XVIII IMPROVEMENT OF RURAL INFRASTRUCTURES

Tables

Figure

XVIII IMPROVEMENT OF RURAL INFRASTRUCTURES

(1) General

18.01 The present chapter deals with the improvement of "social infrastructure" which comprises educational facilities, public health facilities, electricity and communication network. These sectors are, needless to say, very important for improvement of rural life and are considered to be included in the overall integrated rural development programme. The development plans of these sectors in the Province should not be independent of the country-wide plans. The plans should preferably form a part of the national development plans to be prepared by ministries concerned. However, the definite development plans of these sectors have not been formulated yet on the national basis. The development plans have, therefore, been tentatively studied to provide the basic concept for the improvement of rural facilities and to serve as a reference for the institutions concerned in future.

(2) Education

18.02 Although the number of primary schools can be considered sufficient, their quality is far from adequate. They suffer from an acute shortage of qualified teaching staffs as well as a lack of instruction materials. Only a limited number of schools offer the full range of six grades, a large majority having only three grades or less. Very few school children finish the primary education because schools are usually located away from their villages and the school attendance is not practicable due to their responsibility for daily water fetching. Lower and higher secondary schools are insufficient in number and school enrollments are very low. Adult education has also hardly been conducted in the Province. Under these conditions, illiteracy is prevalent in the Province with a rate of

91.3 %. The present conditions of educational facilities in the Province are tabulated in Table 18.1.

18.03 Improvement of educational facilities, especially for elementary education, has long been one of the people's serious concerns. Although LDAs have constructed some schools, school enrollments remain still as low as 18 % compared to the national average of 26 %. Table 18.2 shows the education schemes that the provincial government of Hajjah have requested the Japanese Team to take into account in their master plan.

18.04 Under these circumstances, the following basic concepts for improvement of educational facilities are proposed:

a. promotion of elementary education through up-grading of existing 210 primary schools and construction of additional 57 primary schools as requested by the Hajjah government office,

b. introduction of an itinerant education system for the children living far from the schools,

c. promotion of adult education through establishment of public halls, equipped with audio-visual aids and library, in major towns.

18.05 The existing 210 primary schools will be up-graded to the six-grade schools, each having more than 100 pupils. The additional 57 primary schools are to be constructed to accommodate about 3,500 pupils in total who have not receive any elementary education so far. The additional schools will have 3 classrooms with 60 pupils on an average. The general layout of proposed primary school is shown in Fig. 18.2. After completion of these improvement plans, the school enrollment would increase to 32 % which is above the national average (26 %) and is almost equal to the present

level of Sana'a.

18.06 Even if these plans are successfully accomplished, the school attendance would remain low due to the scattered population (therefore, a majority of population is far from schools) and the children's busy work of water fetching. In order to increase the school attendance, itinerant (travelling) school system would be very important.

18.07 The integrated rural development would essentially require many educated workers, which largely determine the success of the development. For promotion of building the educated manpower resources, special attention should be given to the adult education. In this sense, it is proposed that seven (7) public halls be established in the major towns of Hajjah, Abs, Al Mahabisha, Washha, Shahara, Harad and Midi.

(3) Health Facilities

18.08 Of the diseases spreading throughout the country, diarrhoeal diseases and schistosomiasis are the most prevailing in the Hajjah Province. Diarrhoeal diseases largely caused by contaminated water are the major causes for the high infant mortality (about 20 %) in the Province. The estimated prevalence of schistosomiasis in the Province is the highest in the country with 255 patients per 1,000 inhabitants.

18.09 The extreme shortage of modern health care is one of the main reasons for the low standard of public health in the Province. There is only one hospital in the town of Hajjah. Although small dispensaries were recently constructed in Kahlam, Midi, Al Mahabisha, Harad and Abs, these have not yet effectively been operating due to the lack of required medical service facilities and medical personnel.

Even if they were well equipped, they would be in no sense sufficient for the whole population of some 400,000 of the Province. At present, the beds are always fully occupied and most of the patients stay in their villages without receiving any medical treatment. Table 18.4 shows the present low level of health facilities in the Hajjah Province.

18.10 The proposed development plan comprises:

a. up-grading of existing six (6) dispensaries at Kahlam, Midi, Al Mahabisha, Harad, Sharhil and Abs
b. construction of new facilities at At Tur, Washha and Shahara
c. unification of these facilities as branch hospital under existing main hospital in the town of Hajjah
d. up-grading of the existing main hospital in Hajjah
e. construction of eight (8) health centres and 21 rural health care units

18.11 The hospital improvement plan is given in Table 18.5. The total number of beds will be increased from existing 170 to 470, corresponding to 850 persons per bed. With a view to extending basic health services over the majority of rural inhabitants, 8 health centres and 21 primary health care units will be established as shown in Table 18.6. Major functions of these health units will be:

a. simple anti-natal and post-natal care
b. simple infant care
c. organization of periodic immunizations
d. performance of care finding surveys
e. receiving medical supplies and equipments
f. in-patient care limited to emergencies
g. referal of cases to higher level that cannot be dealt with at each level.

(4) Electric Power Supply

18.12 Electric power is used mainly for lighting in the Province. The town of Hajjah has a power station, and the electricity is supplied to houses. In the other areas, small portable generators with a capacity of three to five kilowatts are used. However, total number of households enjoying the benefit of power supply is quite limited at present.

18.13 Electricity is another requisite for the well-being of rural inhabitants. Rural electrification would bring on safe and bright lighting, enabling the people to spend cultural life after sunset. Television set will open a new road to cultural, social, economic and political information. It would also give a better opportunity for rural industries. Relatively thickly settled areas including Mabyan, Al Mahabisha, Abs, Harad, Midi and Shahara will be given priorities and power network system would be established.

18.14 Judging from the distribution of housing areas and the topographic conditions of the Province, power supply system with a single power station would require a huge construction cost for transmission lines and related facilities and therefore be unlikely realistic and feasible.

18.15 It is therefore proposed that electrification be programmed in small scale, preferably village-by-village basis. The electrification plan will be thus integrated with village water supply schemes which will require power supply for pump operation. The proposed plan for electric power supply is shown in Table 18.7. The electric power supply schemes will cover 25 towns and villages, and the total number of beneficiaries will be increased to about 35 % of the total inhabitants.

(5) Telecommunications

18.16 Telecommunication networks are hardly available in the Province except telephone service between Hajjah and Sana'a for which the test operation is now underway. It is planned to connect Hajjah and Al Mahabisha by telecommunication system in 1979. However, the communication capacity, as a whole, is still very poor. Therefore, information and action lags occur in the Province especially in the economic sector, which shows the backwardness of this Province.

18.17 Rural inhabitants would get accurate and quick economic information through telecommunication equipment and could respond to the market situation more efficaciously. Telecommunication would also bring the latest news from relatives and friends living far away. Sub-provincial centers and other development centers would be connected by telephone aiming at efficient economic development. The proposed telecommunication network is shown in Fig. 18.1.

Table 18.1 List of Primary, Preparatory and Secondary Schools

Description	Hajjah	Sana'a	YAR
Primary School			
No. of Schools	210	294	1,528
No. of Classes	615	1,247	6,150
No. of Pupils	13,522	49,473	221,482
No. of children to be attendant	75,500	153,500	860,500
Ratio of school attendance (%)	18	32	26
Preparatory School			
No. of Schools	5	19	97
No. of Classes	ND		
No. of Pupils	ND		
No. of children to be attendant	28,500	57,500	322,500
Secondary School			
No. of Schools	1	3	24
No. of Classes	5	47	174
No. of Pupils	69	2,363	7,197
No. of children to be attendant	19,000	38,500	214,500
Ratio of school attendance (%)	0.4	6.1	3.4

Source: Statistical Year Book 1976 - 1977

Table 18.2 Number of Schools Requested by the Province

Quada	Nahiya	No. of Primary Schools	No. of Preparatory Schools	No. of Secondary Schools	No. of Religious Institutes
Hajjah	Hajjah	4		1	1
	Mabyan	3	1		
	Al Maghraban	1			
	Al Jamimah	1			
	At Tur	3	1		
	Bani Al Awam	2			
	Kuhlan Afar	2	1		
	Maswar	3			
	Najrah	1			
	Al Shaghadrah	2	1		
Midi	Midi	1	1		
	Harad	2		1	
	Abs	5	1	1	
	Kaidenah	3			
Al Mahabisha	Al Mahabisha	1	1		1
	Al Mufleh	1			
	Aflah Kheiran	3		1	
	Aslam	2			
	Al Qof	1			
	Sharhil	2	2		
	Kahlan Al-Sharaf	1			
Washha	Washha	3			
	Kasher	3			
	Mustabah	2			
Shahara	Shahara	1	1		
	Al Madan	1	1		1
	Al Qufla	1			
	Swair	1			
	Falimat Habur	1			
Total		57	11	4	3

Table 18.3 Future Condition of Primary Schools

	No. of Childrens to be attendant	No. of Schools	No. of Pupils	No. of School attendance (%)
Present Condition	75,500	210	13,500	18
Proposed Plan				
a. improvement		210	21,000	
b. new construction				
- Hajjah		22	1,320	
- Midi		11	660	
- Al Mahabisha		11	660	
- Washha		8	480	
- Shahara		5	300	
Sub-total		57	3,500	
Total	75,500	267	24,500	32

Table 18.4 List of Health Facilities in 1976

	Drug Stores	Pharmacies	Rural Health Units	Health Sub-Centres	Health Centres	Dispensaries		Hospitals		Population /bed
						Beds	No.	Beds	No.	
Hajjah	1	-	6	-	2	60	3	68	1	5,800
Sana'a	44	7	11	-	6	20	1	900	5	900
YAR	166	16	75	11	16	355	13	2,637	24	1,700

Source: Statistical Year Book 1976-1977

Table 18.5 Hospital Improvement Scheme

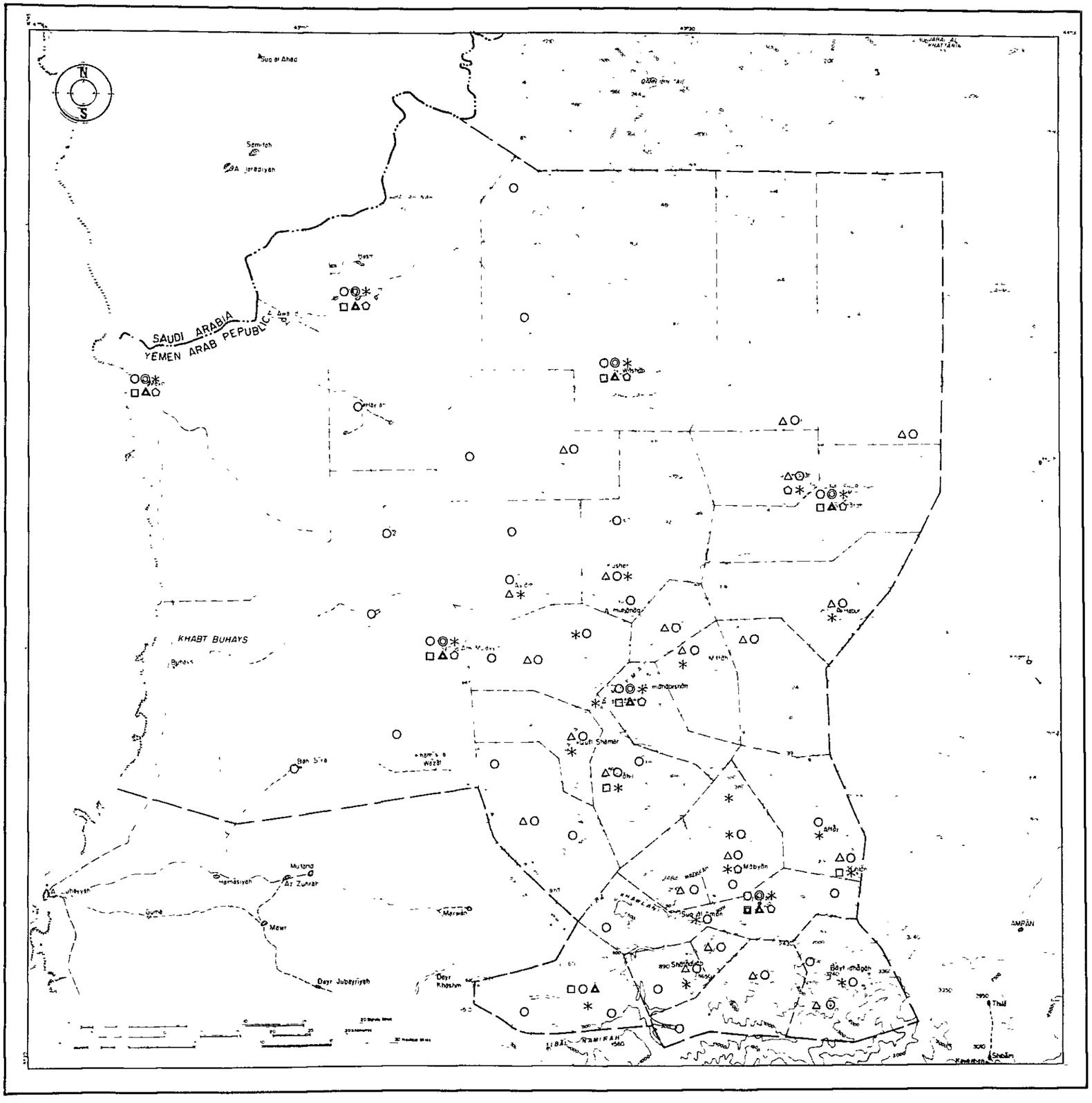
Description	Name of Towns	No. of Existing Beds in 1979	No. of Proposed Beds
Main Hospital	Hajjah	100	200
Branch Hospital	Kuhlan	10	30
	Midi	10	30
	Al Mahabisha	10	30
	Harad	10	30
	Sharhil	10	30
	Abs	20	30
	At Tur	-	30
	Washha	-	30
	Shahara	-	30
Total		170	470
		(Population/bed:	850)

Table 18.6 Health Centre Scheme

Quada	Nahiya	Health Centres	Rural Health Units
Hajjah	Hajjah	1	
	Mabyan		1
	Al Maghrabah		1
	Al Jamimah		1
	At Tur	1	
	Bani Al Awam		1
	Kuhlan Afar		1
	Maswar		1
	Najrah		1
	Al Shaghadrah		1
Midi	Midi	1	
	Harad	1	
	Abs	1	
	Kiydenah		1
Al Mahabisha	Al Mahabisha	1	
	Al Mufleh		1
	Aflah Kheiran		1
	Aslam		1
	Al Qof		1
	Sharhil		1
	Kahlan Al-Sharaf		1
Washha	Washha	1	
	Kasher		1
	Mustabah		1
Shahara	Shahara	1	
	Al Madan		1
	Al Qufla		1
	Swair		1
	Falimat Habur		1
Total		8	21

Table 18.7 Electric Power Supply Scheme

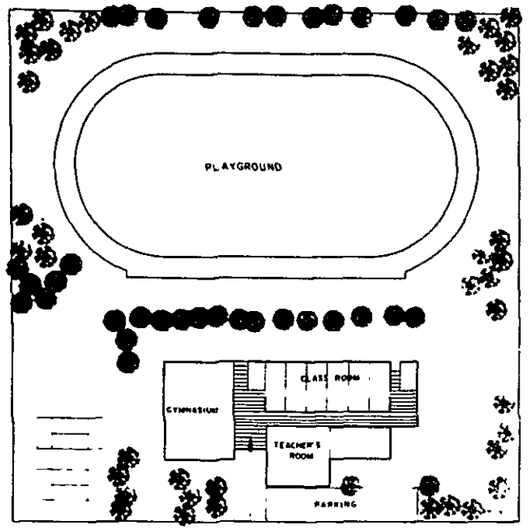
Name of Town or Village	Planned Service Households	Capacity of Generator (kVA)
1. Hajjah	(existing)	
2. Suq Al Aman	170	75
3. Ash Shafadirah	2,200	1,000
4. North Mabyan	1,100	500
5. Jabal Al Dafir	1,700	750
6. Mabyan	1,700	750
7. Bani Kais	460	200
8. Bayt Idhaqah	1,100	500
9. Kuhlan	1,700	750
10. Affar	1,100	500
11. Sharhil	690	300
12. Qufl Shamal	170	75
13. Al Shaafeen	230	100
14. Al Mahabisha	(under construction)	
15. Miftah	690	300
16. Kusher	230	100
17. Al Muhanaq	1,100	500
18. Aslam	170	75
19. Habur	690	300
20. Shaharah	690	300
21. Al Madan	2,200	1,000
22. Washha	2,200	1,000
23. Abs	460	200
24. Harad	170	75
25. Midi	460	200



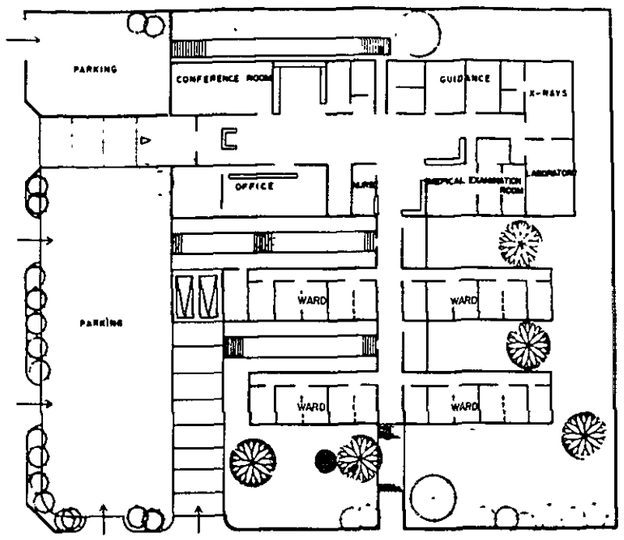
LEGEND

- ○ Primary School
- ◎ Public Hall
- ▣ Main Hospital
- □ Branch Hospital
- ▲ Health Center
- △ Rural Health Unit
- ✳ Electric Power Supply
- ⬠ Telephone Exchange

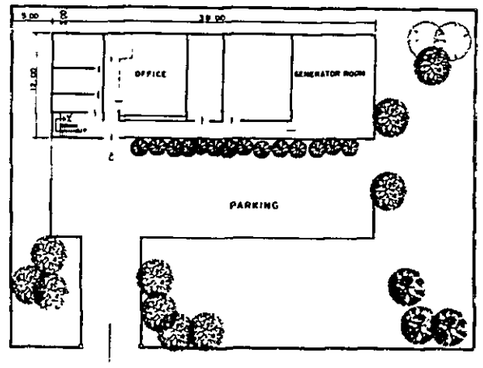
Fig 18.1 Geneval Plan of Rural Infrastructures



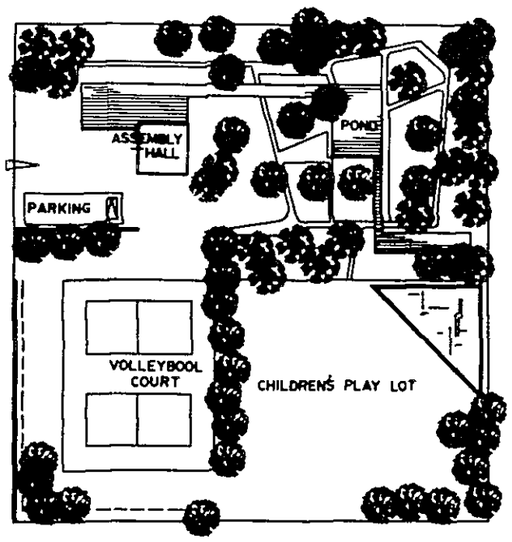
PRIMARY SCHOOL



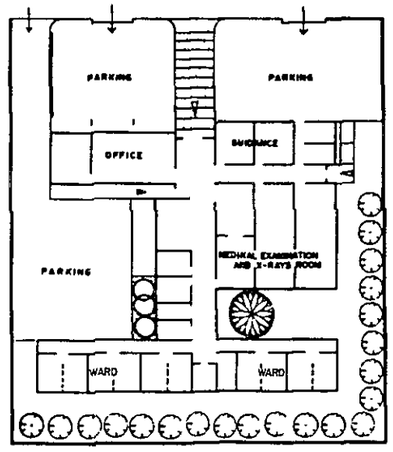
HOSPITAL



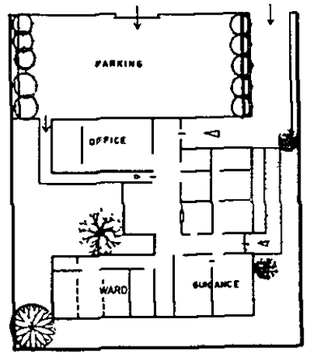
TELEPHONE EXCHANGE



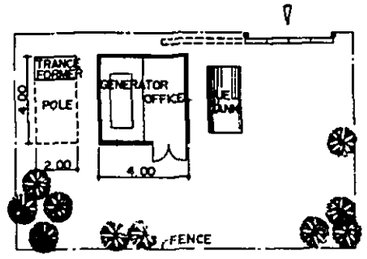
PUBLIC HALL



HEALTH CENTER



RURAL HEALTH UNIT



POWER STATION

Fig. 18.2 General Layout of Rural Infrastructural Facilities

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C.P.O. (1977)	The First Five-Year Plan 1976/77 - 1980/81
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Ministry of Health (1976)	National Health Programme 1976/77 - 1981/82

XIX IDENTIFICATION OF POSSIBLE PROJECTS AND PRELIMINARY IMPLEMENTATION SCHEDULE

XIX IDENTIFICATION OF POSSIBLE PROJECTS AND PRELIMINARY IMPLEMENTATION SCHEDULE

(1) General

19.01 Although the Hajjah Province has some physical potential for development, exploitation of development potential is presently constrained by a number of physical, human and institutional factors. The expansion of agricultural production is definitely limited by the all-important factor "water" coupled with small area of arable land. Feeder roads connecting the farming areas have not been developed. Many villages are not accessible by motorized transport. Safe drinking water is very scarce and incidents of water-borne diseases are high. Schools are scarce and number of pupils enrolled in the primary school is limited to only 9 % of the total number of children in the age group of 5 - 14 years. The illiteracy rate among the people over 10 years of age is 91 %. Manpower resources are still at very low level. There is eventually no branch offices of the government institutions to serve agriculture which is the key industry in the Province. Many of the rural inhabitants have more serious concerns for the immediate improvement of their living environment than the long-range on-farm improvement.

