canals; however, the cooperation takes place among the beneficiaries of a given irrigation system, not at the village level. Among the Jarawan and Gharqi-Kokab inhabitants there exists

no tradition of contributing physical labor to projects of common benefit.

D. Health and Education Levels and Existing Services

1. Education: many villages possess primary schools; their coverage was not determined by the present study, but it seems fairly high. The overall literary rate was locally cited as 70% for the Euphrates Valley villages, 60% for the Sharqi-Kokab area, and 50% for the Jarawan region. While all of these estimates may be on the high side, the proportion between them seems reasonable.

2. Health: the Kasrah area has two clinics (at Kasrah and Jezrat Milaaj), each staffed by a paramedic and an assistant; one physician attends both clinics. The Turaif area has one clinic, not yet in operation. The Sharqi-Kokab region has one clinic (at El Hol), with a paramedic and an assistant, which is barely functioning for lack of a physician and an adequate medicine supply. In addition, the health service of Deir ez-Zor province has 6-7 mobile teams (with one vehicle each) for control of malaria, trachoma, and cholera and for vaccination campaigns (Hasakeh province probably has similar services).

The most common diseases mentioned in the rural areas were (i) stomach diseases (diarrhea, intestinal amoebiasis, typhoid, and some cholera), especially during the summer, and (ii) pulmonary diseases (bronchitis, tuberculosis), which occur mainly in the winter. Anemia is frequent among grownups, and malnutrition and and tonsils among children.

Some 70% of the rural population has askaris intestinal worms. Subjectively, however, the population feels that the incidence of disease is low, and does not regard health as one of its high-priority problems.

3. Roads: all project villages in the Euphrates Valley lie along or near a paved road. In the Jarawan area there are no paved roads but the need for them is low, since owing to the low precipitation and to the good natural drainage system of the badia, vehicles can reach the villages practically year-around. In contrast, in the Sharqi-Kokab plains, which have almost no paved roads, precipitation is higher and drainage worse, so that during the winter many villages are not accessible be vehicles for up to three months. This constitutes a major problem for the inhabitants, especially in cases of medical emergencies.

E. Present Water Supply Practices and Attitudes

The water supply situation in the Euphrates Valley is very different than the one in the Jarawan plateau and the Sharqi-Kokab plains. Consequently, these regions are discussed separately in the following.

1. The Euphrates Valley

i. Source of water: in the Euphrates Valley, the villages are located 1 to 6 km from the river. During the non-irrigation season (7 months) the inhabitants obtain

water from the river. During the irrigation season (5 months) people draw water from the irrigation canals, which are usually found within 500 m of the houses. Groundwater is not used for human consumption because of its bitter taste.

ii. Mode of transport: water is hauled by donkeys carrying two tin containers of about 36 liters each. Fetching water is typically women's work, although teen-age boys sometimes do it where the distance to the river is large. Each family draws its own water; no water is purchased.

iii. Water consumption rate averages about 27 liters per capita day (lcd), which implies (for an average family of 8 persons) 3 donkey round trips averaging 6 km each, or an average of 8 hours per day spent in bringing water. During the irrigation season, the water consumption rate increases to about 40 lcd owing to its proximity, and only about 1 hour is spent daily in fetching water.

iv. Beneficiaries' priorities: from the inhabitants' subjective point of view, the interest of a piped water system lies in its convenience, since they are not yet aware of its health benefits. Accordingly, the interest shown by the villagers in the installation of a water supply system varies inversely with their distance from the river. While for those who reside 3-6 km from the river water constitues the most desired public service,

for those who live 1 km or less from the river electricity and health service are of equal or greater priority.

v. Projected consumption rates: if pipe water becomes available, the net consumption rate is likely to be about 50 lcd for public fountains and about 100 lcd for house connections.

2. The Jarawan plateau

i. Source of water: in the Jarawan plateau there are no local sources of potable water. These exist many wells, usually 20-30 m deep, but the water has a bitter taste and causes stomach pains; it also deposits a salt layer if used for bathing or washing floors, and makes clothes rough if used for laundry. Consequently, well water is used only for watering livestock and for house construction; it is utilized for personal purposes only in extremis. For drinking and household requirements the inhabitants usually buy river water at a price averaging SP 10 per 200 l barrel. During the rainy season the inhabitants use ponded rainwater for household purposes, and the poorest also for drinking.

ii. Mode of transport: water is brought to the houses for sale by pickup trucks (4-5 barrels on each) from the Euphrates River, a distance of 30-50 km. The inhabitants also receive some treated water gratis from government tank trucks, which bring it from Deir ez-Zor (about 110 km).

These trucks stop at a central point in the village, from which the inhabitants carry the water on donkeys to barrels or plastic containers in their homes.

Water for livestock is hauled from wells with pulleys by means of horses or donkeys.

iii. Water consumption rates and cost: The inhabitants purchase about 7-11 lcd, or about 2-3 barrels weekly for a family of eight. This rate diminishes to about 1 barrel per week during the rainy season. At the water price of SP 10 per barrel, this signifies that the average family spends about SP 900 to SP 1300 annually, or 20% to 25% of its total income, to buy water.

In addition, every family receives gratis from the government tank trucks 0.5 to 1 barrel every 7-10 days, which amounts to about 2 lcd.

iv. Beneficiaries' priorities: not unnaturally, for inhabitants of the Jarawan plateau water supply has by far the highest priority among desired services. Other desired services, in descending oreer of priority, are schools (where these are not yet constructed), electricity and medical facilities. All of these services are felt to have a much lower priority than water.

v. Projected consumption rates: if piped water becomes available at a reasonable price (say 2-5 SP/m^3), people will consume about 40-50 lcd. Unless measures are taken

piped water also for watering

to the contrary, the beneficiaries will use the/ livestock, which will bring the total consumption up to the equivalent of about 100 lcd.

