REPORT
ON
MASTER PLAN STUDY
FOR
HAJJAH PROVINCE INTEGRATED RURAL DEVELOPMENT
IN
THE YEMEN ARAB REPUBLIC

VOLUME TWO — STUDY REPORT

MARCH 1980

JAPAN INTERNATIONAL COOPERATION AGENCY

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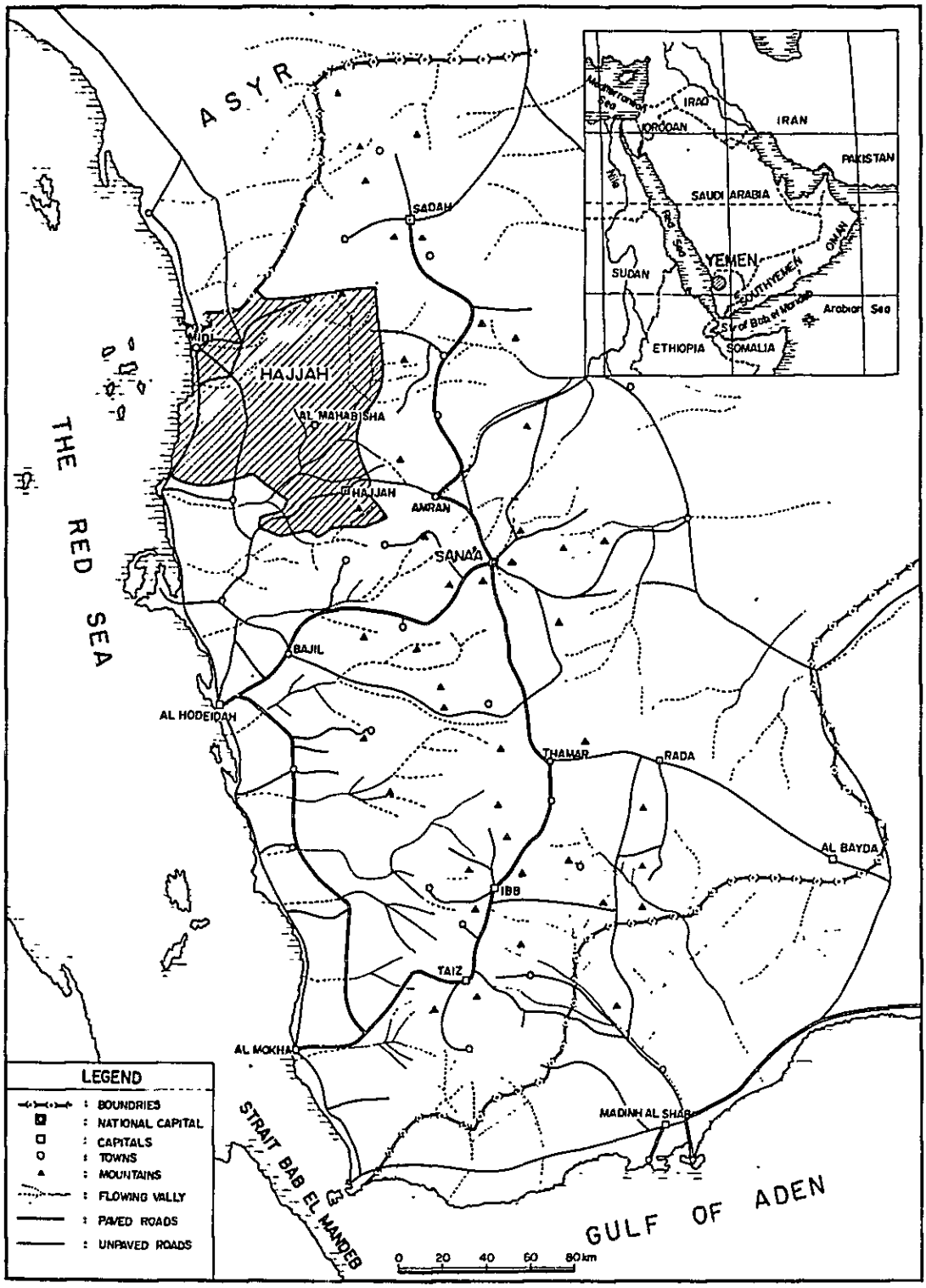
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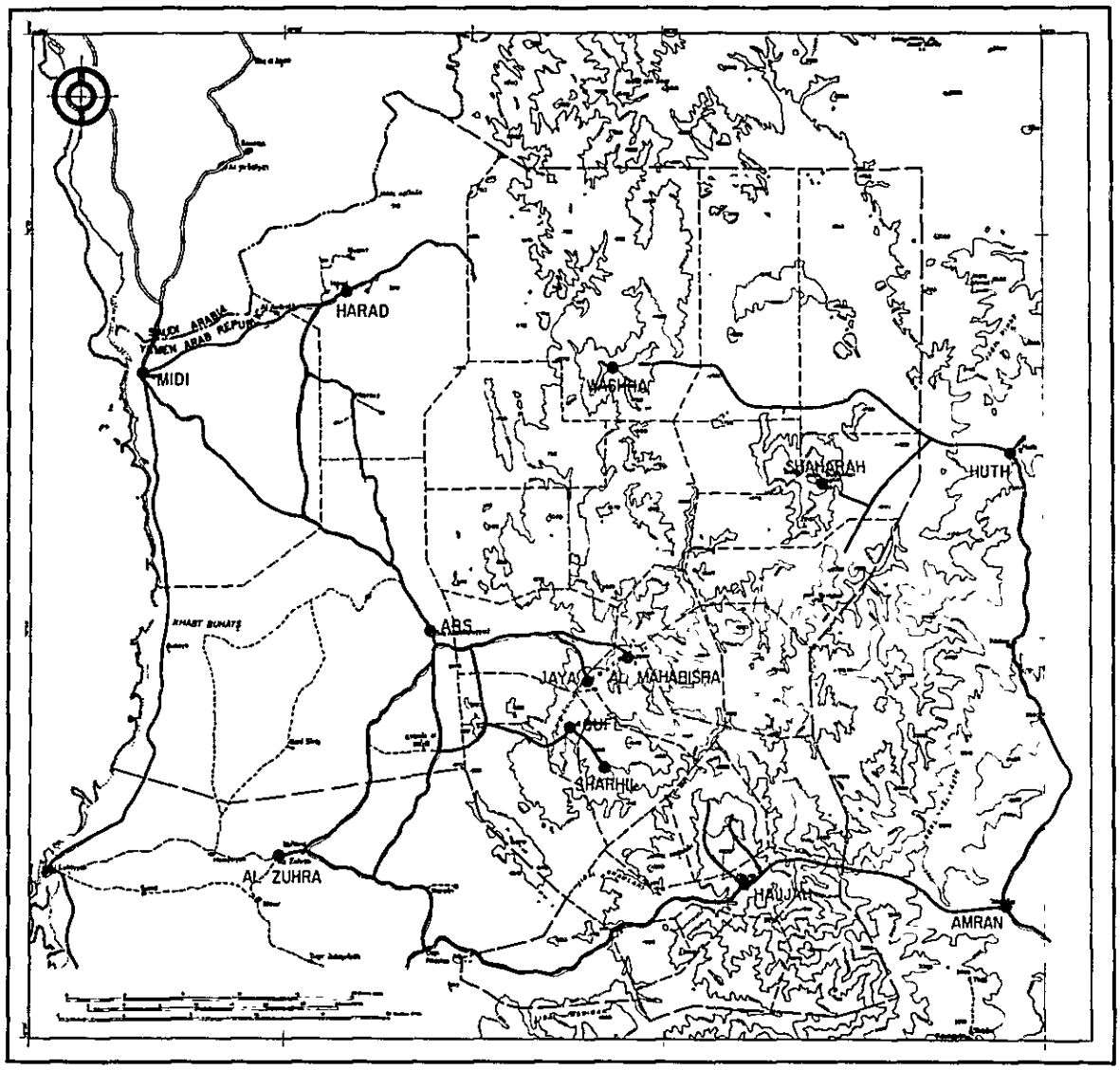