19.02 On the basis of full understanding for such present situation, the development concept and strategies have been established as stated in Chapter XI and in line with the basic concept, various studies have been made on all the sectors involved in the integrated rural development. Thus, several possible projects concerning each sector have been identified as mentioned in previous chapters.

19.03 As stated in Chapter XI, all the sectors are closely connected each other in the envisaged rural development

and will have to be integrated into an overall development plan, paying due attention to the inter-relationship among the relevant sectors.

19.04 The overall development plan, which would constitute the first integrated rural development effort in the Hajjah Province, aims to improve the standard of living of 76,900 families living in the Province by increasing the productivity of about 141,000 ha of farmland. The plan would also aim to improve the condition of rural life by providing the people's basic needs for social services like clean drinking water, rural access roads, elementary education, health facilities and electricity.

(2) Identification of Possible Projects

19.05 The possible projects, which have been identified on the basis of the studies on each sector, are listed as follows:

a. Rural water supplies: Installation of 25 village water supply system

b. Rural road network:

   i. Construction and up-grading of secondary roads; Hajjah - Khashim - Al Zuhra (60 km), Al Zuhra - Abs (45 km), Abs - Al Mahabisha (35 km), Al Mahabisha - Hajjah (45 km), and Abs - Harad (70 km).

   ii. Construction of a bridge on Wadi Mawr at the site where the Al Mahabisha-Hajjah road run across.

   iii. Construction and up-grading of 1,700 km of feeder roads.

c. Agricultural development:

i. Agricultural research for promotion of midland agriculture through establishment of a comprehensive agricultural research station.

ii. Promotion of water-saving irrigation techniques and farm mechanization in lowland through establishment of a research and training center for irrigation and mechanization.

iii. Agricultural census and statistics

iv. Detailed physical resources survey

v. Collection of meteorological and hydrological records through establishment of observation network

vi. Institutional services for agricultural extension and farm inputs supply

vii. Agricultural credit services

viii. Multiplication and distribution of pure-line seeds of recommendable varieties

ix. Demonstration of small scale pump irrigation and horticulture techniques

x. Promotion of livestock improvement through veterinary services, improvement of animal feeds and breeding

d. Irrigation improvement:

i. Hydrological observation of wadi-flow

ii. Field trials on crop-water requirement and irrigation method for making the best possible use of the limited water

iii. Construction of irrigation facilities covering a total area of 10,000 ha; 8,500 ha in lowland, 500 ha at Al Mahabisha and 1,000 ha along wadi courses

e. Afforestation:

i. Multiplication and distribution of seedlings of recommendable tree species through operation of a forest nursery and extension services

ii. Pilot afforestation schemes for effective demonstration, covering 4 typical areas; Tihama lowland, range lands on rocky slopes, marginal terraced land, and gullied areas and/or severe erosion sites

f. Improvement of other rural infrastructures and social services:

i. Expansion of educational facilities including a new construction of 57 primary schools, upgrading of existing 210 primary schools and establishment of 7 public halls

ii. Improvement of public health facilities including construction of 3 branch hospitals, 8 health centers and 21 rural health care units

iii. Electricity supplies in combination of pump operation for rural water supplies

iv. Construction of telecommunication network connecting between major towns

g. Organization and management:

i. Establishment of a comprehensive implementation body (Project Office)

ii. Recruitment and training of local staff

iii. Expatriate expert services and training of counterpart staff

(3) Stagewise Development and Priority Area

19.06 Immediate execution of these possible projects would be very difficult due to a number of constraints involved.

However, early implementation would be of rather serious requirement, even in part, in order to stop the continuous decline in economic growth of the Hajjah Province. Once decision is made for implementation of initial projects, however, success must be guaranteed. On the contrary, it is generally conceived that project has an aspect of trial and error and is executed finally through many mistakes. This means that the initial projects will have the chances to experience a number of unexpected risks. Considering all these, it is proposed that, in order to minimize such risks and to lead the late-coming project to full success, a small scale integrated project be established initially, which will be gradually expanded as more trials become known and more experience is obtained through implementation of the initial integrated project.

19.07 It is also proposed that the initial integrated project be formulated in a particular area where physical and economic environment is relatively favourable compared to other areas of the Province. In the first place, all the development efforts will be concentrated to this priority area. Development of other areas will be made progress successively on the basis of the achievement and results of the development carried out in the priority area.

19.08 The priority area should be selected according to the following criteria:

a. Satisfying development requisites: Aiming at successful implementation and efficient execution of the projects to be carried out, the priority area should comply with development requisites as well as possible considering major position of the development will be carried out by local self-help, which comprise:

i. to be economically advanced relatively to the other areas.

ii. to be richly endowed with human resources both in quality and quantity in comparison with the other areas.

iii. to be relatively well equipped with infrastructural facilities, especially transport facilities.

iv. to have able and experienced development associations within its area

v. to have adequate capital saving for investment.

b. Having typical condition in physical-economic-social context: The development of the priority area is to spearhead the successive development of the other areas of the Province. In other word, the development of the area will be a model project to be taken for a pattern of development in the Province. The area, therefore, should be representative of the Province in physical-economical-social context.

c. Having big development potential: Considering the importance of the success of the development of the area, the priority area should be selected out of these having higher physical potentials particularly in terms of water and land resources endowments. The greater production with higher productivity and improved standard of living attained will have strong persuasive power and give incentives to the initiation of development projects in other areas of the Province. Moreover, the capital savings which may be realized through the successful achievements in the area could be invested in the projects to be carried out elsewhere in the Province.

(4) Preliminary Implementation Schedule

19.09 Considering all these, the preliminary implementation schedules for all the possible projects are prepared and illustrated on Fig. 19.1. The priority area and priority projects will be described in detail in Chapter XXI, "PRIORITY AREA AND DEVELOPMENT PLAN."

1 2 3 4 5 6 7 8 9 10 (Year in c

Project office

General management

- Recruitment and training of local staff
- Expatriate expert services and training of counterpart staff
- Establishment of observation network → Collection of meteorological and hydrological records
- Agricultural census and statistics
- Detailed physical resources survey

Rural water supply dept.

- Rural water supplies (4 villages) → Rural water supplies (21 villages)
- Electricity supplies (4 villages) → Electricity supplies (21 villages)

Road construction dept.

- Secondary roads (Hajjah-Al Mahabisha-Abs, 80 km) → Secondary roads (Hajjah - Khashim - Al Zuhra - Abs - Harad, 175km)
- Bridge on Wadi Mawr
- Feeder roads (290km) → Feeder road (1,400 km)

- Branch offices in Al Mahabisha and Abs → Improvement of other rural infrastructures and social services → Improvement of other rural infrastructures and expansion of social services
- Other (5) branch offices in At Tur, Mabyan, Shahara, Harad and Midi

Agricultural service dept.

- Institutional services for agricultural extension and farm inputs supply

Agricultural credit dept.

- Agricultural credit services

Administration dept.

Agricultural research station

- Agricultural census and statistics
- Detailed physical resources survey
- Agricultural research for promotion of midland agriculture → Multiplication and distribution of pure-line seeds of recommendable varieties
- Promotion of livestock improvement through veterinary services, improvement of animal feeds and breeding
- Demonstration of small scale pump irrigation and horticulture techni
- Establishment of a forest nursery → Multiplication and distribution of seedlings of recommendable tree s
- Pilot afforestation schemes for demonstration
- Field trials on crop-water requirement and irrigation method
- Construction of pilot irrigation projects → Construction of irrigation facilities

Research and training center for irrigation and mechanization

- Promotion of water-saving irrigation techniques and farm mechanization in lowland

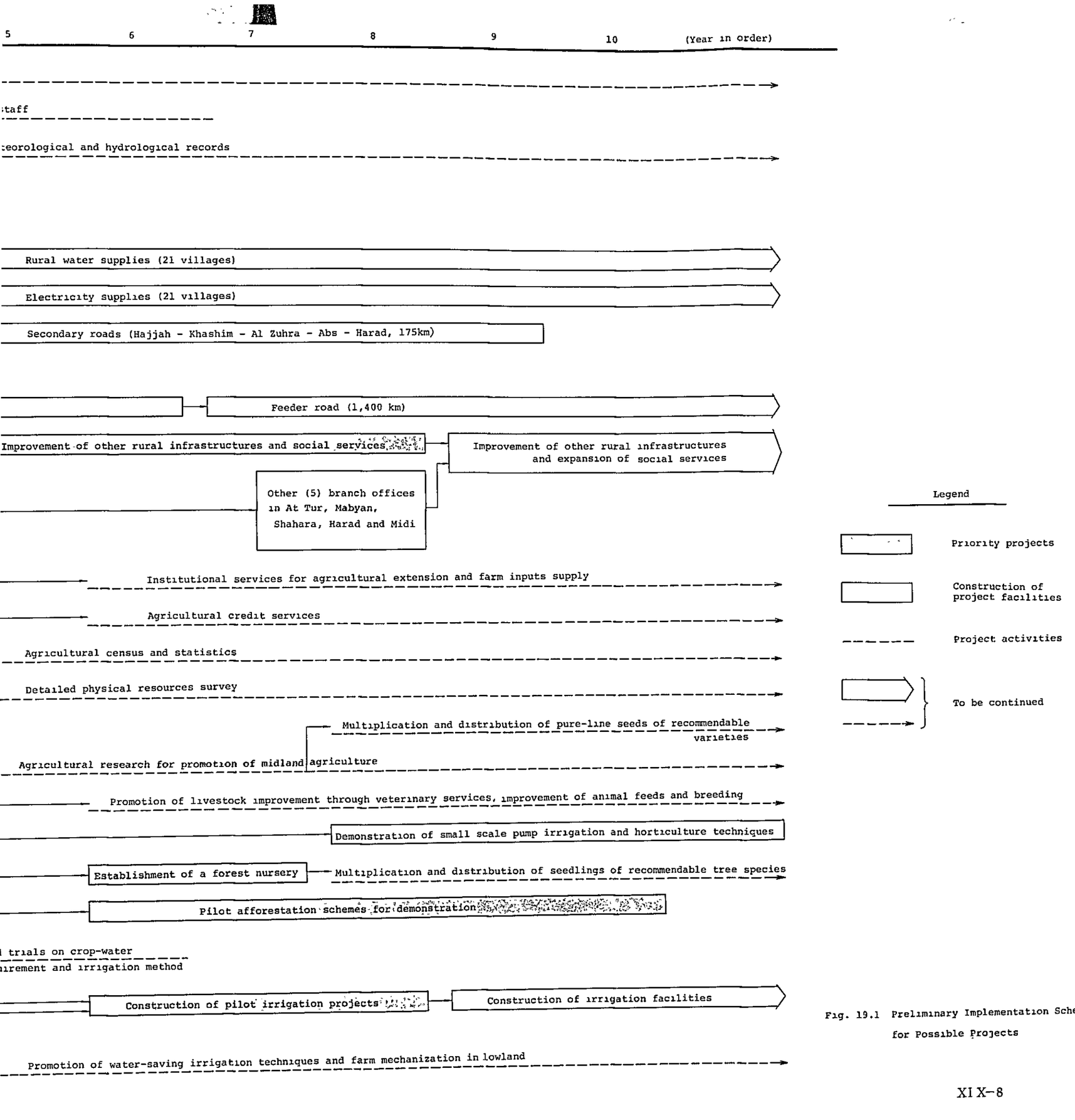
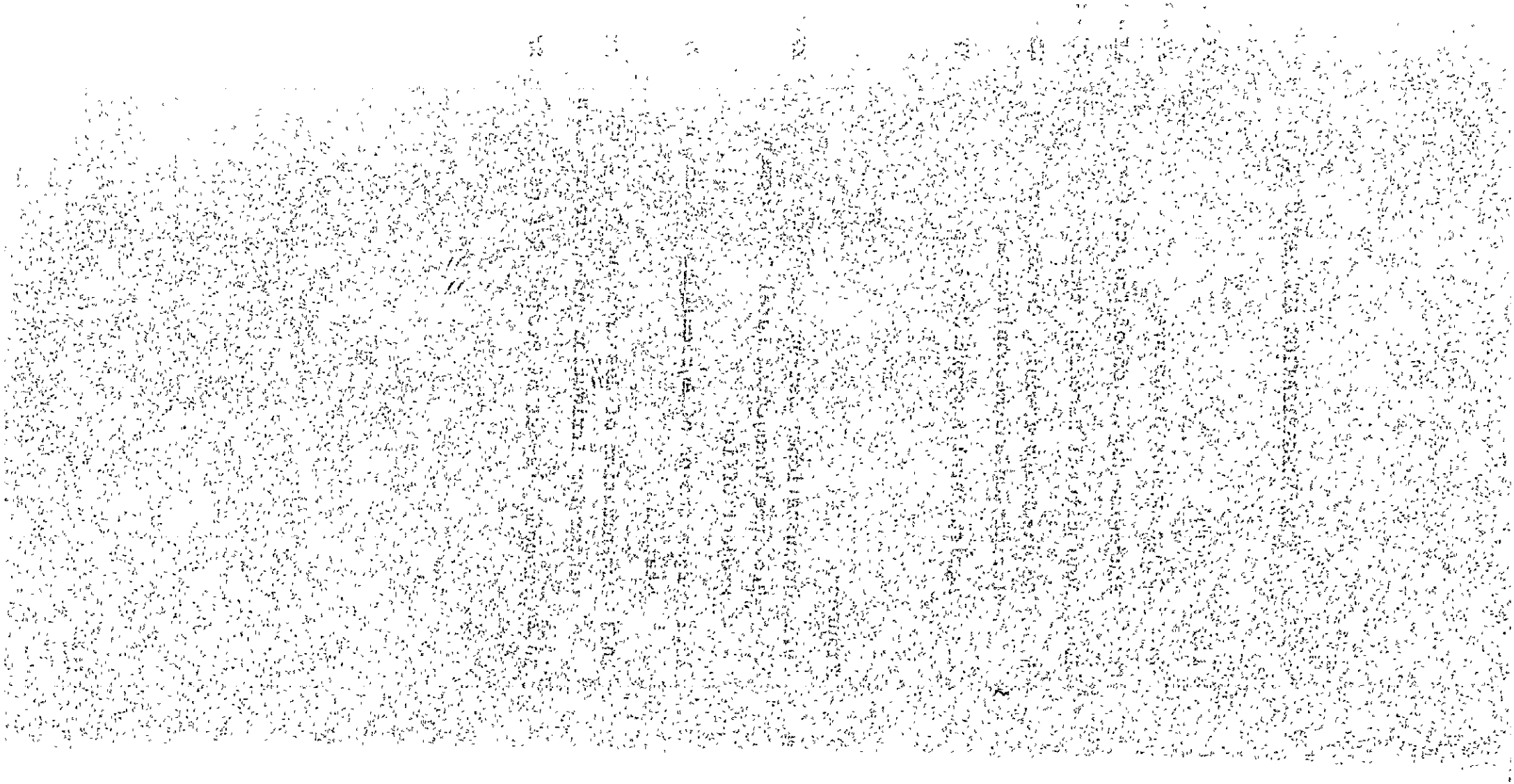


Fig. 19.1 Preliminary Implementation Schedule for Possible Projects

XX ORGANIZATION AND MANAGEMENT

Figures



XX ORGANIZATION AND MANAGEMENT

(1) General

20.01 The objectives of the integrated rural development are:

a. to increase agricultural production and stimulate economic growth, and
b. to improve the condition of rural life.

Several action plans aiming at these objectives have been formulated, including rural water supplies, rural road networks, agricultural support services, irrigation improvement, afforestation, etc., as mentioned in the previous chapters.

20.02 The integrated rural development of the Hajjah Province will essentially involve almost all of the sectors which are closely connected each other. Each sector will have to give the greatest contribution to the overall development of the Hajjah Province, paying due attention to the inter-relationship among relevant sectors.

20.03 Needless to say, the participation of the rural inhabitant will be essential for successful implementation of rural development. The government support and guidance will also have to play an important role for the promotion of rural development.

20.04 Since all the sectors should be integrated in the development of the Hajjah Province, a comprehensive implementation body will have to be newly established within the Province. The comprehensive implementation body will have to carry out all the necessary tasks for integrated rural development, including physical resources survey, planning and design, project preparation, construction, research, extension services and likes.

(2) Organization Structure

20.05 At the national level, a new coordination committee will have to be established for making the basic policy, designation of the key personnel, provision of necessary budget including foreign assistance and inter-ministerial regulation. The coordination committee will be chaired by the Minister of Agriculture and the member of the committee will consist of the representatives from Central Planning Organization (CPO), Ministry of Public Works, Agricultural Credit Bank (ACB), Confederation of Yemeni Development Associations and the Provincial Government of Hajjah.

20.06 At the provincial level, the comprehensive implementation body tentatively named "Hajjah Province Integrated Rural Development Project Office" will be established for execution of all the necessary works including:

a) survey and study (soil, land use, statistic etc.)
b) observation (hydrological, meteorological)
c) improvement of rural infrastructure
d) agricultural research
e) agricultural extension service
f) agricultural credit service
g) farm input supply
h) irrigation water supply
i) farm mechanization
j) rural water supply
k) road construction

20.07 For execution of these works, the Project Office will have five (5) departments, seven (7) branch offices, and two (2) research and training institutions at full development stage as illustrated in Fig. 20.1. The proposed layout of the Project Office is given in Fig. 20.4.

(3) Stagewise Expansion of Project Office

20.08 Taking the limited budget available, weakness of manpower resources and anticipated slow progress of related works into consideration, it is not realistic to establish the complete organization of the Project Office at the initial stage of development. It should be developed stagewise; initially on a small scale, which will be gradually expanded as more trial results become known and more experience is obtained.

20.09 The stagewise expansion of the Project Office will be as follows:

1st Step ... Establishment of the Project Office with three (3) Departments of Administration, Road Construction and Rural Water Supply for making the development implementation plan and detailed design of the road connecting Hajjah, Al Mababisha and Abs, and of the water supply facilities and major feeder roads within the priority area (Chapter XXI, to be refered).

2nd Step ... Establishment of the Agricultural Research Station at Al Mahabisha and the Research and Training Center for Irrigation and Mechanization at Abs for creating the most recommendable agricultural techniques to be adopted in the midland area and the Tihama lowland, respectively.

3rd Step ... Openning the Agricultural Service Department and the Agricultural Credit Department at the main Project Office and the Branch Offices at Al Mahabisha and Abs

for commencement of the construction works of rural infrastructural facilities in parallel with institutional agricultural services in the priority area.