3. The Sharqi-Kokab plains

i. Source of water: in the Sharqi-Kokab region there are many wells, 10 to 60 m deep, as well as a large spring and a lake near El Hol which are used for irrigation, but the water is too bitter for human consumption. Only a few sweet-water wells exist, and inhabitants from up to 8-10 km away (over 6 hours per round trip) carry water from them. Other inhabitants purchase for drinking and household use water brought from the Khabur River or from wells outside the region (40-60 km distant).

ii. Mode of transport: in the Sharqi-Kokab area, unlike other regions, when water is brought from wells men sometimes perform this function. Elsewhere, water is brough in barrels on pick-up trucks or (more often) on tractor trailers. Government tank-truck service is infrequent.

iii. Water consumption rate and cost: in the Sharqi-Kokab area water costs only SP 5-6 per barrel, in comparison to SP 10 at Jarawan (possibly, owing to the greater availability of tractor trailers in Sharqi-Kokab). In consequence, the quantities utilized are larger -- about 5 barrels weekly for a family of eight, or 18 lcd. At this rate the average family spends about SP 1100

annually, or about 22% of its total income, to purchase water.

iv. Beneficiaries' priorities: as in the Jarawan area, water supply is by far the most strongly felt need of the inhabitants. Second priority is given to paved roads, since for about three months during the winter many areas are not accessible to vehicles. Lower priorities are given to electricity and medical services, in that order.

v. Projected consumption rates: if piped water were available at SP 1 per barrel (5 SP/m^3), residents repeatedly stated their willingness to consume 2 barrels daily per family, i.e. 80 lcd.

III. PROJECT SUMMARY

The present section shortly describes the projects proposed, as a basis for their socio-cultural appraisal which follows.

A. Water Systems

1. The Kasrah/Jarawan project (Diag. 1) will consist of a river intake near Kubar with possibly a filtration gallery, from which the water will be pumped to a local high point (70 m head difference). From that point the water will flow by gravity southeast to Diab and northwest to Jezrat Milaag where it will be lifted by booster pumps into a main line to Jarawan, with branches to Abu Khashab and other villages.

2. The Turaif project (Diag. 1) will consist of a river intake at Turaif, from which the water will be pumped southeast to Shamiyah and northwest to Ma'adin.

3. The Sharqi-Kokab/El Hol project (Diag. 2) will consist of an intake on the Khabur River above Hasakeh, from which the water will be pumped to a reservoir on the slopes of Jebel Kokab. From that point the water will be distributed by gravity to villages of the Sharqi-Kokab plain. A booster station will be enable the water to reach the El Hol region.

Several technical recommendations concerning those projects are detailed in Appendix A.

B. Installation of Water Concessioners

One of the main recommendations of the present report is to install a water seller in charge of every public fountain. This person (a villager) will not be a functionary but a concessioner: he will charge the villagers a predetermined price for every 36-liter tin or other container which they fill, and pay the Ministry of Housing and Utilities according to the total quantity consumed, as measured by a water meter attached to the public fountain. Thus it will be in the concessioner's interest to increase consumption and to avoid water waste. The water price charged to the concessioner will be the price necessary to assure operation, maintenance and replacement of the system: the price paid by the villagers will be calculated so as to provide the concessioner with a sufficient but not excessive income. The concessioner will be trained in proper maintenance of the fountain.

The installation of water concessioners has a threefold purpose:

i. to provide the project with its own source of income for its adequate operation and maintenance;

ii. to maintain the fountains; and, most important,

iii. to prevent the use of water for unplanned purposes such as watering livestock, house construction, gardening, and plain waste. Without the control provided by the water concessioner it is virtually certain that, especially in the water-short Jarawan and Sharqi-Kokab regions, the first villages on the

line will consume such quantities that the last ones will suffer shortages.

At 500-1000 users per public fountain and a consumption rate of 50-100 lcd, a surcharge of only 0.50 SP/m^3 (SP 0.10 per barrel) over the price necessary for system operation, maintenance and replacement will assure the water concessioner a monthly income of SP 750, which compares favorably with the current monthly salary of about SP 400 for unskilled labor in the region.

Moreover, for the villages, the water concessioner's fee constitutes an internal transfer payment rather than a cost. Since beneficiaries and concessioner will usually be related, this fee will literally "stay in the family".

C. Technical Assistance

An essential element of the project will be the provision of technical assistance to the Water Supply Authority for the design and execution of rural water supply projects. The objective of this assistance will be (i) to strengthen the national capacity for planning and implementing such projects, and (ii) to create a project pipeline for their continued financing.

D. Involvement of the Health Service

The project offers an opportunity to improve health levels (in particular, to lower the incidence of gastro-intestinal diseases).

To this end, a continuing effort will be necessary for educating the beneficiaries to utilize the increased water supply for better personal hygiene, washing hands, washing vegetables, etc. The province-level health services can perform this function, especially by conducting a compaign among the school children (distribution of leaflets, talks by schoolteachers). For this purpose, each project should include one light vehicle for the health service; the latter can supply the necessary personnel and materials. The water concessioners could also be used as points of contact with the communities by giving them a short training in instructing the villagers in better hygiene.

The areas effected by the rural water supply systems should be included in future rural health projects which may be implemented in NE Syria, in order to obtain the benefits of interaction between water supply and health.

IV. PROJECT SOCIO-CULTURAL FEASIBILITY

A. Priority of the Project for the Beneficiaries

For the inhabitants of the Jarawan and Sharqi-Kokab regions, the project fulfills what is by far their highest felt and expressed need (Sec. II.E). This is also evidenced by the fact that these persons pay 20%-25% of their meager income to purchase water (Sec. II.E). In these regions, the provision of potable water is nearly a water of survival.

In the Euphrates Valley, the provision of potable water is also the number one expressed need of the population whenever the distance to water is several km, which is usually the case (Sec. II.E). In this region, piped water supply is primarily a matter of convenience: people will prefer drawing water from a public fountain located 500 m away rather than from the river located some 4 km away; but, since they have not yet been made aware of the health effects of treated water, they are likely to utilize irrigation-canal water if it is close

B. Willingness to Pay for Water

As a consequence of these priorities, in the Sharqi-Kokab and Jarawan area the inhabitants will regard reasonably-priced piped water (e.g. SP 0.50 per 200 l, in comparison to the present cost of SP 5 to 10 per 200 l) as a great benefit. In the Euphrates Valley, people are also likely to pay such price whenever the alternative water source is more than 1 km away, which is usually the case.

In no project area are these any religious or other objections to the principle of paying for drinking water.

C. Pattern of Placement of Public Fountains

Owing to the remarkable lack of conflicting social classes or groups within the villages in the project area (Sec. II.C), it will be possible to place the public fountains according to strictly technical criteria, i.e. one fountain for each housing concentration of several hundred inhabitants or more.

D. Projection of the Population Growth Rate

As pointed out in Sec. II.A.3, emigration from the project area is strictly seasonal (e.g. to the pastures in the spring or the cotton-growing areas in the summer) or temporary (e.g. to construction work in town or in the oil countries). The number of persons who emigrate permanently with their families is insignificant, and no trend of growth is discernible in it. Therefore the population growth rate of the project areas may be taken as equal to the average rate for Deir ez-Zor and Hasakeh provinces, or 2.8% per annum. Barring a decrease in the population growth rate for Northeast Syria as a whole, the above rate is likely to prevail in the project area during project life and may therefore be utilized for population projections.

E. Investment and Annual Cost per Beneficiary

Table 3 shows that updated construction costs are about

SP 37.5 mill. for the Kasrah/Jarawan project and SP 30.0 mill. for the Sharqi-Kokab/El Hol project. Investment per direct beneficiary will be on the order of SP 1350 on the Kasrah subproject and SP 2410 on the Jarawan subproject, or about SP 1630 for the Kasrah/Jarawan project as a whole. For the Sharqi-Kokab/El Hol project, if the number of beneficiaries is taken as 20,000 (Ministry of Housing estimate), the cost per beneficiary will be SP 1500. Field observations, however, suggest that the number of direct beneficiaries is at least 25.000, so that investment will be SP 1200 per beneficiary. Consideration of the large number of indirect beneficiaries, who will obtain water by truck, tips the balance further in favor of the Sharqi-Kokab project.

F. Possibilities for Community Participation

Owing to the lack of tradition of village-level voluntary labor contributions to projects of common interest (Sec. II. C.6), involvement of the beneficiaries in project construction (e.g. excavating ditches for the water mains) is not recommended. The beneficiaries will participate by full payment for project operation, maintenance and replacement costs through the system of water concessioners (Sec. III.B).

G. Communication Between Project Management and Beneficiaries

During project planning and execution, the beneficiaries should be kept up to date regarding the project completion

schedule in order to avoid early expectations and disappointments. Likewise, the institution of water charges is expected to be well-accepted by the beneficiaries if it is explained to them from the beginning. Contact should take place through the mukhtar and the informal group of village elders (Sec. II.C.4). The communication should be two-way: the village representatives should be consulted, for instance, regarding the desired location of the public fountains and the nomination of the water concessioners.

4. Alternative to the Project

Groundwater is not viable alternative, since at depths of up to 80 m no potable water was found. Even if potable water is found at greater depths, the cost is not likely to be competitive with piped river water, and the operational problems larger.

The only practical alternative to the project is to expand the tank-truck services to the Sharqi-Kokab and Jarawan regions to furnish equivalent quantities of water. The cost of this alternative may be roughly estimated as follows:

- Amortization of a 17.5 ton tank truck (SP 200,000 over 5 years at 8%, 300 days/yr)	=	167 SP/day
- Fuel and lubricants	=	50 "
- Chauffeur	=	33 "
- Repairs	=	50 "
		300 SP/day

Considering the tank truck can make one trip daily, the cost of trucked water is about 17 SP/m^3.

In comparison, the investment cost of e.g. the Sharqi-Kokab project, amortized over 30 years at 8%, works out to SP 6850 daily. Considering an initial population of 25,000 beneficiaries, growing during project life to 60,000 beneficiaries, and a consumption rate of 100 lcd, the prorated investment cost will average about 1.5 SP/m^3, or (including operation and maintenance costs) about 2.0 SP/m^3. This piped water is about 8.5 times more cost-effective than trucked water.

I. Cost of Water to the Beneficiaries

At a price of SP 0.5 per 200 l, which would cover the operation, maintenance and replacement costs and the water concessioner's fee, a family of eight would be paying 1 SP/day for 50 lcd. If the beneficiaries will pay only for operation, maintenance and the concessioner's fee, the cost to the family will be about SP 0.2 per 200 l, or 0.4 SP/day (150 SP/year).

V. PROJECT SPREAD EFFECTS

A. The "Oil-Stain" Effect

The most immediate spread effect of the projects, especially in the Sharqi-Kokab area, will be the provision of water to large populations which lie beyond the project boundaries, but which will be able to obtain treated water by truck from the project terminal, thus diminishing the distance of those populations from potable water from about 50-70 km to 10-30 km and correspondingly reducing their water costs and allowing an increase in the quantities consumed. This population of secondary beneficiaries is roughly estimated at 2,300 for the Jarawan project, 10,000 for the Sahrqi-Kokab/El Hol project and 5,000 for the Turaif project.

B. Creation of a Project Pipeline

The longer-term spread effect of the projects will be brought about by the provision of technical assistance to the Water Supply Authority and the establishment of a pipeline for the planning, financing and construction of other rural water supply systems in Syria on a continuing basis, to the benefit of additional rural populations.