4th Step ... Establishment of the remaining Branch Offices at Mabyan, At Tur, Harad, Midi and Shahara.

(4) Agricultural Research Station

20.10 Under the guidance of the Central Agricultural Research Station in Taiz, the Agricultural Research Station will conduct the various tests concerning adaptability of modern technique to the local condition in parallel with the basic studies and observation necessary for agricultural development of midland region in the Hajjah Province. The technical information obtained through the experimental work will be used for the extension services. The station will also contribute to in-service training of field extension workers. In addition, a forest nursery would be included in the Station in the light of importance of afforestation for highland and midland regions.

20.11 The proposed organization of Agricultural Research Station will consist of six (6) Departments with an administration section as illustrated on Fig. 20.2. Crop Research Department will carry out experimental work on food crops, fodder crops, cash crops including vegetables and fruit trees suitable for midland region collaborating with other Departments related. Livestock Department will take care of the research work for main livestock, i.e., cow, sheep, goats and poultry including veterinary examination, pathological nutrition and breeding studies. Irrigation Department will carry out field trials on effective irrigation method for the best use of limited water by using small

scale pumps, together with metorological and hydrological observation, in collaboration with Crop Research Department. Farm Management Department will make agricultural economic studies including agricultural statistics, market price investigation and farm economic survey. Afforestation Department will manage the forest nursery and pilot afforestation schemes. Information Department will prepare all the information translated from the results of research and experimental work conducted by each Department. Several subject-matter Specialists will be attached to this Department as a suspension bridge between the experiment and extension.

20.12 Proposed site of Agricultural Research Station will be in the Jaya area with gross area of about 10 ha. About 2,500 m^2 of main office building including laboratories will be constructed. At the stage which the Project activities will get on the right track, the following branch stations will be established:

a. Stock Seed Stations A stock Seed Station with about one ha of field will play an important role as a center of seed improvement and multiplication of recommended varieties of respective crops. Extension seed will be multiplied by the progressive farmers in respective areas under the contract with the Seed Station.

b. Livestock Breeding Station Under the supervision and guidance of the Livestock Department, a Livestock Breeding Station will be established for livestock improvement in each kind of main domestic animals. The site will be at Mabyan or At Tur with about 2 ha in size.
At the same time, the veterinary service stations will be established in the local centers where the branch offices will be set up.

c. Horticulture Center For further development of the activities of the Crop Research Department, especially on vegetables and fruit trees, at this stage, a Horiculture Center will be established at Tahannen area with about 10 ha of research farm. The Center will carry out the testing of trees species selected elsewhere in this country for their adaptability to local condition and also the multiplication of seedling of fruit-trees recommendable for the area.

d. Afforestation Office As the pilot activities of afforestation, the Afforestation Department will make arrangement of the Pilot Afforestation schemes with a total area of about 200 ha in and around Al Mahabisha. The schemes will be managed by the Afforestation Office to be established in the scheme areas under the supervision of the Afforestation Department of Agricultural Research Station. After the success of the pilot schemes in future, the expansion of the afforestation will be continuously carried out in other areas of the Hajjah Province.

(5) Research and Training Center for Irrigation and Mechanization

20.13 For the development of lowland area, two major development constraints, limited available water and labour shortage, will have to be eliminated. In this view, the "Research and Training Center for Irrigation and Mechanization" will be established within the Abs area where irrigation water is available from Wadi Qur.

20.14 As for the organization, under the supervision of the Director, three Departments, i.e. Irrigation, Machinery and Administration, will be organized as illustrated in Fig. 20.3. Irrigation Department will carry out mechanized farming trials under spate irrigated condition, together with necessary irrigation trials for crop-water requirement and water application method for tropical crops, in order to find out the most suitable irrigated mechanization farming practices for the lowland region. Agronomic studies will not be essential because they have been well carried out in the Wadi Zabid Development Project area where physical conditions are almost same. The center will establish the meteorological stations and hydrological gauge network and collect these basic data for future irrigation development in the lowland. Machinery Department will be responsible for the operation and maintenance of machinery. Training of the operator and mechanic will be the main work of this Department. Administration Department will take care of general administration of the Center.

20.15 The size of the Center will be about 20 ha. In future, with the development of the Wadi Harad, the Branch Station will be set up at Harad, having similar functions of the Center.

(6) Agricultural Support Service

20.16 Agricultural extension service in the Hajjah Province will be commenced at the 3rd step of development after the completion of initial stage of the Agricultural Research Station and the Research and Training Center for Irrigation and Mechanization. At this stage, the Agricultural Service Department and the Agricultural Credit Department will be put operation in the Project Office. Under the supervision of Director of the Agricultural Service Department, 7 senior extension officers will be appointed for the administration

of the extension services in each working area at Quada level. At the Nahiya level, an area supervisor will station in each Nahiya for the promotion of extension activities. About 5-6 extension workers will be put under the supervision of area supervisor.

20.17 In due consideration of present low level of skilled manpower, the basis of extension services will be training of extension workers. The trainees who intend to work as the extension worker, will be selected from the local community sent to the Central Agricultural Research and Training Station in Taiz for the pre-service training. After the graduation of the training course, these trainees would be appointed as the extension worker of Hajjah Province.

20.18 Agricultural Input Supply Service will also be carried out under the responsibility of the Agricultural Service Department. A Senior Officer will be appointed for carrying out the input supply service under the supervision of Director of the Department. The arrangement of agricultural requisites will be made by this Department in collaboration with the Agricultural Credit Department. The farm input will be distributed to the farmer through the extension service channels.

20.19 Agricultural credit service will concurrently be started with the Agricultural Extension Service. In the Project Office, Agricultural Credit Department will be set up in close coordination with Agricultural Credit Bank (ACB)/Agricultural Credit Fund (ACF). It is recommended that this department function as local agent for ACB/ACF and promote the establishment of farmer credit cooperatives.

20.20 For the execution of agricultural support services, expatriate assistance will be necessary at least during initial 5 years. The expatriate should be proficient in Arabic as well as adequate knowledge and experience in respective field.

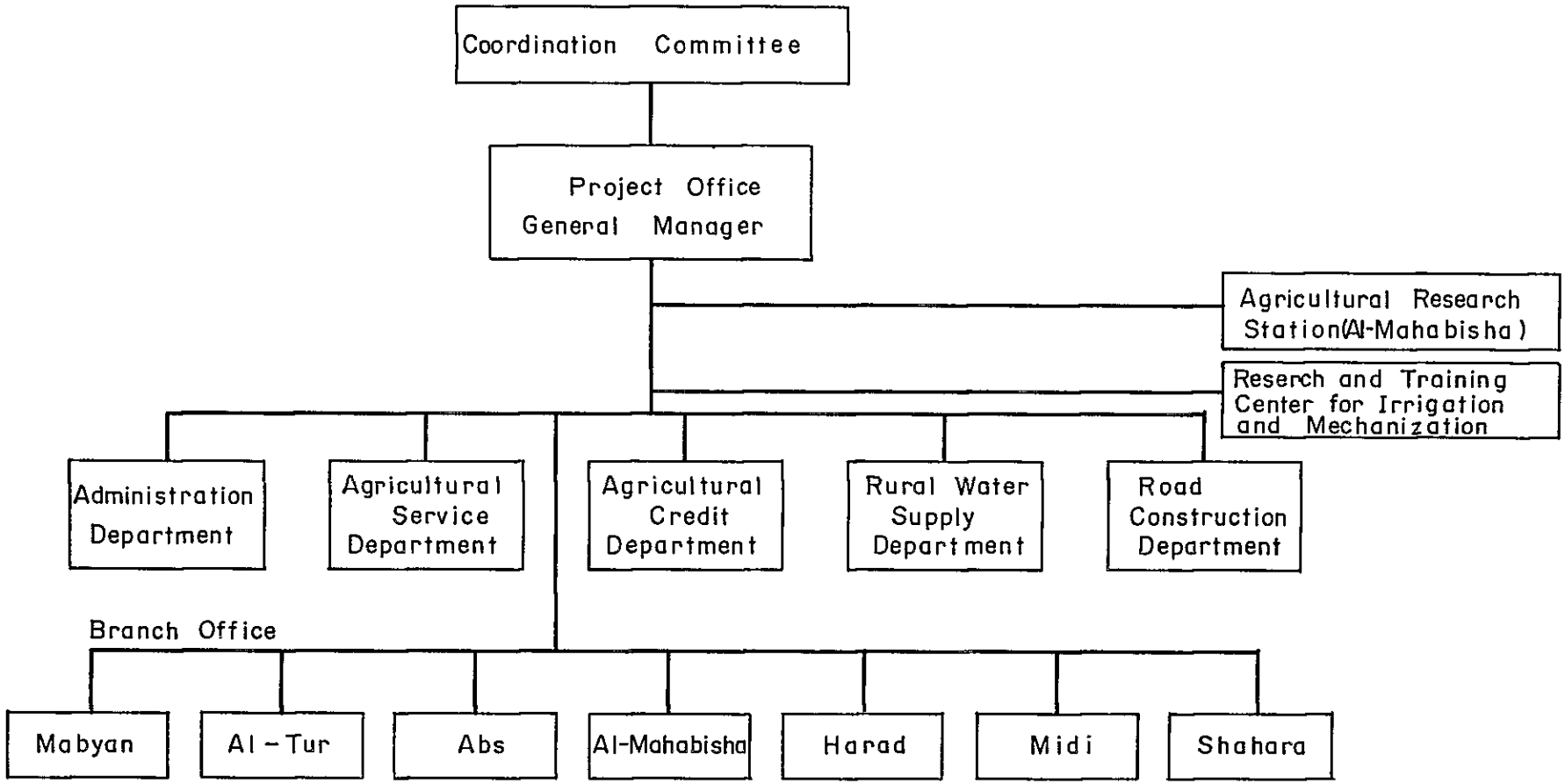


Fig. 20.1 Organizational Set-up of Hajjah Province Integrated Rural Development Project Office

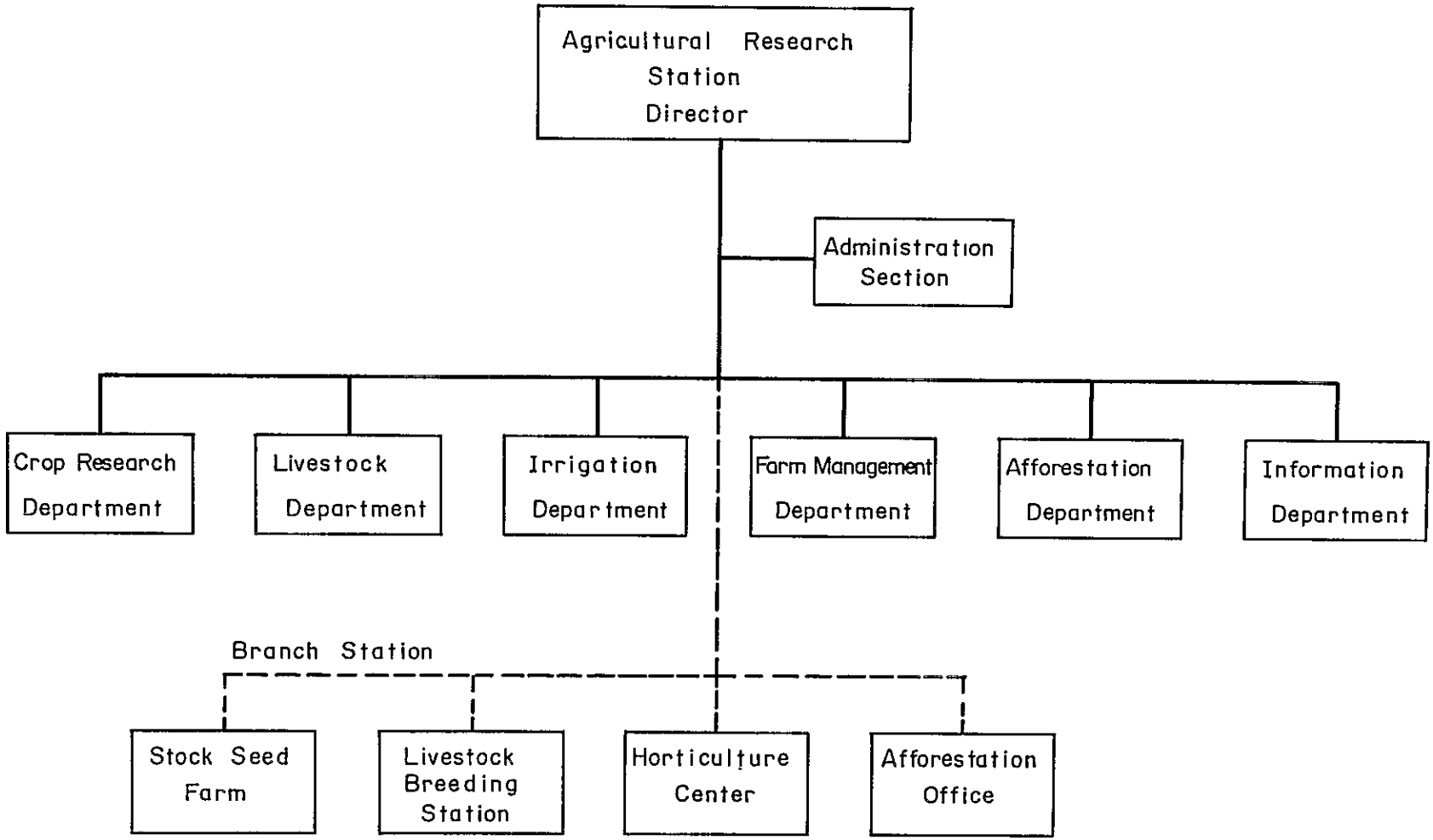


Fig. 20.2 Organization of Agricultural Research Station

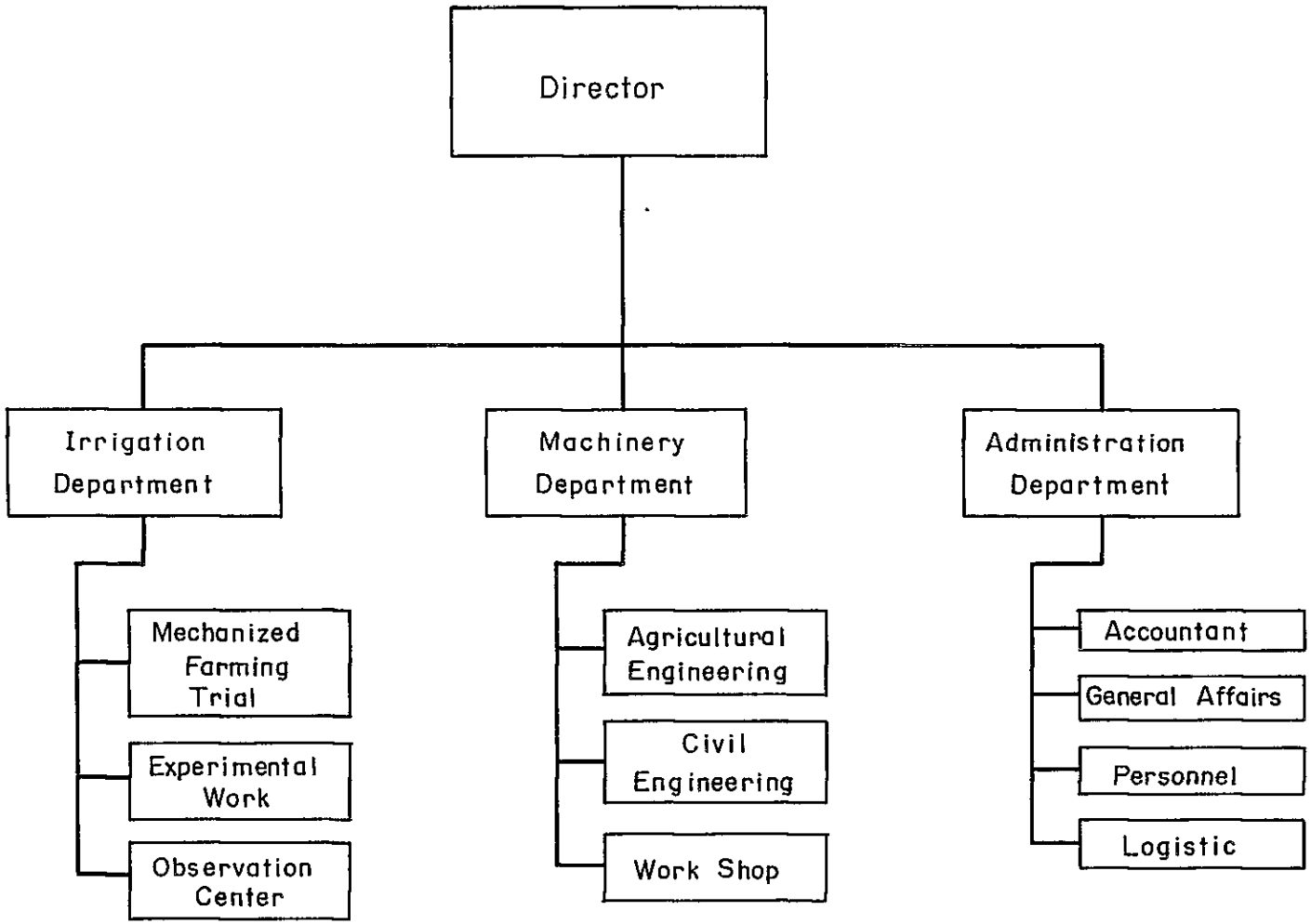
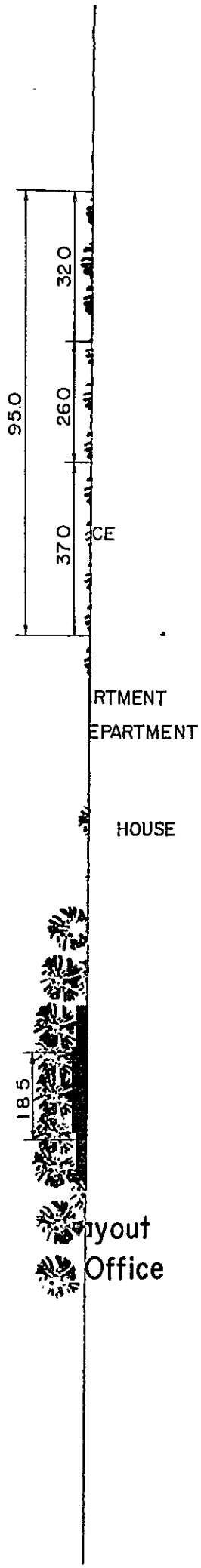