C. Introduction of Innovations

The projects will also introduce some elements which are not practiced at present in the region, such as the institution of

water charges for public fountains and possibly the utilization of filter galleries. The experience with these measures will be of benefit to future water supply projects.

VI. SOCIAL CONSEQUENCES AND INCIDENCE OF BENEFITS

A. Incidence of Benefits

1. Financial benefits to the poorest rural inhabitants

The primary beneficiaries of the project will be the semi-nomads of the Jarawan badia and the dry farmers/migrant workers of the Sharqi-Kokab plains; these two groups are among the poorest of the rural poor in Syria, as reflected in income and diet (Sec. II.B). By having its water expenses reduced from about SP 1100 to SP 150 annually, the average family (whose total income is about SP 5000 annually, or about US$160 per capita) will in effect experience an increase of about 20 % in its income.

2. Benefits to women

Women will be the primary beneficiaries of the Euphrates Valley projects. The time spent by women in bringing water will decrease from about 8 hours to about 1 hour daily. Women will have correspondingly more time for taking care of their children, performing productive agricultural tasks, or simply for resting from their work which at present is practically continuous.

3. Health benefits

Health benefits due to the supply of treated water will accrue the whole rural population and especially to children, who are the group which suffers most from gastro-intestinal diseases.

4. Employment benefits

A small employment effect will be generated by creating the job of water concessioner in charge of each public fountain.

B. Social Consequences

1. Social levelling efect

A rural water supply system based on public fountains is equally accessible and offers similar benefits to all villagers. Futhermore, as noted above (Sec. II.B), the difference in living standards between different families in the project areas is minimal. The project will in fact further reduce these differences, since at the extremely high present high water prices ($6 to $12 per m^3) the poorest families can afford only minimal amounts of it --"only water for tea" as they express it. The much lower water cost which a piped water system permits will assure an equal access to this vital resource.

2. Reduction of seasonal migration

Especially in the Sharqi-Kokab region, the provision of piped water is likely to reduce the summer migration to the Khabur river valley, since that migration is caused partly by the search for income and partly by the search for water. While the magnitude of this reduction is difficult to estimate it may amount to several thousands of persons.

3. Effect on the existing social structure

The project will cause no upset in the existing social structure. The vehicle owners who are at present engaged in hauling water will have alternative occupations in transporting sheep and wheat, or bringing water to the population surrounding the project area, which will now be able to afford water due to the shorter hauling distance. Thus vehicle owners will not be negatively effected by the project.

4. External effects

The proposed sources of water for the project -- the Euphrates and the Khabur river -- carry vastly more water than is being utilized at present, so that the projects will cause no conflict with irrigation [redacted] uses.

VII. CONCLUSIONS

A. The Project Area

The project area includes three zones of very different agro-economic characteristics: the irrigated wheat/cotton/sugar-beet economy of the Euphrates Valley; the sheep and barley economy of the Jarawan plateau; and the rainfed wheat/migrant worker economy of the Sharqi-Kokab plains.

B. Demographic Characteristics

The direct beneficiaries of the project (persons who will be within about 4 km of piped water) number about 17,000 in the Kasrah area, 6,000 in the Jarawan area and 20,000 to 25,000 in the Sharqi-Kokab area. There will also be roughly 2,300 indirect beneficiaries (who will obtain potable water from the project by truck) in Jarawan and 10,000 in the Sharqi-Kokab area. The projected growth rate of this population is 2.8% annually. There is a seasonal spring migration from the Jarawan area to pastures and a summer migration from the Sharqi-Kokab area to the Khabur Valley, but permanent migration to urban areas is insignificant.

C. Economic Characteristics

Per capita income (including autoconsumption) is about $160 per annum in the Jarawan and Sharqi-Kokab areas and slightly higher in the Euphrates Valley. There is very little difference in per capita income among the rural families.

The diet staples are bread and tea. The beneficiaries are definitely among the poorest of the rural poor in Syria.

D. Social Characteristics

All project beneficiaries are Arab-Speaking Sunni Moslems, without minorities. Within villages everyone is usually related; there are no mutually exclusive groups. Consequently there are no social limitations on the access to public fountains. There is a well-defined communication channel to the village through the mukhtar and the informal council of elders. There is no tradition of voluntary labor contributions to community projects. Ministry of Housing personnel has a good contact with the villagers.

E. Water Supply Practices

Along the Euphrates, water is hauled by donkeys from the river (average distance -- 3 km; consumption -- 27 lcd) or, during the irrigation season, from canals (average distance -- 0.5 km; consumption -- 40 lcd). There are no potable water sources in the Jarawan area and in most of the Sharqi-Kokab region. Inhabitants of those areas spend 20%-25% of their meager total income to buy water, which is brought by truck or tractor, at SP 10 per 200 l in the Jarawan area and SP 5 per 200 l in Sharqi-Kokab. In Jarawan, this is supplemented by some water distributed gratis by government tank trucks. Consumption

is about 11 lcd in Jarawan and 18 lcd in Sharqi-Kokab.

F. Beneficiaries' Priorities

Water supply is by far the most felt need in the Jarawan and Sharqi-Kokab areas, and is also first priority (though less acutely so) in most of the Kasrah area, wherever present distance to water is several km. The inhabitants are willing to pay for piped water SP 0.5 per 200 l -- especially so in the Jarawan and Sharqi-Kokab regions, where they are presently paying SP 5 to 10 per 200 l. There are no religious or other objections to paying for water. The price of SP 0.5 per 200 l will be sufficient to fully cover system operation, maintenance and replacement costs, as well as to support a water concessioner who will sell the water at every public fountain. At the above price, the net consumption rate will be about 50 lcd from public fountains, and 100 lcd wherever house connections are installed in the future.

G. Design Considerations

Investment costs at present design standards will be about SP 37.5 mill. for the Kasrah/Jarawan project and SP 30.0 mill. for the Sharqi-Kokab/El Hol project, or about SP 1500 per direct beneficiary. This cost can be reduced by about 25% through dispensing with rapid filter plants and treating the water only by sedimentation and chlorination; this will not effect the health aspect. Economies are also possible through changing

the design and reducing the number of elevated water tanks. Even at the above cost, the system is about 8.5 times more cost-effective than the alternative, which is to bring water by truck. The preliminary layout proposed for the systems is reasonable. The design water consumption rate of 125-175 lcd is not excessive, if future house connections and demand by the indirect beneficiaries are taken into account. The Ministry of Housing is constructing similar projects in the same provinces. Maintenance standards of existing water supply projects are high.

H. Project Benefits

In the Jarawan and Sharqi-Kokab regions, the project will effectively increase the income of the rural poor by about 20% by effecting a corresponding reduction in their water costs. In the Sharqi-Kokab area, a significant reduction in the summer migration to the Khabur Valley is expected. In the above areas there will also be a social levelling effect by increasing access of the poorest families to potable water through reducing its price. In the Kasrah area the primary beneficiaries will be the women, since the time spent by the women of an average household in bringing water will decrease from about 8 hours daily to about 1 hour. In all areas there will be a significant health effect, particularly for children, through reduction of gastro-intestinal diseases. The project will cause no conflict with present irrigators, water sellers or any other

group. The project will not cause environmental problems since house connections will not be provided at present and the public fountains will be designed so as to avoid drainage problems.

VIII. RECOMMENDATIONS

A. Further Steps to be Taken

Technical assistance should be given to the Water Supply Authority for the design of the projects and preparation of detailed cost estimates with a view to their early financing. A population count in the Sharqi-Kokab and surrounding area (if possible, with the use of aerial photography) will be useful, although not indispensable, for the design.

B. Design Aspects

Rapid sand filter plants should be replaced by filtration galleries or deferred to a future stage in order to reduce costs. Elevated storage tanks should be of the single-stem type and placed farther apart than at present. Public fountains should be more spaciously designed than at present, located near drainage outlets, surrounded by gravel and equipped with self-closing valves. Water mains should, in general, have a diameter of not less than 150 mm, to properly serve the indirect beneficiaries beyond the project limits.

C. Choice of Project

The Sharqi-Kokab/El Hol project has a higher social effectiveness than the Deir ez-Zor projects since (i) its per capita cost is comparable or lower, (ii) it will effectively increase by 107

the income of all its beneficiaries, (iii) there will be no problem in instituting a water charge of SP 0.5 per 200 l, since at present the inhabitants are paying SP 5 per 200 l, (iv) the project will serve a large number of indirect beneficiaries, and (v) it has the potential of significantly reducing summer migration to the Khabur Valley. These factors should be weighed against the stronger design and execution capacities of the Deir ez-Zor Ministry of Housing office.

D. Condition Precedent

The Ministry of Housing should, as a condition precedent, agree to institute water charges at public fountains on the project and to install a local concessioner (rather than a functionary) to collect payments by volume at every fountain. This is deemed indispensable in order to (i) assure sufficient income for system operation and maintenance, and (ii) prevent water use for purposes other than human consumption, so that the water will suffice for all beneficiaries. The concessioner will also be trained in proper maintenance of the public fountain.

E. Communication with Beneficiaries

Beneficiaries should be informed through their mukhtars regarding project progress, and their advice sought regarding matters such as the placement of fountains and the selection of the water concessioners.

F. Health Education

The Health Service should be involved in instructing the beneficiaries (primarily through the schools) to utilize the project water for better hygiene. To this end, every project should budget one vehicle for the corresponding health service. Every water concessioner will also receive the training necessary to instruct the villagers in better hygiene.

If rural health projects are implemented in NE Syria, the areas which obtain rural water supply systems should be included in such projects in order to obtain the benefits of co-location.

TABLE 1: POPULATION - KASRAH/JARAWAN PROJECT

Village	Population 1977	Population 2009 a/
Kasrah area		
Al-Kasra	2925	7100
Sughayyir Jezrah	1523	3697
Hawaarij Diab/Abu Mutiah	1308	3175
Al-Harmushiyah	1344	3262
Al-Kabar	2148	5214
Hmar al-Ali	1092	2650
Jezrat ash-Shati	1263	3065
Jezrat Abu Hmaid	2600	6311
Jezrat Milaaj	1476	3587
As-Sa'awah	1297	3148
Subtotal, Kasrah area	16,976	41,209
Jarawan area-direct beneficiaries		
Jarawan	1,300	3,158
Sabaah el Kheir	240	582
Sabaagha	260	631
Adaman Sarab	250	607
Adaman Dbeis	250	607
Abu Khashab & environs	800	1942
Fneijiil & environs	1500	3640
Subtotal-direct beneficiaries, Jarawan area	4,600	11,167
30% added	1,400	
Subtotal, direct project beneficiaries	22,976	52,376

a/ At 2.8% annual growth rate

TABLE 1: POPULATION-KASRAH/JARAWAN PROJECT (CONT'D)

Jarawan area-indirect beneficiaries (about 20km from pipe terminal)