Fig. 20. 3 Organization of Research and Training Center for Irrigation and Mechanization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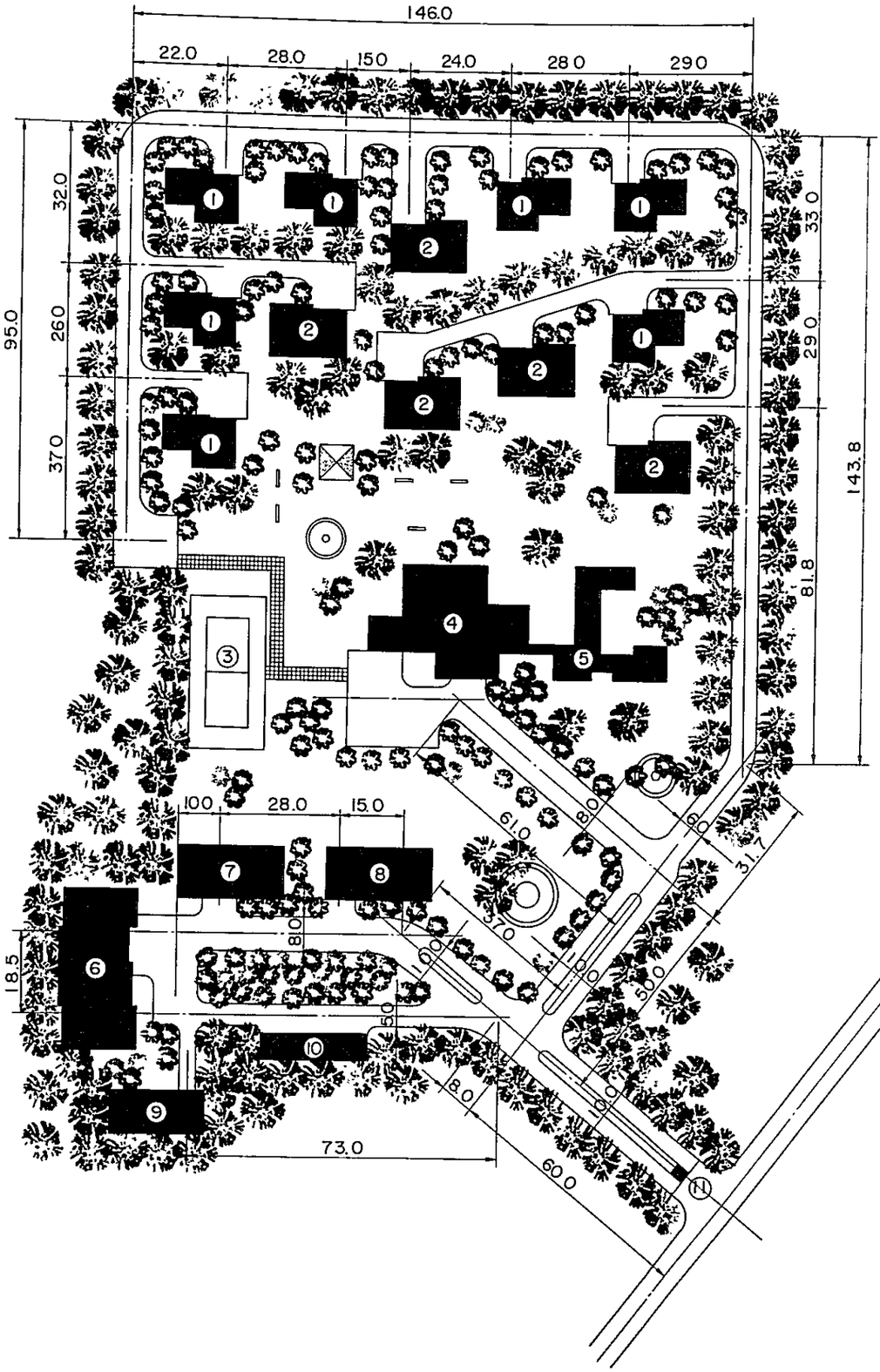


LEGEND

1 TWO BEDROOM RESIDENCE
2. THREE BEDROOM RESIDENCE
3 TENNIS COURT
4 CLUB
5 GUEST HOUSE
6 MAIN OFFICE
7 ROAD CONSTRUCTION DEPARTMENT
8 RURAL WATER SUPPLY DEPARTMENT
9 DRIVERS' DORMITORY
10 COVERED PARKING
11. MAIN GATE AND GUARD HOUSE

Fig. 20.4 Proposed Layout of Project Office

XXI PRIORITY AREA AND DEVELOPMENT PLAN

Tables

Figures

XXI PRIORITY AREA AND DEVELOPMENT PLAN

(1) Selection of Priority Area

21.01 The Priority area was selected on the basis of the selection criteria proposed in the Section (3) of Chapter XIX. The selected area extends over the catchment area of the Wadi Qur, as shown in Fig. 21.1 (Location Map), occupying a total area of 62,000 ha. The area comprises the two economically developed areas, i.e., Abs and Al Mahabisha.

21.02 The Al Mahabisha area is the most economically advanced area in the whole Hajjah Province. Although no precise record is available for the economic statistics of the Province, the farm economic survey results indicate that over 65 % of the total gross agricultural production value was earned in this area. The Abs area is also the most economically developed area in the Tihama plain of the Province.

21.03 The selected area is representative for the Province in the physical - economic - social context. As described before, the Hajjah Province is divided into three geographical regions, i.e., lowland, midland and highland. The proposed priority area contains all these areas with the Abs area standing for Tihama lowland, the Al Mahabisha area for highland and the areas in between two these areas for midland. The development of priority area will thus be a model project to be taken for a pattern of development in the Province.

(2) Present Condition of Priority Area

Physical condition

21.04 The proposed priority area has relatively higher development potential in the Province. The proposed area is relatively richly endowed with the water and land resources which generally impose crucial restriction on the development. Al Mahabisha area is considered to be one of the high rainfall areas in the Province with the average annual rainfall of more than 600 mm. Besides, it has a couple of springs with average production rate of 20 ℓ/sec. which could be utilized for small-scale irrigation in the area. In the Abs area, irrigation water could be taken from Wadi Qur flowing east to west in the area. Some 1,300 ha of land could supplementarily be irrigated in the Abs area, using the water during the rainy season.

21.05 The priority area is favoured with fertile soils with 50.3 % of arable land. The soil condition in the priority area is described in Table 21.1. The land classification is summarized below:

Land class	Area (km^2)	Proportional extent (%)
Class 1 (arable)	60	9.7
Class 2 (arable)	90	14.5
Class 3 (arable)	162	26.1
(Sub-total)	(312)	(50.3)
Class 4 (limited arable)	178	28.7
Class 6 (non-arable)	130	21.0
Total	620	100.0

The map which indicates the distribution of soil units is shown in Fig. 21.2. The land classification map is also given in Fig. 21.3.

21.06 The lands in the priority area are highly utilized for crop production, being reflected in good agricultural onditions. The cropland occupy about 16,800 ha, or 27.1 % of the total land area compared with the provincial average of 14.7 %. The present land use in the priority area is summarized in Table 21.2. The land use map is shown in Fig. 21.4.

Socio-economic condition

21.07 In a relative sense, the selected priority area is richly endowed with human resources. It has a population of some 47,500 or 12 % of the total population of the Province, as shown in Table 21.3. The literacy rate is higher in the Al Mahabisha part compared with the average figure for the Province. Although literacy rate is generally low in the Tihama area, the Abs area is presumed to be most advanced in this respect.

21.08 The proposed priority area is relatively well equipped with inland transport facilities. At present, the two principal towns of the proposed area, Al Mahabisha and Abs, are connected by a rough dirt road within 2 hours distance by car drive. Abs is connected with Hodeidah which is the major port for foreign trading in the country by road transport via Bajil within 5 hours distance. Another dirt road is under construction between Al Mahabisha and Hajjah which will be jointed with Hajjah-Amran road which is also under construction and scheduled to be completed in 1980. Consequently, Al Mahabisha and Abs are connected with Sana'a, capital of the country, via Hajjah and Bajil, respectively.

21.09 The LDA activities in the Province has relatively long history and has been very active, constructing most of the rural access roads and rural water supply facilities.

The LDA activities in the Al Mahabisha and Abs areas have particularly been intensive and successful. The LDAs in the priority area are relatively well staffed with planning and administrative personnel and have been playing a significant role in the local development efforts in the Province.

21.10 No accurate information is obtainable about the amount of investment funds available in the priority area. However, judging from the prosperity of the Al Mahabisha area, it can be well presumed that capital savings which would be invested for development, is relatively abundant in the area.

Present agricultural production

21.11 Out of a total land area of 62,000 ha, croplands occupy 16,800 ha in the priority area. The regularly cultivated land totals 9,600 ha. The rest, or 7,200 ha of cropland, is the marginal cropland where cultivation is made only during high rainfall years. The major crops are sorghum and millet in the Abs area and qut in the Al Mahabisha area. The net crop production value is estimated at about YR333 million in total, which corresponds to 29.7 % of the total production value of the Province. The detailed estimate is given in Table 21.5.

(3) Integrated Rural Development Plan

Project components

21.12 The projects which would be integrated in the priority area, as a priority project, should be comprehensive and be directed towards overall improvement of rural incomes and living conditions.

21.13 In order to identify the priority projects, all the possible projects have been classified into three (3)

groups, in accordance with the priority determined through the assessment of the people's needs, economic viability, technical difficulties and social indirect benefit; i.e., a) basic projects to be first undertaken (top priority projects), b) second priority projects and c) third priority projects.

21.14 The top priority projects which would be integrated and implemented in the priority area, would comprise:

a. Rural water supplies: Installation of 4 village water supply system

b. Rural road network:

   i. Construction and up-grading of secondary roads; Abs - Al Mahabisha (35 km) and Al Mahabisha - Hajjah (45 km)

   ii. Construction of a bridge on Wadi Mawr

   iii. Construction and up-grading of 290 km of feeder roads

c. Agricultural development:

   i. Collection of meteorological and hydrological records through establishment of observation network

   ii. Establishment of agricultural research station

   iii. Establishment of research and training center for irrigation and mechanization

d. Irrigation improvement: Construction of pilot irrigation projects; Abs area (1,300 ha), Jaya area (300 ha), Tahannen area (100 ha) and Sharhil area (100 ha)

e. Afforestation

   i. Establishment of a forest nursery

   ii. Pilot afforestation schemes for demonstration

f. Improvement of other rural infrastructures and social services:

   i. Improvement of health facilities; construction and up-grading 3 branch hospitals (Abs, Sharhil, Al Mahabisha) as well as main hospital at Hajjah, and new construction of primary health care units.

   ii. Electricity supplies in combination of pump operation for rural water supplies

g. Organization and management:

   i. Establishment of a comprehensive implementation body (Project Office)

   ii. Recruitment and training of local staff

   iii. Expatriate expert services and training of counterpart staff

Rural water supplies

21.15 Rural water supplies would be provided to four (4) towns of Sharhil, Qufl Shamal, Al Shaafeen and Abs with population totalling 15,000 of inhabitants. Besides, the town of Al Mahabisha has another water supply project which is under construction with financial aid from West Germany. This project will serve population totalling 15,000 of inhabitants. After completion of these water supply schemes, about 63 % of rural inhabitants will have piped water in the priority area.

21.16 These four towns are located in more favourable conditions than other towns in the Province, as regards the distance from town to water source. The construction cost is, therefore, expected to be lower than other schemes. The water facilities will comprise intake boxes, electric driven pumps and storage tanks as described in Chapter XII,

Rural Water Supplies. Four (4) power generating stations will be constructed for operating the pumps. The electric power will also be used for lighting at night and for other domestic uses.

Rural road network

21.17 The proposed road network, which consists of existing roads improvements and new constructions, is shown in Fig. 21.6. The secondary road connecting Hajjah and Al Mahabisha and Abs is the most important trunk in the priority area. Although the existing road between Abs and Al Mahabisha can be passable by four wheel drive vehicles, its poor horizontal and vertical alignments and narrow width will have to be improved. There also exists a dirt track between Al Mahabisha and Hajjah. However, it is suitable only for animal transport. This road runs across the Wadi Mawr. A bridgework with a total length of about 200 m will be newly required for assuring all season passage. The profile and the structures of the proposed bridge are shown in Fig. 21.7.

21.18 The construction of the feeder road which will run between Abs and Al Mahabisha via Qufl and Jaya will be a prerequisite for the implementation of the rural water supply schemes and agricultural research institutions, giving means of transportations and communications. The implementation of the Abs - Al Mahabisha feeder road, together with the Abs - Hajjah secondary road, will be accorded with top priority in the overall implementation schedule for the whole integrated rural development project in the priority area.

Agricultural development

21.19 The meteorological and hydrological data will be essential for future agricultural development. It is

proposed that the observation network be established as early as possible. The proposed sites for observation gauges are shown in Fig. 21.5 (General Plan of Priority Projects). The observation network should be set up immediately after the establishment of the Project Office and all the records will be kept by the General Manager until the research institutions will be organized (refer to Fig. 19.1, Preliminary Implementation Schedule for Possible Projects). The observation will be continuously carried out by the research institutions even after their establishment.

21.20 The agricultural research station will be established in the Jaya area, 3 km southeast of Al Mahabisha. The proposed size will be 10 ha. The general layout of the station is given in Fig. 21.9.

21.21 The proposed site for the research and training center for irrigation and mechanization will be located within the Abs area where about 1,300 ha of the spate irrigated land will possibly be improved by constructing headworks on the Wadi Qur and canal system. The proposed size of the center will be 20 ha. The general plan of this institution is shown in Fig. 21.10.

Irrigation improvement

21.22 It is proposed that field trials on crop-water requirement and irrigation methods for making best possible use of the limited water, be carried out in the proposed research institutions.

21.23 The irrigation scheme covering about 1,300 ha around Abs will be constructed as a model scheme for irrigation of the wadi-delta plain (possible irrigation area: 7,500 ha). The water sources will be Wadi Qur which has a catchment

area of 243 km^2. The major facilities required will comprise 2 headworks, 15 km main canal and 4 supplementary tube wells.

21.24 In the Al Mahabisha area, there exist about 500 ha of irrigable area; 300 ha of Jaya area, 100 ha of Tahannen area and 100 ha of Sharhil area. There also exist about 200 ha of irrigable wadi lands along the Wadi Qur. These areas will be irrigated by construction of pumps and pipe lines.

Afforestation

21.25 A forest nursery will be established within the proposed agricultural research station. The size of the nursery will be one ha. The seedlings will be multiplied in the nursery and distributed to the farmers. For effective demonstration of the promising tree species, three (3) pilot afforestation schemes will be initiated in the priority area; each one for lowland, midland and highland areas. The total areas for the pilot afforestation schemes will be 200 ha.

Improvement of rural infrastructures

21.26 The priority will be given to, among others, a) improvement of health facilities and b) electric power supplies. The improvement of health facilities will include the up-grading of 3 branch hospitals at Abs, Sharhil and Al Mahabisha, as well as the main hospital at Hajjah, and new construction of 2 primary health care units at Qufl Shamal and Al Shaafeen. The electric power supplies will be undertaken in combination of rural water supplies at Abs, Sharhil, Qufl Shamal and Al Shaafeen.

Organization and management

21.27 The Project Office will have to be first established

within the town of Hajjah. The Project Office will recruit the required number of local staff immediately after its establishment and will carry out all the necessary preparatory works for execution of the priority projects. In due consideration of scarce manpower resources, it is proposed that some expatriate experts will be deployed in the Project Office.

Future agricultural production

21.28 The future agricultural production is estimated as shown in Table 21.6. The net production value will be possibly increased from YR333 million to YR472 million in future.

(4) Preliminary Implementation Schedule

21.29 The implementation schedule for the first integrated rural development project is tentatively prepared and shown in Fig. 21.11. The implementation schedule will have to be modified after full discussion with the representatives of the Local Dévelopment Associations who will be the core for execution of the project. It should also be subject to further studies on project components which would be carried out on the basis of more detailed field information, especially of agricultural statistics and meteoro-hydrological records.

(5) Preliminary Cost Estimate

21.30 The costs required for execution of the first integrated rural development project are estimated as shown in Table 21.7. The total project costs will be YR 252 million. The cost estimate has been roughly made on the basis of current prices (as of 1979) prevailing in YAR. The costs required for project operation and maintenance have not been estimated due to uncertain base for the estimate. The price contingencies for future inflation are

not included in the estimate. The project costs thus estimated have been converted to annual fund requirement, in accordance with the implementation schedule, as shown in Table 21.8.

Table 21.1 Physiography and Soils

	Physiography/Terrain Units	Soil Units: Dominant 50%	Soil Units: Associated 20 - 50%	Soil Units: Inclusions 20%	Land Class	Area (ha)
L	LOWLAND					
L1	Salty flats	Zg - 2/3a	-	Zt - 2/3a	6	-
L2	Low dunes and sand sheets	Re - 1a	Je - 2a	Yh - 2a	4	-
L3	Recent wadi alluvium	Je - 1/2a	Jc - 1/2a	-	2	5,700
L4	Alluvial plain (old wadi alluvium)	Yh - 1a	Jc - 1/2a(g)	Re - 1a(g)	3	-
L5	Alluvial fan (Piedmont), gravelly surfave	Yh - 2a(g)	Yk - 2a(g)	Je - 2a(g)	4	7,800
L6	Northern alluvial fan, medium textured	Je - 2a	Re - 2a	Yh - 2a	1	-
L7	Southern alluvial fan, coarse textured	Jc - 1a	Rc - 1a(g)	-	3	13,400
L8	Fluvial terrace (old wadi terrace)	Yh - 2a	Je - 2a	-	1	4,500
L9	Isolated hills	I	-	Yh - 2bc(1)	6	-
						(31,400)
M	MIDLAND					
M1	Piedmont, gravelly surface	Yh - 2a(g)	Yk - 2a(g)	-	4	100
M2	Colluvial slopes and talus	Je - 16(s)	Jc - 16(s)	Re - 1/2b	4	300
M3	Lower midland scarpment	I	Yh - 2b(1)	Yk - 2ab(1)	6	-
M4	Dissected upland, coarse textured	Je - 1a(g)	I	Xh - 1b(s)	4	9,600
M5	Dissected upland, medium textured	Xh - 2ab	Je - 1ab(g)	Xh - 2b(g)	3	2,800
M6	Higher midland scarpment	I	Yk - 2bc(1)	Yk - 2ab(1)	6	-
M7	Dissected plateau on Yemen Volcanics, gravelly surface	Re - 1a(g)	-	I	4	-
M8	Dissected plateau on inclined limestone and green shale, stony surface	Re - 1bc(1)	I	-	6	13,000
M9	Rock floor on Old Yemen Volcanics	I	-	Je - 1b(1)	6	-
						(25,800)
H	HIGHLAND					
H1	Highland scarpment	I	Je - 1c(g)	-	6	-
H2	Dissected mountain on Yemen Volcanics	Yk - 1ab(1)	Yh - 1ab(1)	I	6	-
H3	Highland plateau on limestone and shale	Xh - 2ab	Je - 2a	-	2	3,300
H4	Dissected mountain on granite and gneiss	Yk - 1ab(g)	I	-	4	-
H5	Small inter-mountain plain	Yh - 2a	Yk - 2ab	Re - 2ab	1	1,500
						(4,800)
						62,000

Table 21.2 Present Land Use

Land use category		Land use subdivision	Area (km^2)	Proportional extent (%)
A. Irrigated cropland	A1	Intensively cultivated under irrigation/pumping and diverted stream flow/ sorghum vegetables and fruits	40	0.6
	A2	Intensively cultivated under regular spate irrigation/mainly sorghum	13	2.1
(Sub-total)			(17)	2.7
B. Rainfed cropland/ Annual cultivation	B1	Densely cultivated/ irregular spate irrigation/ mainly sorghum	2	0.3
	B2	Densely cultivated/ sorghum and millet	63	10.2
	B3	Wadi lands/vegetables and sub-tropical fruits	9	1.5
	B4	Gently sloping lands receiving hill-slope runoff/sorghum and maize	43	6.9
(Sub-total)			(117)	18.9
C. Rainfed cropland/Opportunistic cultivation/mainly millet			18	2.9
D. Rainfed cropland/ Terraced	D1	Densely cultivated/ sorghum, wheat, barley and qut	11	1.8
	D2	Sparsely cultivated/ sorghum, millet, wheat and barley	5	0.8
(Sub-total)			(16)	2.6
E. Rainfed cropland/Rangeland, Opportunistic cultivation, otherwise dwarf shrub grass land mainly millet			0	0.0
Total Cropland (A + B + C + D + E)			168	27.1
F. Rangeland			397	64.0
G. Unused land			36	5.8
H. Settlement areas			19	3.1
Total			620	100.0

Table 21.3 Administrative Division, Surface Area and Population of Priority Area

Nahiya	Area (km^2)	Population
Abs	210	5,000
Aflan	150	16,000
Shamur	50	9,000
Sharhil	30	2,500
Al Mahabisha	75	8,000
Sharaf	20	2,000
Miftah	85	5,000
Total	620	47,500

Table 21.4 Principal Features of Water Supply Schems

Name of town or villages	Planned service population (persons)	Planned supply amount (m^3 per day)	Water resources
1. Sharhil	4,000	320	Wadi Yamaniyah
2. Qufl Shamal	2,300	184	Wadi Yamaniyah
3. Al Shaafeen	3,100	248	Wadi Yamaniyah
4. Abs	5,300	424	Wadi Bawhal

Pumps

Name of town or village	Discharge of water source (m^3 per min)	P_1 Pump station Bore-Power (mm) (kw)	P_2 Pump station Bore-Power (mm) (kw)
1. Sharhil	0.7	100-75	80-55
2. Qufl Shamal	0.4	80-45	-
3. Al Shaafeen	0.6	80-55	-
4. Abs	0.9	100-90	-

Pipes and Public Hydrants

Name of town or village	Pipe length (m) ϕ=50mm	ϕ=75mm	ϕ=100mm	Total length	Number of Public hydrants
1. Sharhil	3,500	3,700	1,700	8,900	5
2. Qufl Shamal	4,900	3,900	-	8,800	6
3. Al Shaafeen	5,500	6,800	-	12,300	10
4. Abs	2,000	2,000	1,000	5,000	5