Village	Population 1977	Population 2009 a/
Taib il-Faal	240	582
Shalaalah	30	728
Jermah	310	740
Barzaan & environs	400	970
Qeiter & environs	400	970
Al-Hajlin & environs	650	1578
Subtotal-indirect beneficiaries, Jarawan area	2,300	5,568

a/ At 2.8% annual growth rate

TABLE 2 : POPULATION -- SHARQI-KOKAB/EL HOL PROJECT

Villages (including environs)	Local estimate	Ministry of Housing estimate
El Hol region		
El Hol	2,400	3,000
Mazra'at el Hol	500	1,500
Tal Anbar	200	200
El Khan	600	500
Al - Jubneh	700	200
Al - Bahrah	800	1,000
Abu Hjeirah	1,000	2,000
Shallalah - Al Fadj	300	-
Subtotal, El Hol region	6,500	8,400
Sharqi-Kokab region		
Al - Butheh	1,000	200
Al - Malkhukieh	2,000	100
Khurbet Wadihiyeh	1,000	100
Abu Jaraadah	300	200
Tufahiyyeh	500	300
Sayed Aklah	800	50
Al Khweish	300	100
Rajm el - Jbab	300	150
Abu Kbarah	200	200
As-Seha	250	100
Skaniyyeh	150	100
Al - MazYunah	150	100
Al - Mastuura	200	300
Hasuniyyeh	200	100
Khurbet al-Jhash	150	200
Salam Aleikum	50	150
Al - Nubutiyeh	-	200
Rabya	-	50
Tal es-suwan	200	100
Al - Waatiyah (+Mozeh)	200	100
Tal es-saman	400	100
Shora Sbeikh	400	100
Msheirfah	700	200
Salhiyyeh Kokab	200	200
Al - Khuritah	300	200
Es-Sakmaan	300	1,000
Khurbet es-sakmaan	300	500
Es-Sibaatah	1,500	1,000
Khurbet Ar-Rayes	200	100
Al - Dabbaghiyyeh	400	100

(continued on next page)

TABLE 2 : POPULATION -- SHARQI-KOKAB/EL HOL PROJECT (CONT'D)

Villages (including environs)	Local estimate	Ministry of Housing estimate
Sharqi-Kokab Region (cont'd)		
Umm al-Mthalith	300	250
Rajm es-Salmas	700	100
Ein al-Husaan	500	100
Khurbet al-Huji	-	300
Rashidiyeh	400	200
Bab al-Faraj	500	200
Tal Shu'eir	250	200
Umm Kehef	300	100
Tal Kehef	500	300
Umm Shagrah	1,500	200
Bab al Kheir	300	200
Qaber Fadel	-	500
Subtotal, Sharqi-Kokab region	18,500	9,050
Total, Sharqi-Kokab and El Hol	25,000	17,450

TABLE 3 : COST PER BENEFICIARY ON VARIOUS PROJECTS

	Kasrah/Jarawan Project			Sharqi-Koka El Hol
	Kasrah Section	Jarawan Section	Total Project	Project
Initial Quantity Estimates				
Asbestos/cement pipes, Ø80 to Ø350 mm, length in km	65	65	130	110
Elevated reservoir capacity, m3	1875	730	2605	1680
Treatment plant capacity, l/s			150	100
Cost Estimates, million of SP				
Asbestos/cement pipes, at 150 sp/m	9.75	9.75	19.5	16.5
Elevated reservoirs, at 2000 SP/m3	3.75	1.45	5.2	3.36
Treatment plant (based on current cost of Mayadin plant)	7.4 a/	2.6 a/	10.0	7.0
Pumping plants, construction and equipment (initial Ministry of Housing estimates + 75%)	2.1 a/	0.7 a/	2.8	2.8
Total	23.0	14.5	37.5	29.66
Number of direct beneficiairies	17,000	6,000	23,000	20,000 to 25,000
Cost, SP per beneficiary	1350 b/	2420	1630	1200 to 1500

a/ Total cost divided according to number of beneficiaries.
b/ Cost per beneficiary on the Turaif project will be similar.

APPENDIX A: RECOMMENDATIONS REGARDING ENGINEERING DESIGN OF RURAL WATER SUPPLY SYSTEMS

In visiting existing water supply projects in Northeast Syria, one cannot help being inpressed by the level of operation and maintenance of these projects, which is superior to the prevailing one in many developing countries. For example, the first system constructed in Deir ez-Zor in 1952 and its extension completed in 1965 are operating satisfactorily; the Tel Tamar rural water supply system (near Hasakeh), completed in 1975, shows a high standard of maintenance; and all systems are furnishing water 24 hours daily. Thus the following technical suggestions are offered as marginal improvements to what is already a functioning water supply program.

1. SYSTEM LAYOUT: The preliminary layout suggested by the Deir ez-Zor office of the Ministry of Housing and Utilities (Diag.1) for the Kasrah-Jarawan project seems sensible. This layout proposes pumping from the Euphrates River near Jezrat esh-Shati 4 km to a local high point (70 m head difference), at which treatment facilities will be located. From this point the water will flow by gravity southeast to Diab and northwest to Jezrat Milaaj. Beyond Jezrat Milaaj a booster plant will be located to pump the water into a main line to Jarawan, with branches to Abu Khashab, Adaman and other villages. The layout proposed for the Sharqi-Kokab syster (Diag. 2) seems sensible.

2. System Design Capacity: in the project areas, a 30-year life span for the asbestos-cement pipes is reasonable. Consequently the system may be designed for the population increases expected in 30 years.

The water consuption rates of 125-175 lcd proposed by the Water Supply Authority as basis for system design are not excessive for the Euphrates Valley villages, since during project life many of these villages are likely to install house connections. In the Jarawan and Sharqi-Kokab areas the per capita consumption will probably remain lower; however, many indirect beneficiaries outside the project areas will also draw water from these projects by truck. Thus the estimates of 125-175 lcd for the direct beneficiaries (those within about 4 km of the water mains) seems sensible for these projects as well.

3. Water Treatment: the engineering design should investigate the feasibility of installing infiltration galleries located in sand banks parallel to the river, instead of rapid sand filter plants. Infiltration galleries may represent considerable savings in comparison with rapid filter plants, which constitute about 25% of total projects costs.

Another alternative is to dispense with filtration and treat the water only by sedimentation tanks and chlorination. This is the process utilized in the Tel Tamar rural water supply project (Hasakeh province), which is functioning since 1975. The non-inclusion of a rapid filter plant in this project has not caused

any technical problems or any beneficiary complaints regarding water quality.

4. Pipes: asbestos/cement pipe will be used in general. However, where excavation in rock may be required (e.g. across the slopes of Jebel Kokab), above-ground cast-iron pipe may offer significant cost reductions. Such pipes are being utilized in the region, even in cultivated areas, without being damaged.