Table 21.5 Present Crop Production in the Priority Area

Abs area

Crops	(A) Cultivated area (ha)	(B) Yield/ha (ton)	(C) Price/t (YRs)	(D) Production (ton)	(E) Production value (×10³YRs)	(F) Production cost (YRs/ha)	(G) Production cost (×10³YRs)	(H) Production tax(D) 10% (×10³YRs)	(I) Gross production cut (G)+(H) (×10³YRs)	(J) Net production value(E)-(I) (×10³YRs)
Sorghum/ Millet	4,900	0.8	2,000	3,920	7,840	240	1,176	784	1,960	5,880
Fruits, etc.	100	8.0	6,000	800	4,800	14,000	1,400	480	1,880	2,920
Maize	50	1.5	1,500	75	113	270	14	11	25	88
Potatoes	50	8.0	4,000	400	1,600	2,500	125	160	285	1,315
Sesames	50	0.5	25,000	25	625	2,000	100	63	163	462
Tabacco	50	1.2	21,000	60	1,260	2,000	100	126	226	1,034
Legumes	50	0.8	6,000	40	240	1,500	75	24	99	141
Vegetables	50	8.0	5,000	400	2,000	2,500	125	200	325	1,675
Sub-total	5,300				18,478		3,115	1,848	4,963	13,515

Al Mahabisha area

Crops	(A) Cultivated area (ha)	(B) Yield/ha (ton)	(C) Price/t (YRs)	(D) Production (ton)	(E) Production value (×10³YRs)	(F) Production cost (YRs/ha)	(G) Production cost (×10³YRs)	(H) Production tax(D)×10% (×10³YRs)	(I) Gross production cut (G)+(H) (×10³YRs)	(J) Net production value(E)-(I) (×10³YRs)
Qut	2,300	2,200 bundles	70	5,060,000	354,200	4,000	9,200	35,420	44,620	309,580
Sorghum/ Millet	1,500	0.8	2,000	1,200	2,400	240	360	24	600	1,800
Grapes	150	4.8	12,000	720	8,640	15,000	2,250	864	3,114	5,526
Coffee	100	0.4	28,000	40	1,120	4,000	400	112	512	608
Maize	50	1.5	1,500	75	113	270	14	11	25	88
Legumes	50	0.8	6,000	40	240	1,500	75	24	99	141
Wheat	50	0.8	2,000	40	80	200	10	8	18	62
Barley	50	1.0	1,800	50	90	200	10	9	19	71
Fruits	50	8.0	6,000	400	2,400	14,000	700	24	940	1,460
Sub-total	4,300				369,283		13,019	36,496	49,947	319,336
Total	9,600				387,761		16,134	38,344	54,910	332,851

Table 21.6 Future Crop Production in the Priority Area

Abs area

Crops	(A) Cultivated area (ha)	(B) Yield/ha (ton)	(C) Price/t (YRs)	(D) Production (ton)	(E) Production value (×10³YRs)	(F) Production cost (YRs/ha)	(G) Production cost (×10³YRs)	(H) Production tax(D)×10% (×10³YRs)	(I) Gross production cut (G)+(H) (×10³YRs)	(J) Net production value(E)-(I) (×10³YRs)
Millet	4,700	1.0	2,000	4,700	9,400	700	3,290	940	4,230	5,170
Sorghum	3,300	1.0	2,000	3,300	6,600	700	2,310	660	2,970	3,630
Maize	3,000	2.0	1,500	6,000	9,000	1,000	3,000	900	3,900	5,100
Potatoes	500	16.0	4,000	8,000	32,000	5,000	2,500	3,200	5,700	26,300
Sesames	500	1.0	25,000	500	12,500	3,000	1,500	1,250	2,750	9,750
Vegetables	500	16.0	5,000	8,000	40,000	5,000	2,500	4,000	6,500	33,500
Sub-total	12,500				109,500		15,100	10,950	26,050	83,450

Al Mahabisha area

Crops	(A) Cultivated area (ha)	(B) Yield/ha (ton)	(C) Price/t (YRs)	(D) Production (ton)	(E) Production value (×10³YRs)	(F) Production cost (YRs/ha)	(G) Production cost (×10³YRs)	(H) Production tax(D) 10% (×10³YRs)	(I) Gross production cut (G)+(H) (×10³YRs)	(J) Net production value(E)-(I) (×10³YRs)
Legumes	2,400	1.4	6,000	3,360	20,160	2,200	5,280	2,016	7,296	12,864
Qut	2,300	2,200 bundles	70	5,060,000	354,200	4,000	9,200	35,420	44,620	309,580
Sorghum	1,500	1.0	2,000	1,500	3,000	700	1,050	300	1,350	1,650
Wheat	800	1.2	2,000	960	1,920	300	240	192	432	1,488
Barley	700	1.2	1,800	840	1,510	300	210	151	361	1,149
Grapes	200	6.3	12,000	1,260	15,120	19,300	3,860	1,512	5,372	9,748
Coffee	200	0.6	28,000	120	3,360	6,000	1,200	336	1,536	1,824
Sub-total	8,700				399,270		21,040	39,927	60,967	388,303
Total	21,200				508,770		36,140	50,877	87,017	471,753

Table 21.7 Project Cost Estimates

	Description	Amount ($\times 10^3$YRs)	Amount ($\times 10^3$US$)
1.	Project office	11,900	2,640
2.	Branch offices	2,400	530
3.	Meteoro-Hydrological observation network	400	90
4.	Rural water supplies	12,900	2,870
5.	Rural road network	149,300	33,180
6.	Agricultural research station	6,800	1,510
7.	Research and training center for irrigation and mechanization	17,100	3,800
8.	Pilot irrigation projects	16,000	3,560
9.	Forest nursery	200	40
10.	Pilot afforestation scheme	1,000	220
11.	Rural infrastructures	34,000	7,560
	Total	252,000	56,000

Item	Quantity	Unit	Rate (YRs'000)	Amount (YRs'000)
1. Project office	5,000	sq.m	2	10,000
Buildings				
Office, Guest house Residence, etc				
Civil works	3	ha	100	300
Fixtures	L.S.			500
Contingencies (10%)				1,100
Total				11,900
2. Branch office				
2.1 Al Mahabisha branch office				
Buildings	500	sq.m	2	1,000
Civil works	0.25	ha	100	25
Fixtures	L.S.			50
Contingencies (10%)				125
Sub-total				1,200
2.2 Abs branch office				
Buildings	500	sq.m	2	1,000
Civil works	0.25	ha	100	25
Fixtures	L.S.			50
Contingencies (10%)				125
Sub-total				1,200
Total				2,400
3. Meteoro-Hydrological observation network				
Meteorological station	5	place	40	200
Hydrological station	2	place	100	200
Total				400

Item	Quantity	Unit	Rate (YRs'000)	Amount (YRs'000)
4. Rural water supplies				
4.1 Sharhil				
Materials and installation	L.S.			2,700
Pumps, electrical equipments and pipes				
Civil works and buildings	L.S.			1,000
Contingencies (10%)				400
Sub-total				4,100
4.2 Qufl Shamal				
Materials and installation	L.S.			1,500
Pumps, electrical equipments and pipes				
Civil works and buildings	L.S.			1,000
Contingencies (10%)				300
Sub-total				2,800
4.3 Al Shaafen				
Materials and installation	L.S.			2,100
Pumps, electrical equipments and pipes				
Civil works and buildings	L.S.			1,000
Contingencies (10%)				300
Sub-total				3,400

Item	Quantity	Unit	Rate (YRs'000)	Amount (YRs'000)
4.4 Abs				
Materials and installation	L.S.			1,400
Pumps, electrical equipments and pipes				
Civil works and building	L.S.			1,000
Contingencies				200
Sub-total				2,600
Total				12,900
5. Rural road network				
5.1 Secondary road				
Hajjah — Al Mahabisha	47	km	800	37,600
Al Mahabisha — Abs	33	km	400	13,200
Contingencies (10%)				5,000
Sub-total				55,800
5.2 Bridge on Wadi Mawr	L.S.			6,000
5.3 Feeder roads				
Abs — Qufl — Al Mahabisha	47	km	300	14,100
Qufl — Sharhil	25	km	300	7,500
Other feeder roads				
a. Mountain region	144	km	300	43,200
b. Tihama region	75	km	200	15,000
Contingencies (10%)				7,700
Sub-total				87,500
Total				149,300

Item	Quantity	Unit	Rate (YRs'000)	Amount (YRs'000)
6. Agricultural research station				
Buildings Office, storage, etc.	2,300	sq.m	2	4,600
Land reclamation	10	ha	50	500
Farm operation equipment Hand tractors and attachments	L.S.			600
Laboratory equipments	L.S.			400
Workshop equipment	L.S.			100
Contingencies (10%)				600
Total				6,800
7. Research and training center for irrigation and mechanization				
Buildings Offices, residences, etc.	4,700	sq.m	1.5	7,000
Land reclamation	20	ha	50	1,000
Construction equipments Bulldozers, power shovels, etc.	L.S.			5,000
Farm operation equipment	L.S.			2,000
Workshop equipment	L.S.			400
Laboratory equipment	L.S.			100
Contingencies (10%)				1,600
Total				17,100

Item	Quantity	Unit	Rate (YRs'000)	Amount (YRs'000)
8. Pilot irrigation projects				
8.1 Wadi-delta plain — Abs area				
Diversion weirs	2	units	3,000	6,000
Main canals	15	km	150	2,250
Tubewells ϕ300mm × 100m	100×4	m	3	1,200
Farm roads, supply canals and land reclamation	L.S.			1,000
Contingencies				1,050
Sub-total				11,500
8.2 Swampy lands — Jaya, Tahannen and Sharhil area				
Tubewells ϕ300mm × 30m	30×9	m	3	810
Main pipe-lines	6	km	160	960
Farm roads, supply pipes and land reclamation	L.S.			500
Contingencies				230
Sub-total				2,500
8.3 Wadi lands	L.S.			2,000
Total				16,000

Item	Quantity	Unit	Rate (YRs'000)	Amount (YRs'000)
9. Forest nursery	L.S.			200
10. Pilot afforestation scheme	L.S.			1,000
11. Rural infrastructures				
11.1 Health facilities				
Main hospital	1	place	8,000	8,000
Branch hospitals	3	place	6,000	18,000
Rural health units	2	place	2,000	4,000
Sub-total				30,000
11.2 Electric power supplies	L.S.			4,000
(Costs of generaters were included in estimate of water supplies.)				
Total				34,000

Table 21.8 Annual Fund Requirement

(Unit: $\times 10^3$ YRs)

Description	Year in order										Total	
	1	2	3	4	5	6	7	8	9	10	($\times 10^3$ YRs)	($\times 10^3$ US$)
(1) Project office	11,900										11,900	2,640
(2) Branch offices				2,400							2,400	530
(3) Meteoro-Hydrological observation network		400									400	90
(4) Rural water supplies		5,000	7,000	900							12,900	2,870
(5) Rural road network		33,500	45,000	28,800	21,000	21,000					149,300	33,180
(6) Agricultural research station			4,000	2,800							6,800	1,510
(7) Research and training center for irrigation and mechanization			5,000	12,100							17,100	3,800
(8) Pilot irrigation project						4,000	5,500	6,500			16,000	3,560
(9) Forest nursery						150	50				200	40
(10) Pilot afforestation scheme						300	300	200	100	100	1,000	220
(11) Rural infrastructures			2,000	2,000	8,000	9,000	9,000	4,000			34,000	7,560
Total ($\times 10^3$ YRs)	11,900	38,900	63,000	49,000	29,000	34,450	14,850	10,700	100	100	252,000	
($\times 10^3$ US$)	2,640	8,640	14,000	10,890	6,450	7,660	3,300	2,380	20	20		56,000

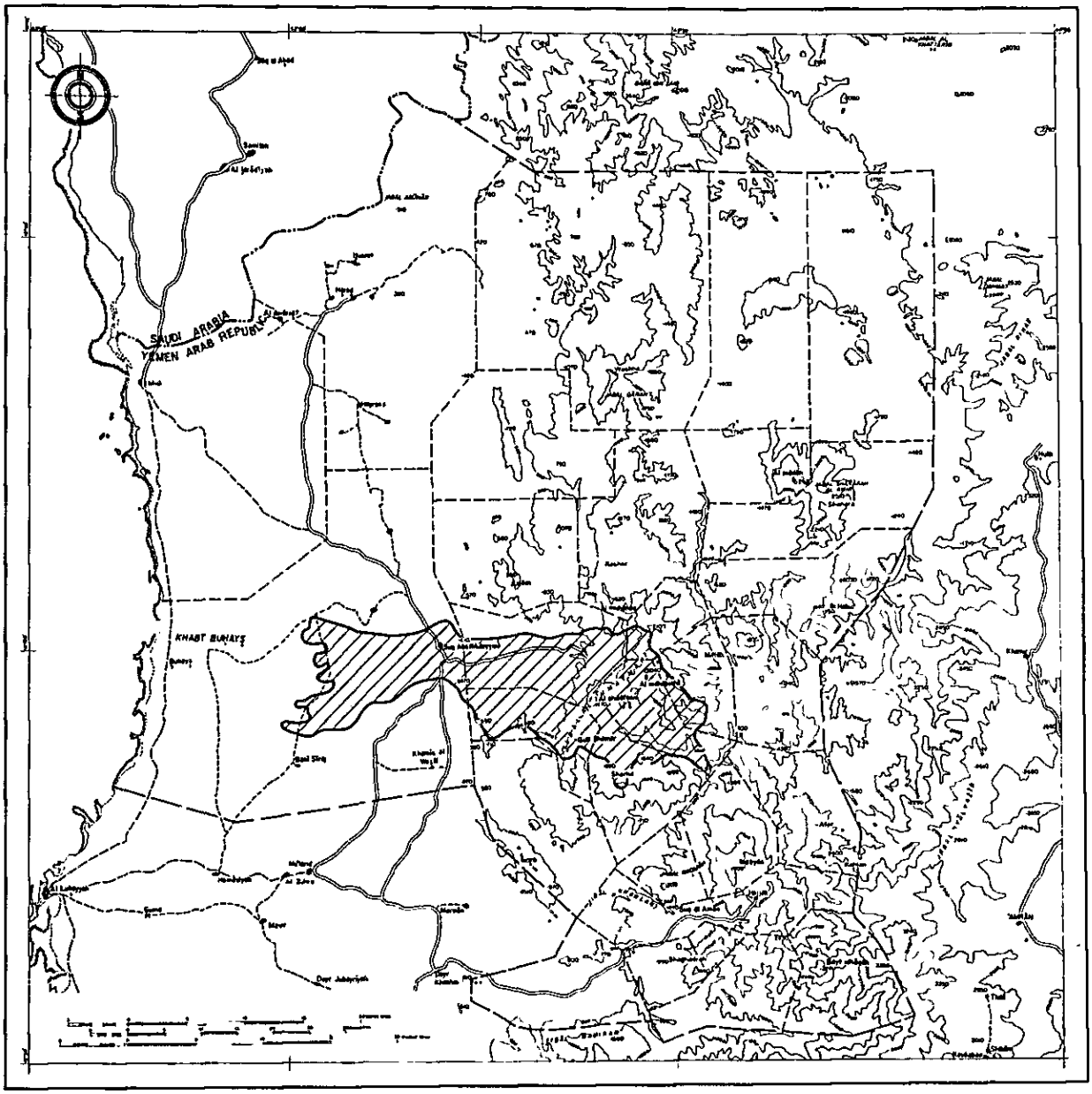
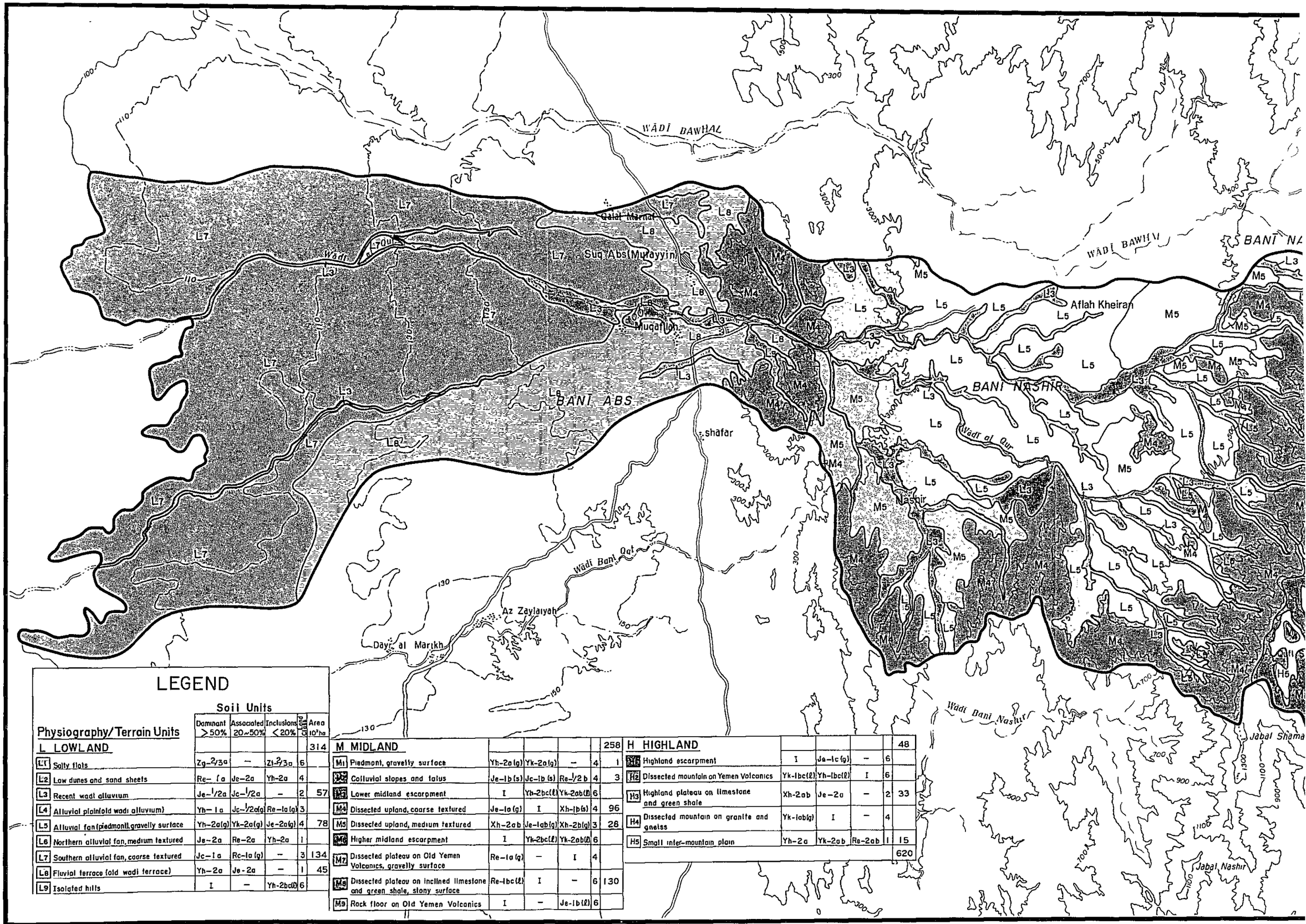