Main lines should in general be of not less than 150 mm diameter, even if smaller diameters would cover the needs of the project population, since the pipe terminals are likely to become loading points for water supply by truck to population beyond the project limits.

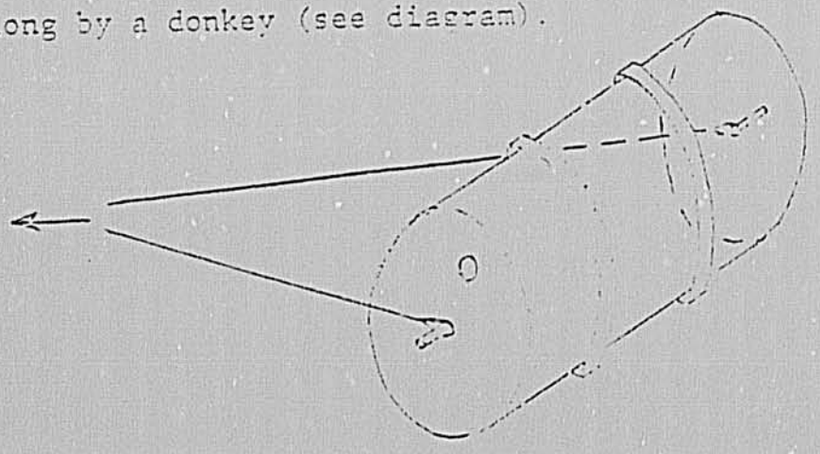
5. Elevated Storage Tanks: the number of reservoirs presently constructed in local rural water systems (usually 1 per village, about 1 to 3 km apart) is probably excessive. It is suggested to build initially only a minimum number of elevated tanks, and provide sealed turnouts for future tanks. These tanks should be constructe after operational requirements show the need for them.

An elevated storage tank shaped like an inverted cone resting on a single pillar is likely to be more economical -- as well as more pleasing to the eye -- than the present design of a barrel-shaped tank mounted on six pillars and a central shaft. Syrian contractors have the capability for constructing such conical tanks.

6. Public Fountains: the ordinary house taps currently mounted on public fountains are woefully inadequate. Such taps, which are not designed for repeated use by many users, invariably disintegrate after a short while, leading to enormous water losses and converting the fountain area into a health hazard. Instead, the project should utilize heavy-duty self-closing valves. Such valves should be mounted on existing systems as well.

The fountains themselves should be designed more spaciously than at present and surrounded by gravel to prevent the adjacent areas from turning into mud puddles. Most important, all fountains should be located above irrigation canals or natural drains to provide outlet for excess water and prevent the creation of ponds. Each fountain should be equipped with a water meter to permit the purchase of water by users by volume.

7. Transport of Water to the Houses: at present almost all water is transported by donkeys, each of which carries two tin containers of about 36 liters each. The local inhabitants are not aware of the ingenious water transport system utilized in Tunisia, which consists simply of a 200 liter barrel with metal stubs soldered at the center of its top and bottom, to which ropes are connected, and the barrel rolled along by a donkey (see diagram).



Such barrels reinforced by hoops to increase strength and rolling ease , are available in the project areas at SP150 each (as compared to SP100 for two 36-liter containers), and most farmers possess them already, so that introduction of this water transport method will involve for the farmers very little cash outlays. This method is particularly appropriate to the nearly flat topography of the Jarawan and Sharqi-Kokab regions. Its introduction by the Housing and Utilities Ministry agents, through demonstrations can decrease the time spent by women in carrying water by about two-thirds, or increase the quantities consumed -- both of which constitute important social benefits at practically no cost.