Fig.21.1 Location Map



LEGEND

Soil Units

Physiography/Terrain Units	Dominant >50%	Associated 20–50%	Inclusions <20%	Class	Area 10^3 ha
L LOWLAND					314
L1 Salty flats	Zg–2/3a	–	Z1–2/3a	6	
L2 Low dunes and sand sheets	Re–1a	Je–2a	Yh–2a	4	
L3 Recent wadi alluvium	Je–1/2a	Jc–1/2a	–	2	57
L4 Alluvial plain(old wadi alluvium)	Yh–1a	Jc–1/2a(g)	Re–1a(g)	3	
L5 Alluvial fan(piedmont),gravelly surface	Yh–2a(g)	Yk–2a(g)	Je–2a(g)	4	78
L6 Northern alluvial fan, medium textured	Je–2a	Re–2a	Yh–2a	1	
L7 Southern alluvial fan, coarse textured	Jc–1a	Rc–1a(g)	–	3	134
L8 Fluvial terrace (old wadi terrace)	Yh–2a	Je–2a	–	1	45
L9 Isolated hills	I	–	Yh–2bc(l)	6	
M MIDLAND					258
M1 Piedmont, gravelly surface	Yh–2a(g)	Yk–2a(g)	–	4	1
M2 Colluvial slopes and talus	Je–1b(s)	Jc–1b(s)	Re–1/2b	4	3
M3 Lower midland escarpment	I	Yh–2bc(l)	Yk–2ab(l)	6	
M4 Dissected upland, coarse textured	Je–1a(g)	I	Xh–1b(s)	4	96
M5 Dissected upland, medium textured	Xh–2ab	Je–1ab(g)	Xh–2b(g)	3	28
M6 Higher midland escarpment	I	Yk–2bc(l)	Yk–2ab(l)	6	
M7 Dissected plateau on Old Yemen Volcanics, gravelly surface	Re–1a(g)	–	I	4	
M8 Dissected plateau on inclined limestone and green shale, stony surface	Re–1bc(l)	I	–	6	130
M9 Rock floor on Old Yemen Volcanics	I	–	Je–1b(l)	6	
H HIGHLAND					48
H6 Highland escarpment	I	Je–1c(g)	–	6	
H2 Dissected mountain on Yemen Volcanics	Yk–1bc(l)	Yh–1bc(l)	I	6	
H3 Highland plateau on limestone and green shale	Xh–2ab	Je–2a	–	2	33
H4 Dissected mountain on granite and gneiss	Yk–1ab(g)	I	–	4	
H5 Small inter-mountain plain	Yh–2a	Yk–2ab	Re–2ab	1	15
					620

500 1000 500 0 1 2 3 4 Statute Miles

1000 500 0 1 2 3 4 5 6 Kilometres

WĀDĪ BAWHAL

BANI NASHĪR

Jabal al Jumaymah

Aflah Kheiran

Tahannen

WADI MAW

BANI NASHIR

Wadi al Qur

Wadi Bani Nashir

Jabal Shamal

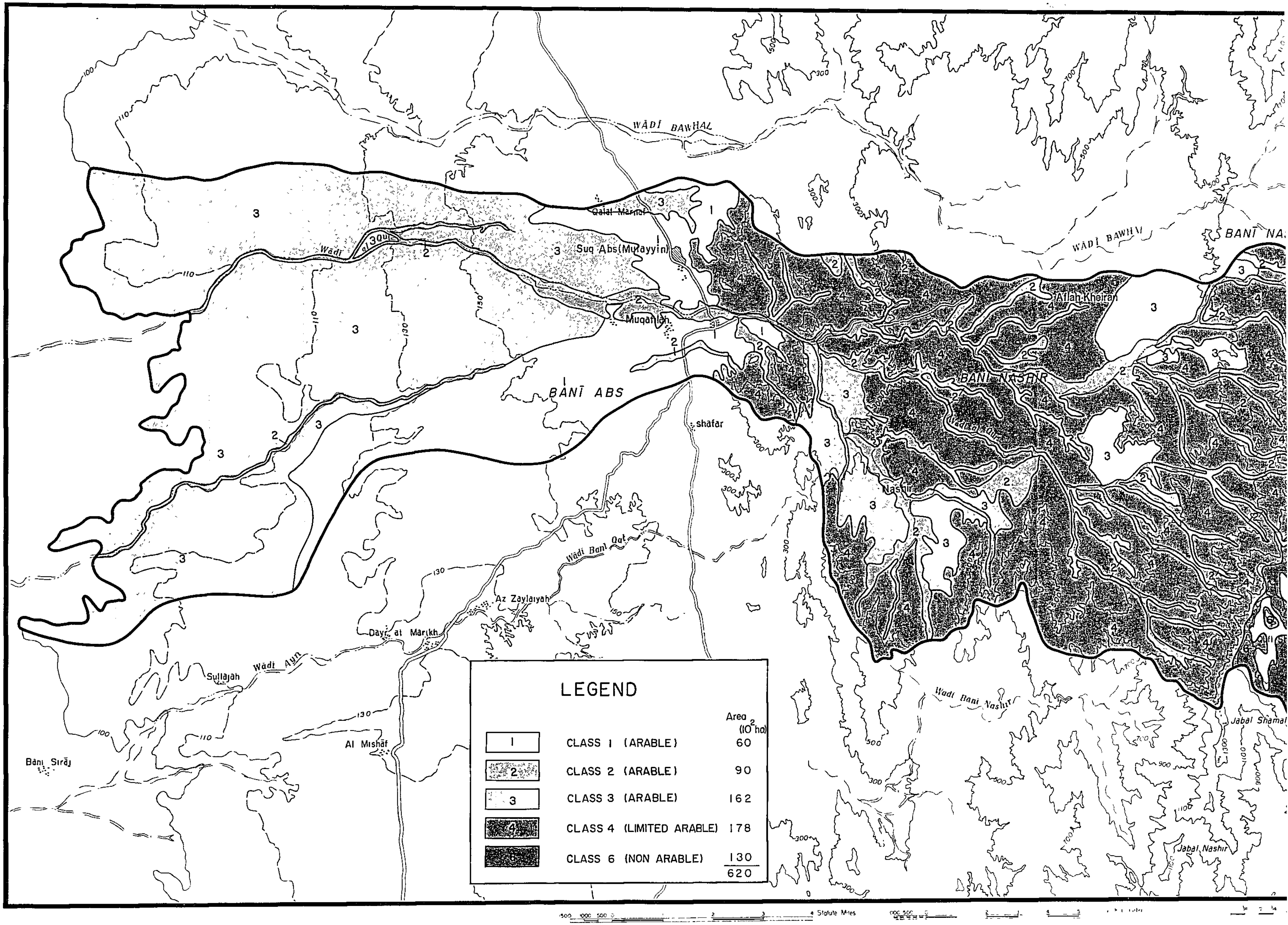
Jabal Nashir

Wadi Dhubawah

Fig.21.2 Physiography and Soils

Kilometres

Nautical Miles



LEGEND
Area (10² ha)
CLASS 1 (ARABLE) 60
CLASS 2 (ARABLE) 90
CLASS 3 (ARABLE) 162
CLASS 4 (LIMITED ARABLE) 178
CLASS 6 (NON ARABLE) 130
620
WĀDĪ BAWHAL
WĀDĪ BAWHAL
BANĪ ABS
BANĪ NASHIR
Suq Abs (Mulayyin)
Muqatilah
Aflah Kheiran
shafar
Nashir
Az Zaylaiyah
Dayr al Marikh
Sullajah
Wadi Ayn
Al Mishaf
Bani Siraj
Wadi Bani Nashir
Jabal Shamal
Jabal Nashir
Statute Miles

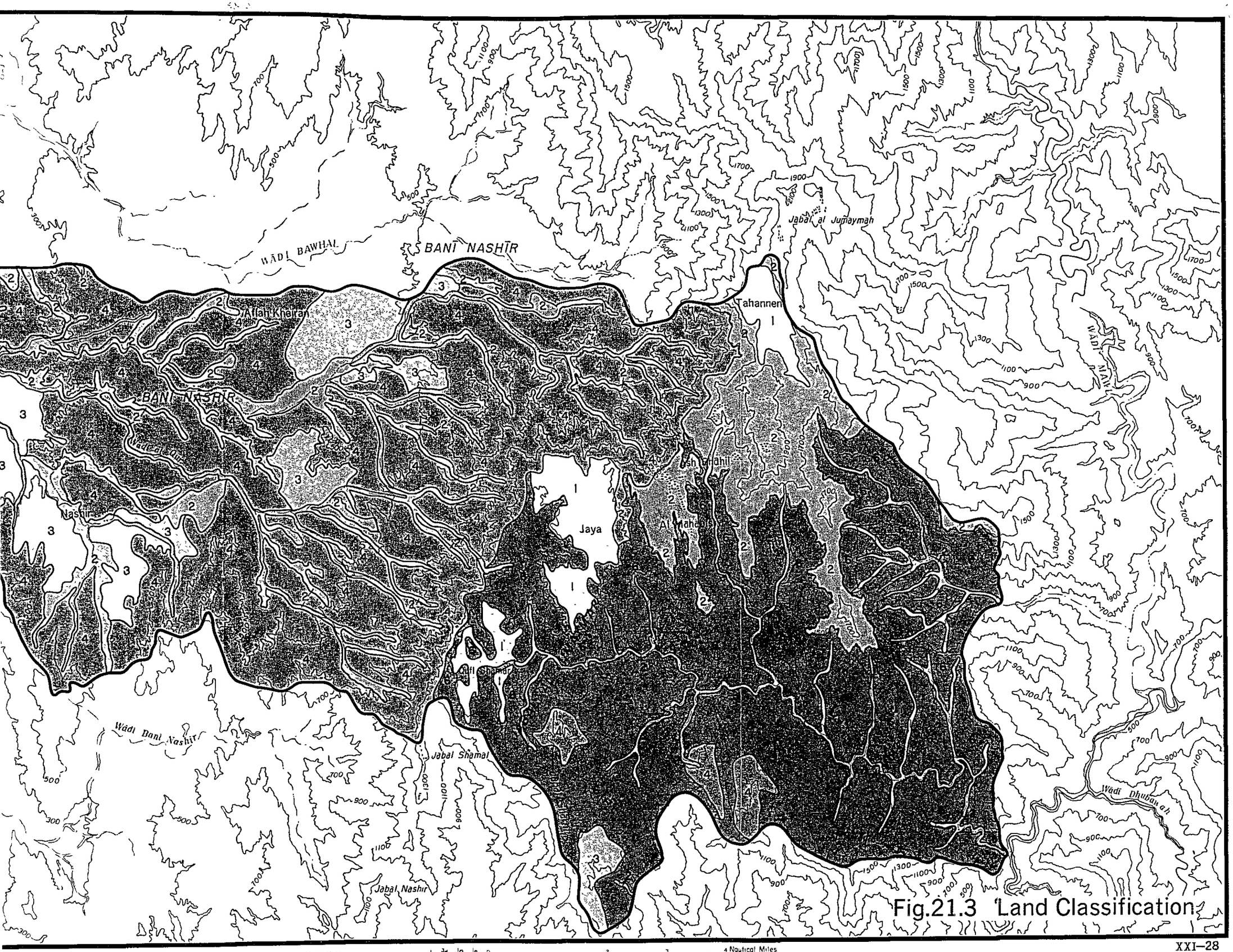
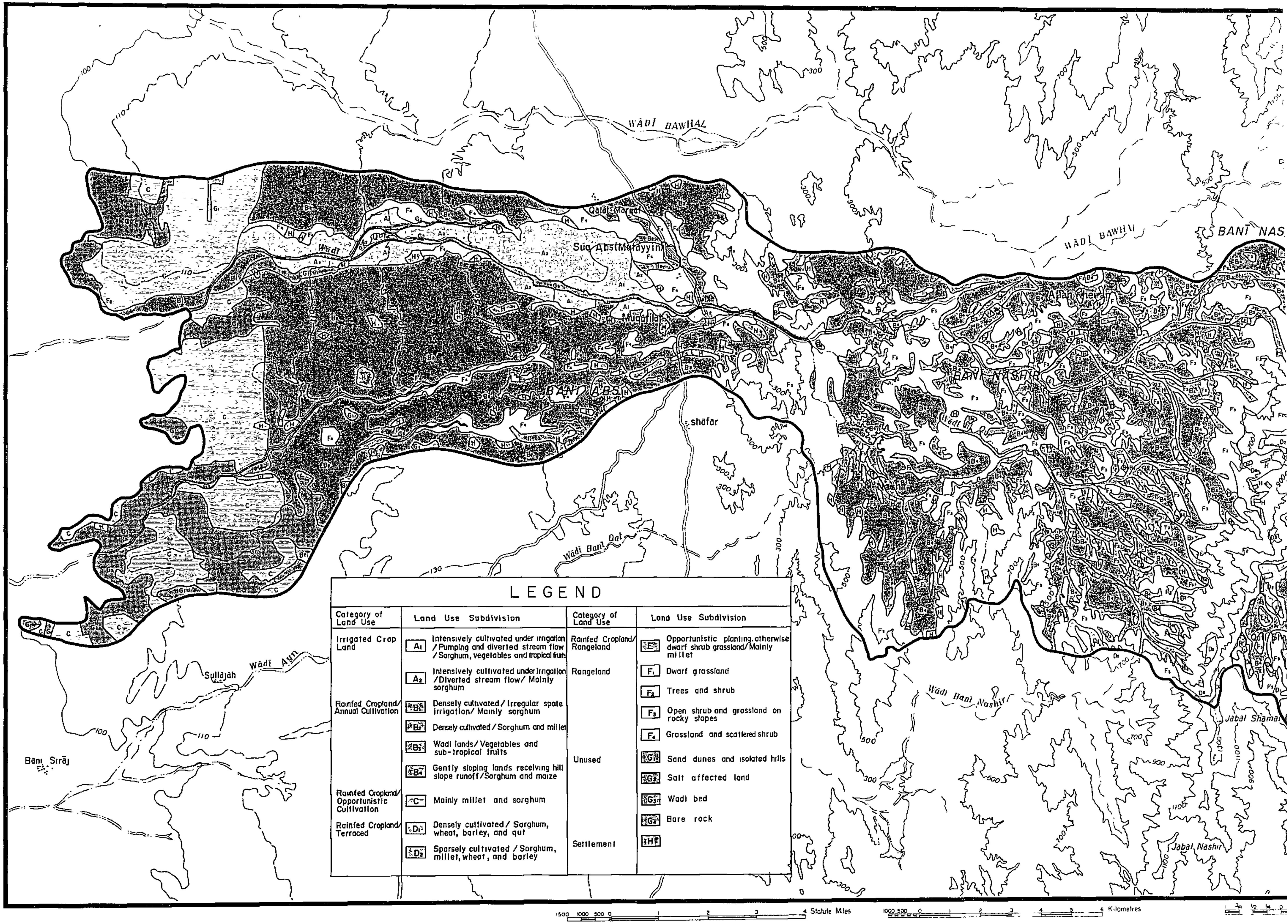


Fig.21.3 'Land Classification'


WĀDĪ BAWHAL
BANĪ NAS
Qalat Markaz
Suq Abs(Mutayyin)
Wadi
Muqāfilah
BANĪ ABS
BANĪ NASHIR
shafar
Wādī Banī Qat
Wādī Banī Nashir
Jabal Shamal
Jabal Nashir
Sullājah
Wādī Ayn
Banī Sirāj
LEGEND
Category of Land Use
Land Use Subdivision
Irrigated Crop Land
A1 Intensively cultivated under irrigation / Pumping and diverted stream flow / Sorghum, vegetables and tropical fruits
A2 Intensively cultivated under irrigation / Diverted stream flow / Mainly sorghum
Rainfed Cropland/ Annual Cultivation
B1 Densely cultivated / Irregular spate irrigation / Mainly sorghum
B2 Densely cultivated / Sorghum and millet
B3 Wadi lands / Vegetables and sub-tropical fruits
B4 Gently sloping lands receiving hill slope runoff / Sorghum and maize
Rainfed Cropland/ Opportunistic Cultivation
C Mainly millet and sorghum
Rainfed Cropland/ Terraced
D1 Densely cultivated / Sorghum, wheat, barley, and qut
D2 Sparsely cultivated / Sorghum, millet, wheat, and barley
Rainfed Cropland/ Rangeland
E Opportunistic planting, otherwise dwarf shrub grassland / Mainly millet
Rangeland
F1 Dwarf grassland
F2 Trees and shrub
F3 Open shrub and grassland on rocky slopes
F4 Grassland and scattered shrub
Unused
G1 Sand dunes and isolated hills
G2 Salt affected land
G3 Wadi bed
G4 Bare rock
Settlement
H
1500 1000 500 0 1 2 3 4 Statute Miles
1000 500 0 1 2 3 4 5 6 Kilometres

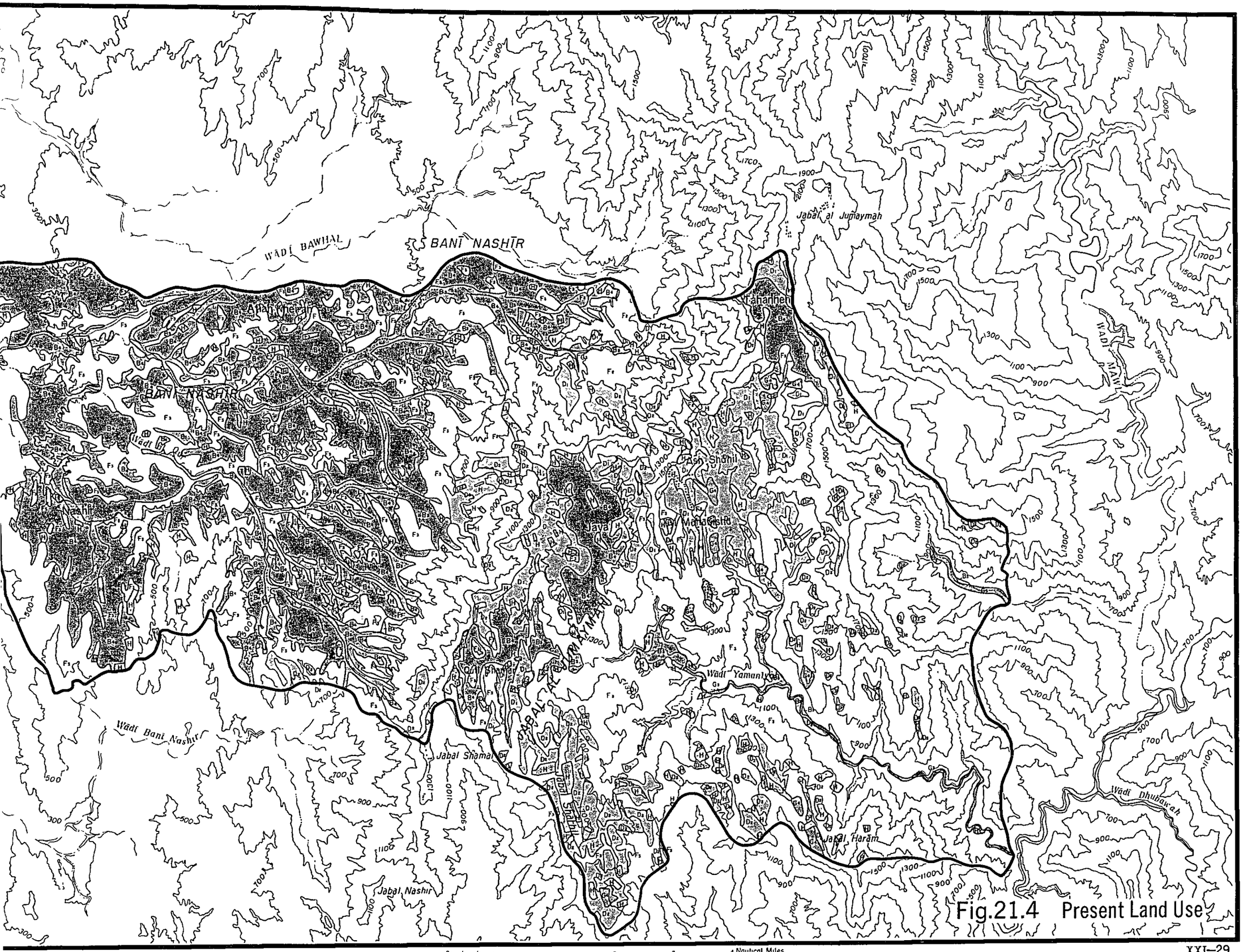
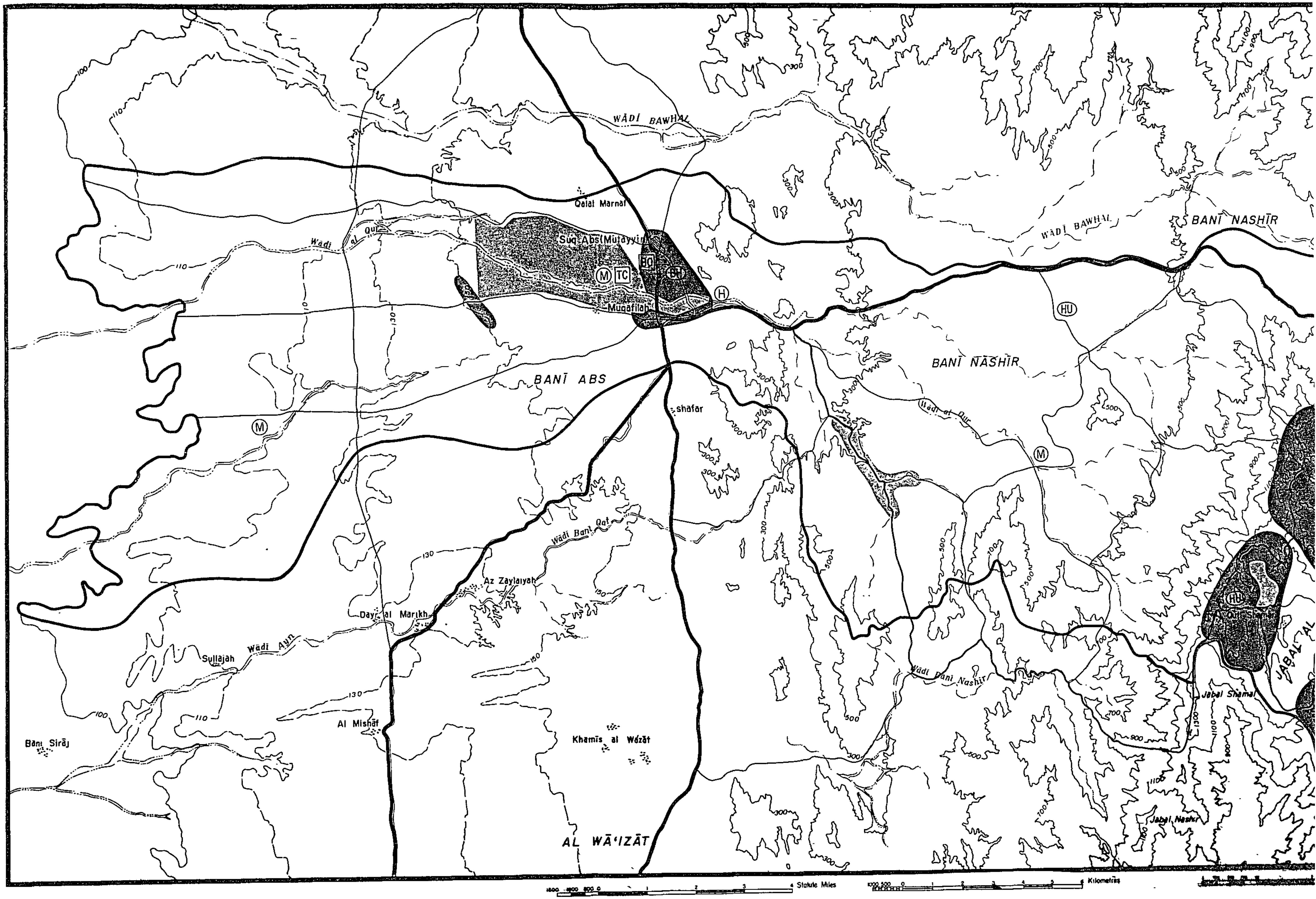