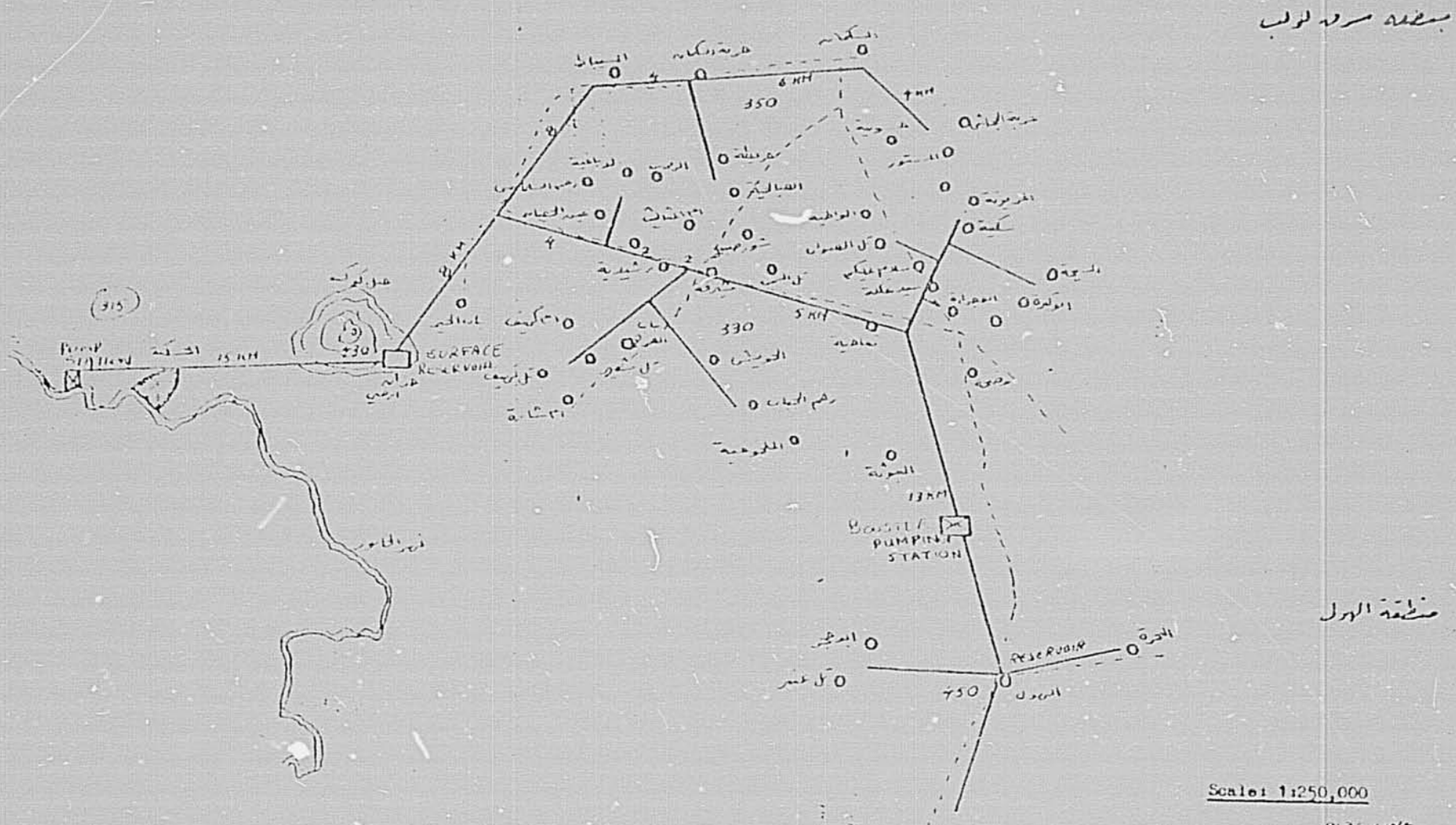


DIAGRAM 2: THE SHARQI-KOKAB/EL HOL PROJECT

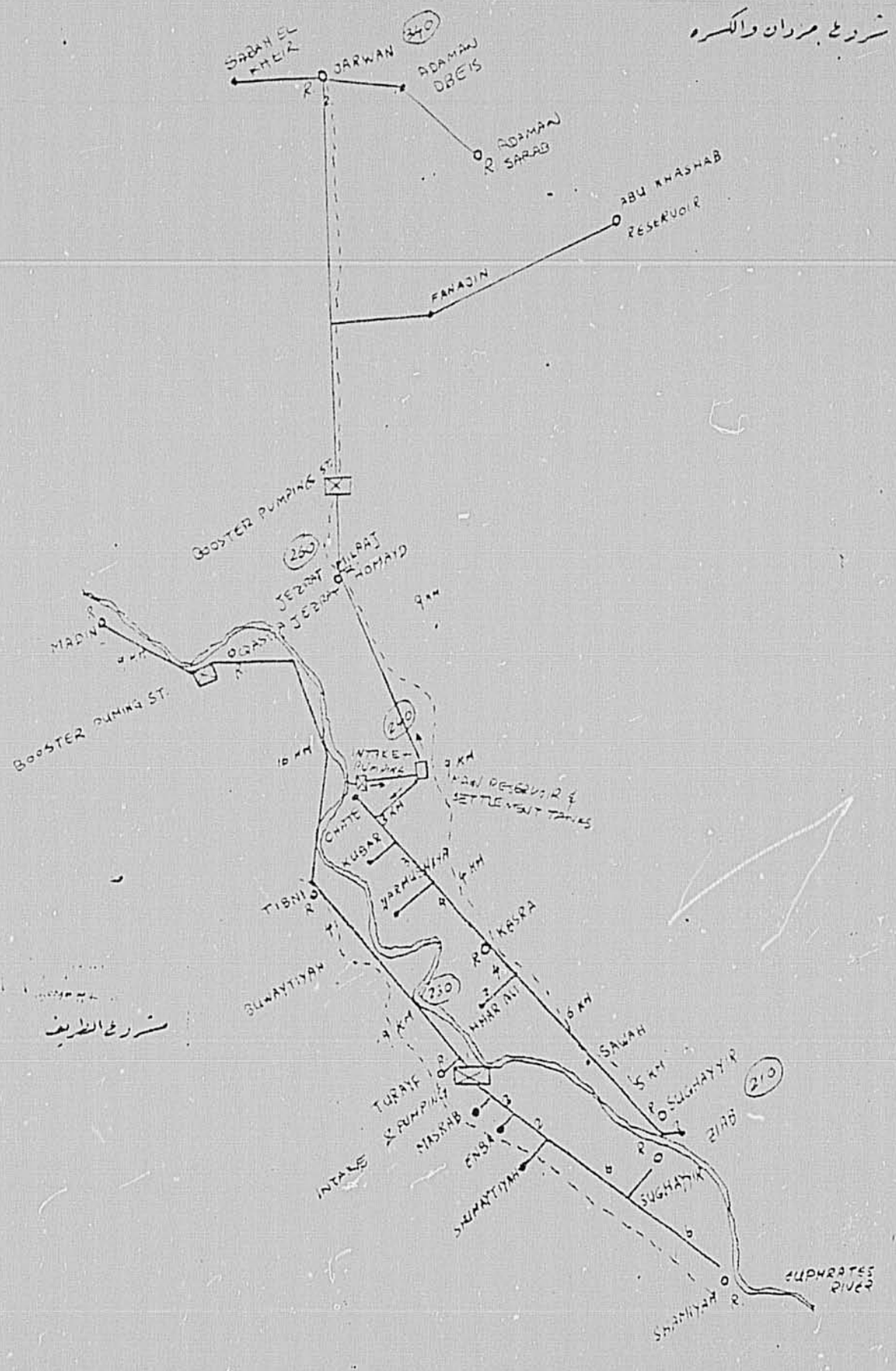


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DIAGRAM 1: THE KASRAH/JARAWAN AND TURAYF PROJECTS