Fig.21.4 Present Land Use



WĀDĪ BAWHAL
Qalat Marnaf
Sūq Abs (Mutayyin)
Wādī al Qur
Muqāfilah
BANĪ ABS
BANĪ NĀSHIR
WĀDĪ BAWHAL
BANĪ NASHĪR
Shafar
Wādī al Qur
Wādī Banī Qal
Az Zaylaiyah
Dayr al Marikh
Sullajah
Wādī Ayn
Al Mishaf
Bani Siraj
Khamīs al Wāzāt
AL WĀ'IZĀT
Wādī Banī Nashir
Jabal Shamal
Jabal Nashir
JABAL AL
Statute Miles
Kilometres

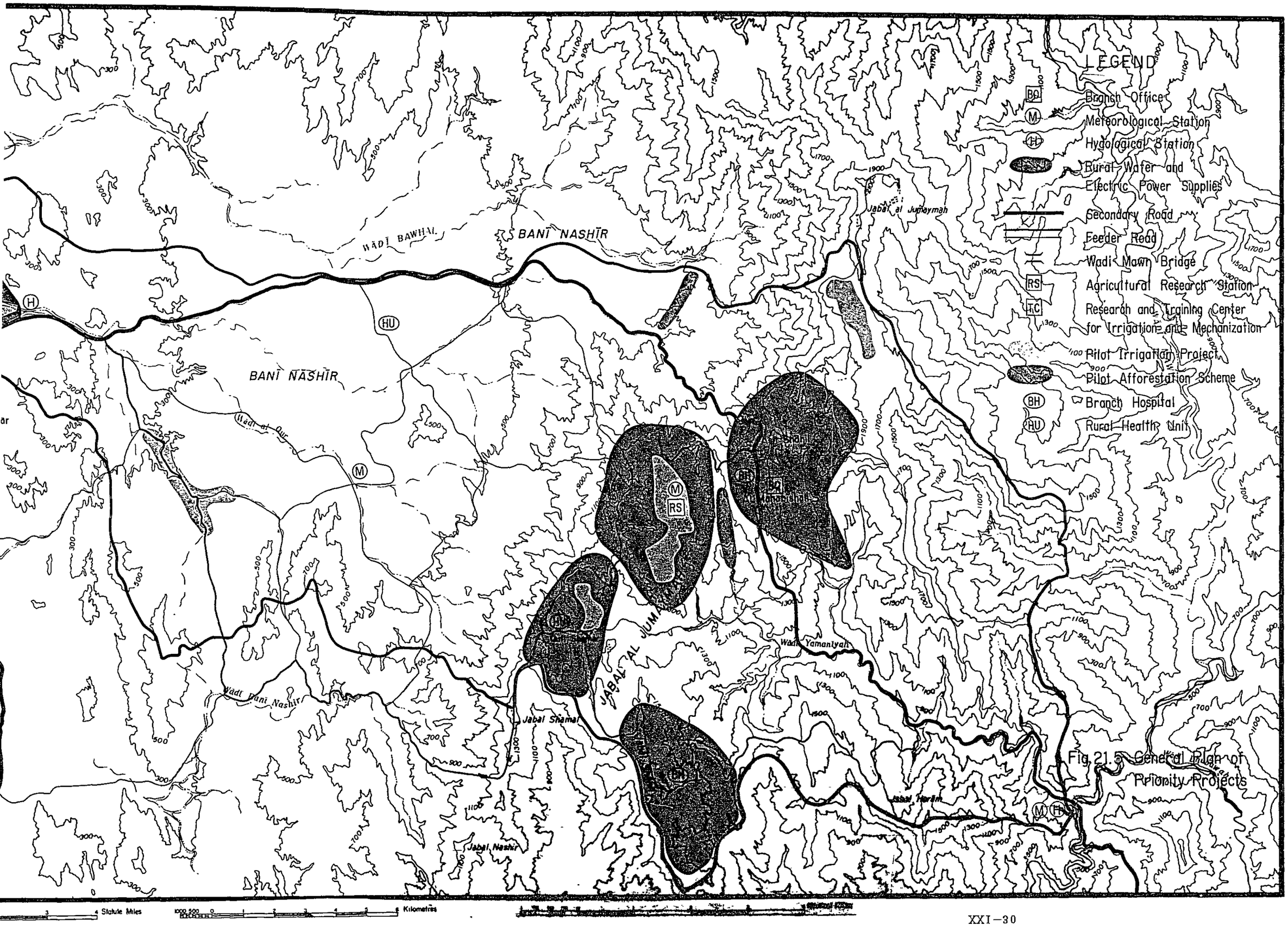
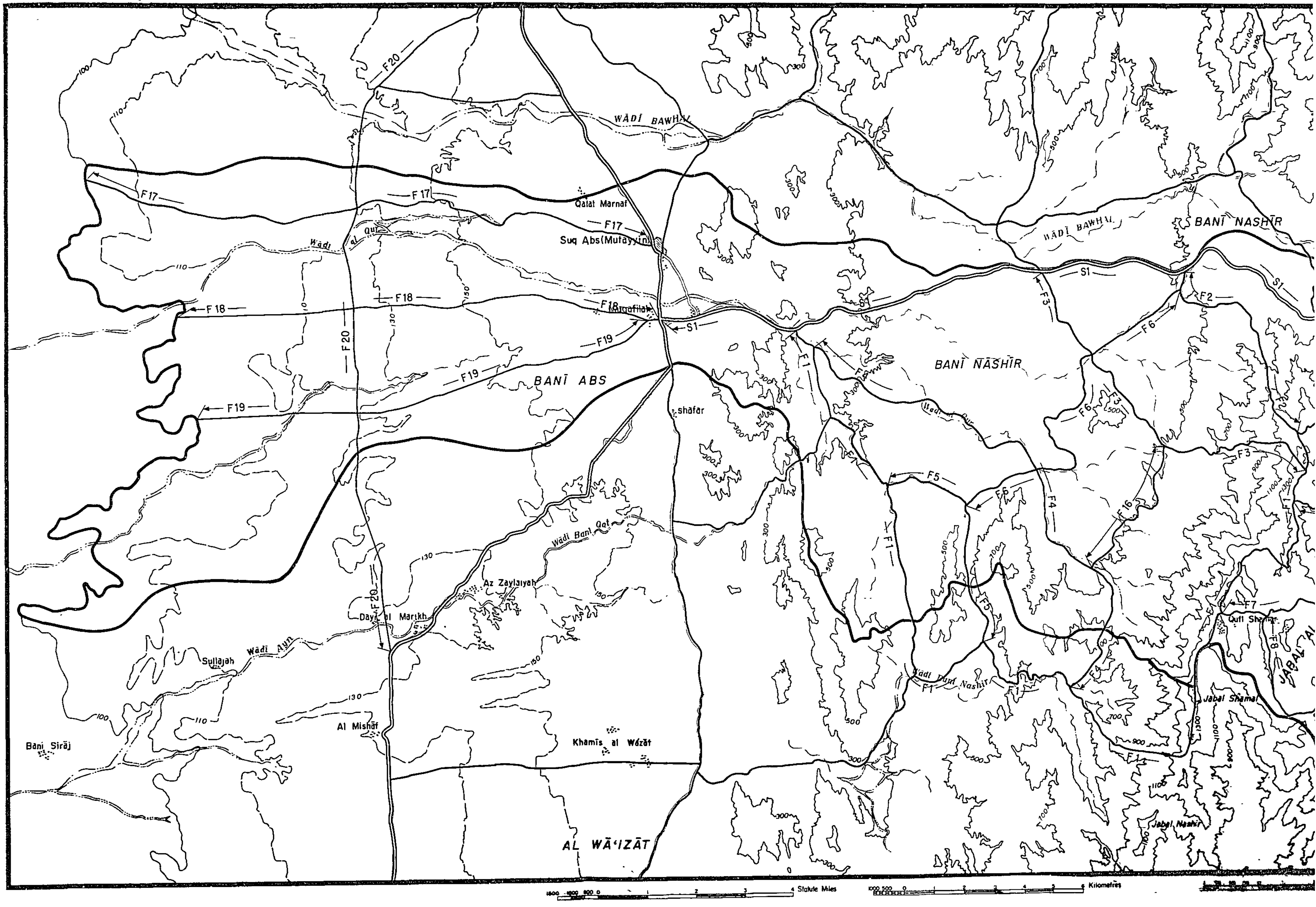
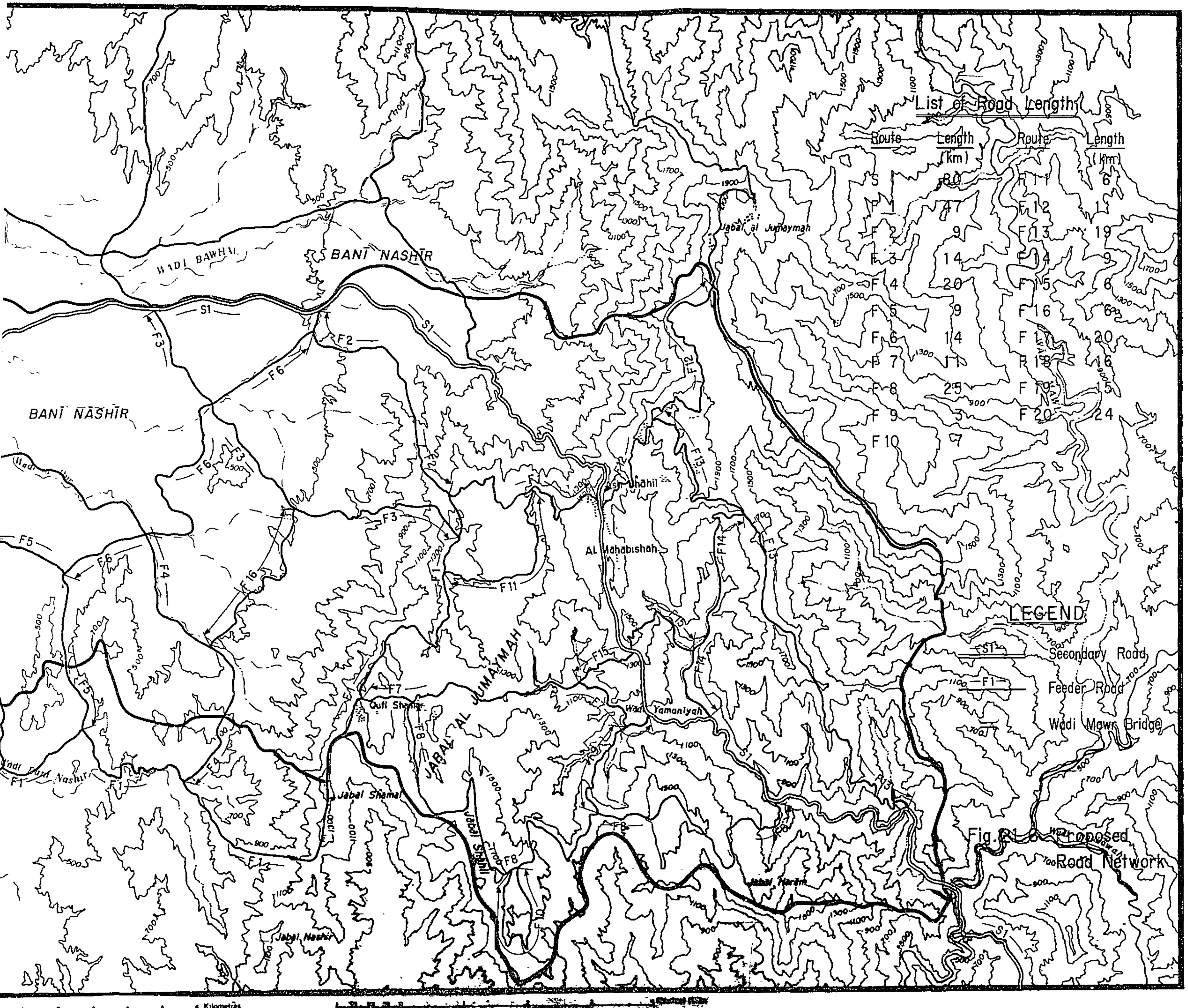


Fig 21.5 General Plan of Priority Projects

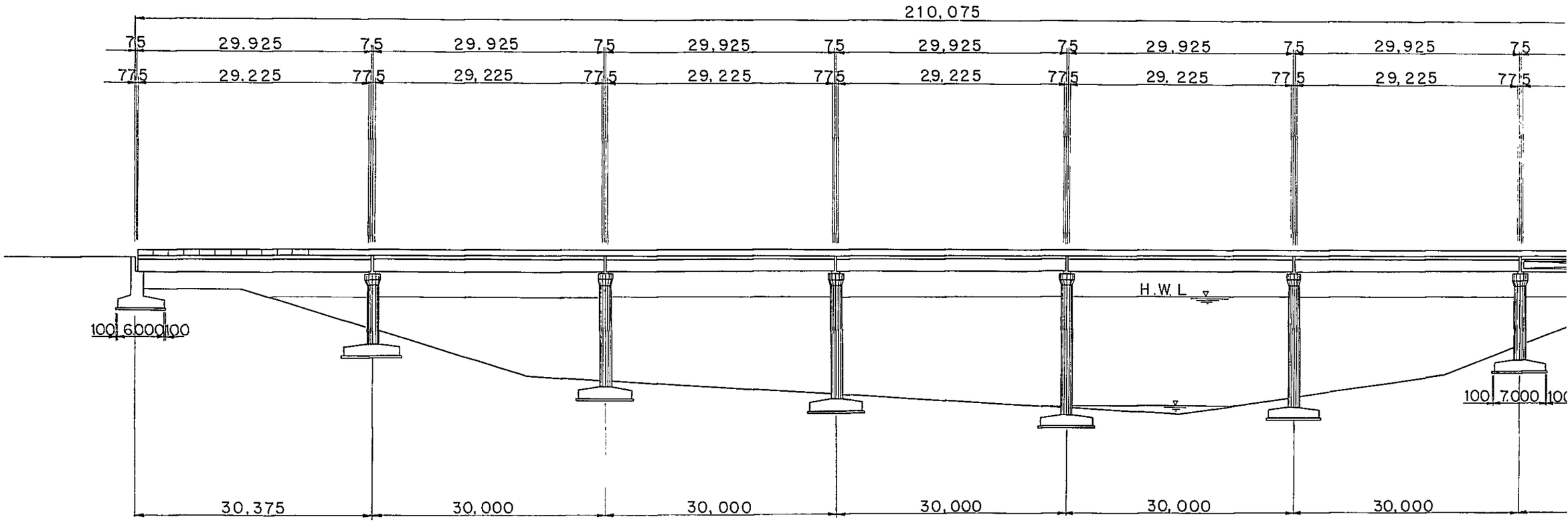

WĀDĪ BAWHAL
Qalat Marnaf
Suq Abs (Mufayyin)
Wādı al Qur
BANĪ ABS
shāfar
Wādı Banı Qat
Az Zaylaıyah
Dayr al Martkh
Sullājah
Wādı Ayn
Al Mishāf
Bani Sirāj
Khamīs al Wāzāt
AL WĀ'IZĀT
BANĪ NĀSHIR
WĀDĪ BAWHAL
BANĪ NASHĪR
Wādı Qur
Wādı Banī Nashir
Qufl Shamar
Jabal Shamar
Jabal Nashir
Statute Miles
Kilometres



List of Road Length

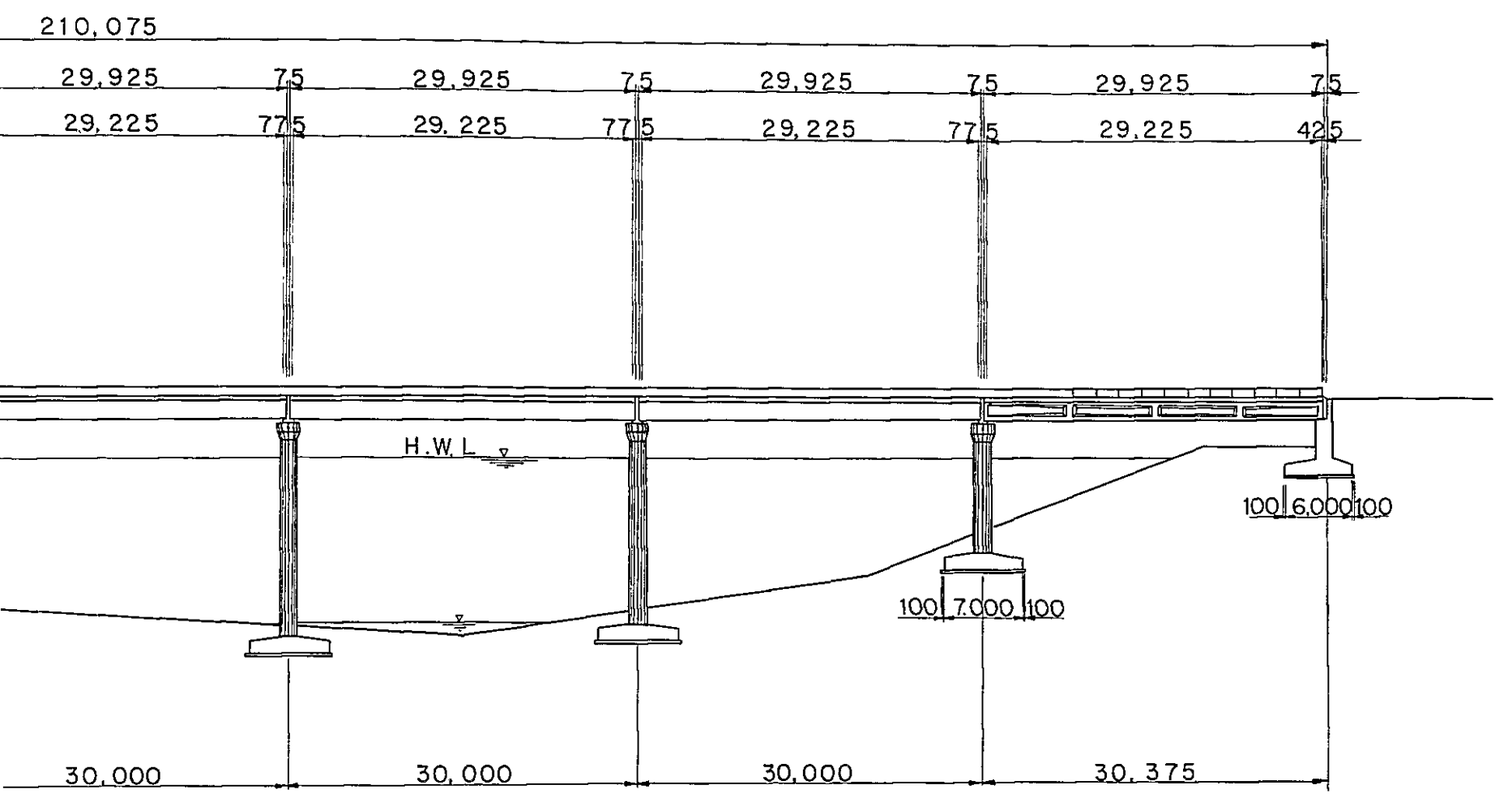
Route	Length (km)	Route	Length (km)
S	80	F 11	6
F 1	47	F 12	11
F 2	9	F 13	19
F 3	14	F 14	9
F 4	20	F 15	6
F 5	9	F 16	6
F 6	14	F 17	20
F 7	11	F 18	16
F 8	25	F 19	15
F 9	3	F 20	24
F 10	7		

Fig. 21.6 Proposed Road Network

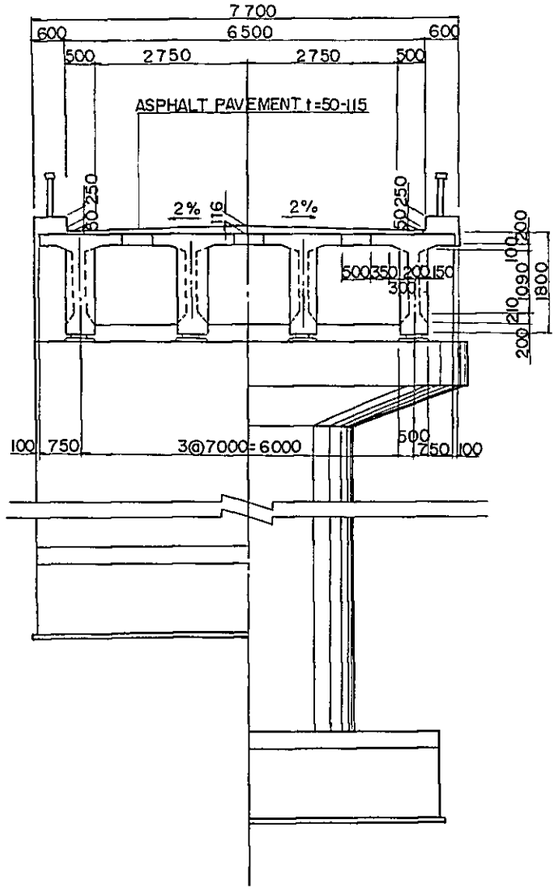


PROFILE SCALE 1 : 500

Fig. 21.7 Wadi Mawr Bridge



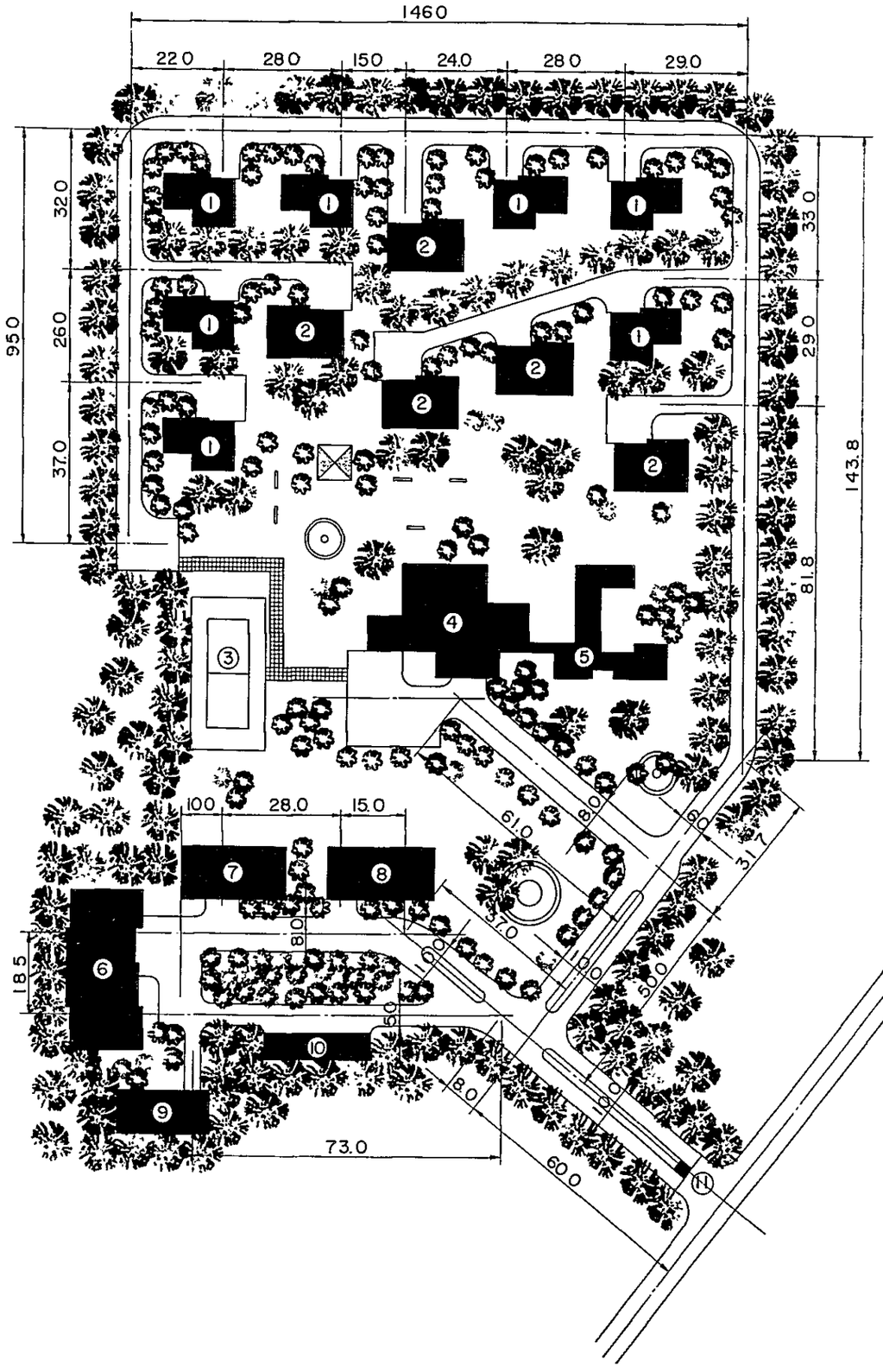
PROFILE SCALE 1 : 500



CROSS SECTION

SCALE 1 : 100

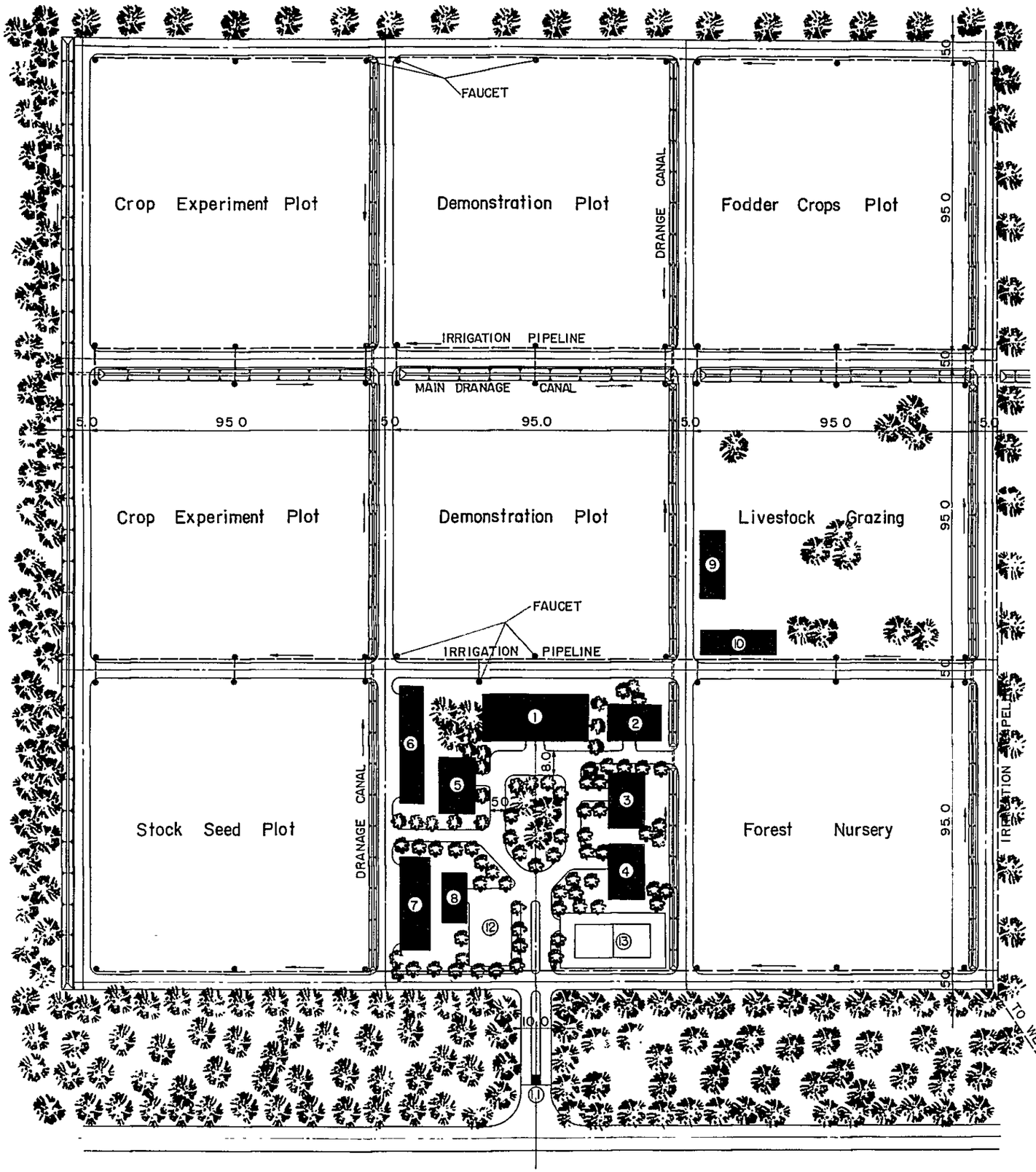
Fig. 21.7 Wadi Mawr Bridge

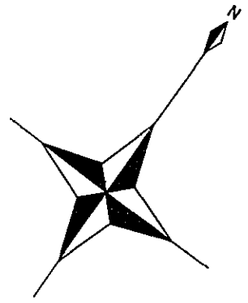


LEGEND

1. TWO BEDROOM RESIDENCE
2. THREE BEDROOM RESIDENCE
3. TENNIS COURT
4. CLUB
5. GUEST HOUSE
6. MAIN OFFICE
7. ROAD CONSTRUCTION DEPARTMENT
8. RURAL WATER SUPPLY DEPARTMENT
9. DRIVERS' DORMITORY
10. COVERED PARKING
11. MAIN GATE AND GUARD HOUSE

Fig. 21.8 Proposed Layout of Project Office





LEGEND

1 MAIN OFFICE
2 LIVESTOCK DEPARTMENT
3 AFFORESTATION DEPARTMENT
4 IRRIGATION DEPARTMENT
5 CROP RESEARCH DEPARTMENT
6 FARM TOOLS STORAGE
7 FERTILIZER STORAGE
8 WATCHMAN'S DORMITORY
9 FODDER STORAGE
10 STABLE
11 MAIN GATE AND GUARD HOUSE
12 PARKING AREA
13 TENNIS COURT

Fig.21.9 General Layout of Agricultural Research Station

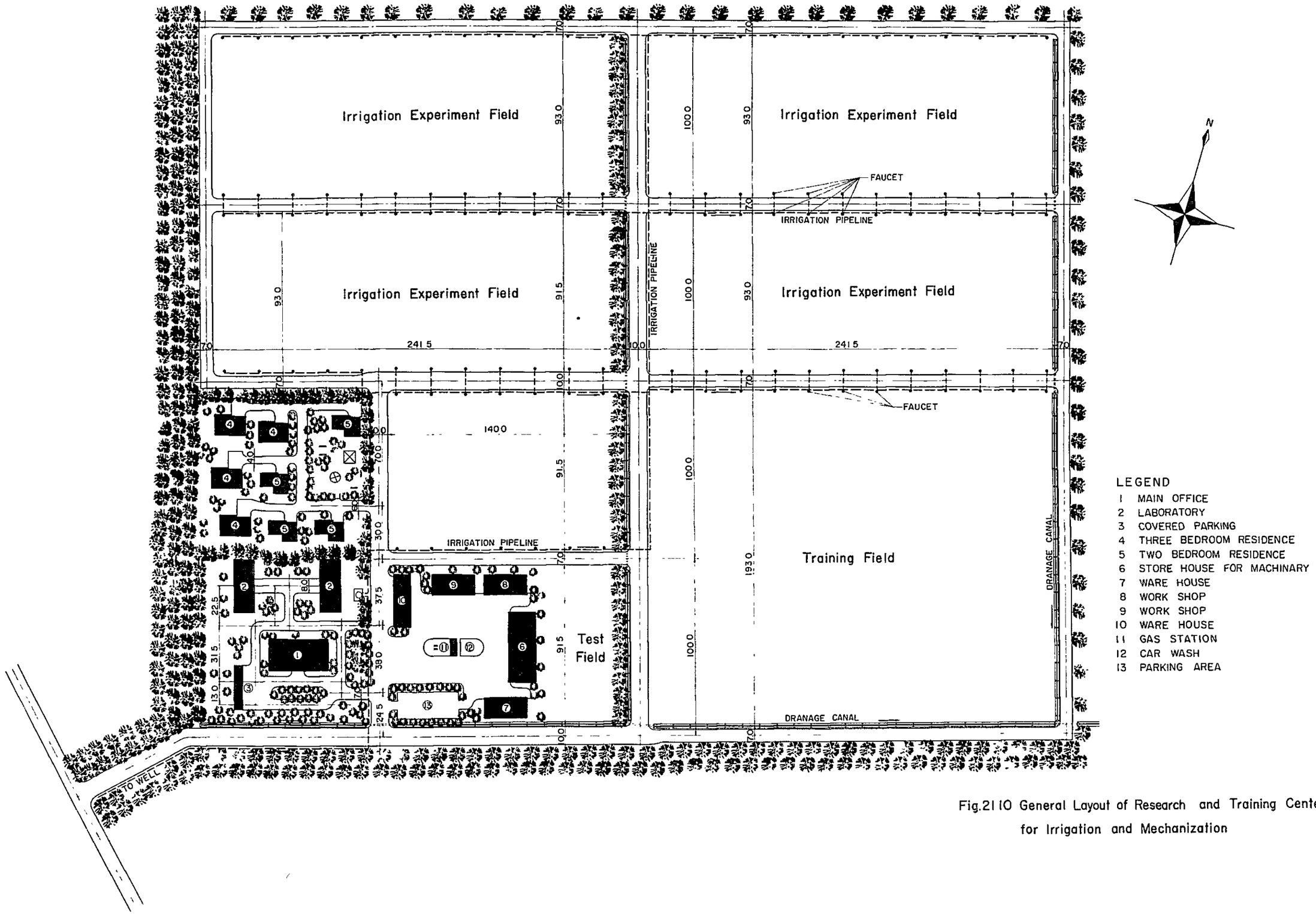


Fig.21 10 General Layout of Research and Training Center for Irrigation and Mechanization

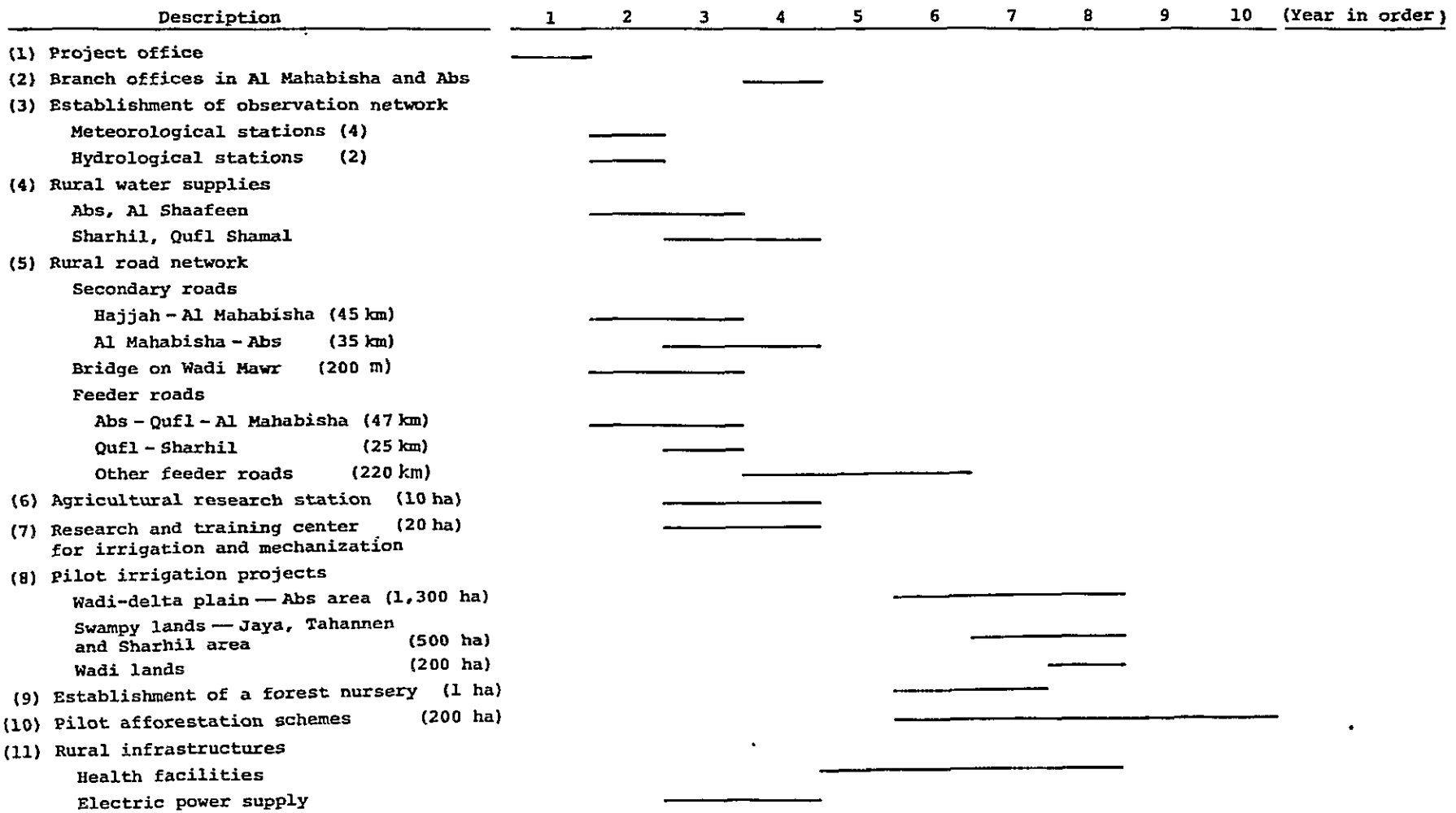


Fig. 21.11 Preliminary Implementation Schedule for Priority Projects