HAJJAH PROVINCE

BASIC DATA

AREA	:	200,000 sq.km
POPULATION	:	6.5 million (1976)
rate of growth		2 % (from 1970 to 1976)
density		28 per sq.km
birth rate		46 (per 1,000)
death rate		27 (per 1,000)
GROSS NATIONAL PRODUCT (GNP)	:	US$1,630 million (1975/76)
per capita		US$390 (1976/77)
CURRENCY UNIT	:	Yemen Rial (YR) YR 1.00 = 100 Fils
CURRENCY EQUIVALENTS	:	YR 1.00 = US$0.22 ≒ ¥50 US$1.00 = YR4.50 ≒ ¥230
FISCAL YEAR	:	July 1 to June 30

WEIGHTS AND MEASURES
(Metric System)

1 millimeter (mm)	=	0.039 inches
1 meter (m)	=	3.28 feet
1 square meter (m^2)	=	10.76 square feet
1 cubic meter (m^3)	=	1.31 cubic yards
1 cubic meter per second (m^3/sec)	=	35.31 cubic feet per second
1 liter per second (1/sec)	=	0.035 cubic feet per second
1 kilometer (km)	=	0.62 miles
1 square kilometer (km^2)	=	0.386 square miles
1 hectare (ha)	=	2.47 acres
1 kilogram (kg)	=	2.205 pounds
1 metric ton (ton)	=	2,205 pounds

ABBREVIATIONS

YAR	=	Yemen Arab Republic
ACB	=	Agricultural Credit Bank
ACF	=	Agricultural Credit Fund
CARS	=	Central Agricultural Research Station, Taiz
CPO	=	Central Planning Organization
CYDA	=	Confederation of Yemen Development Authorities
LDA/LDB	=	Local Development Authority/Board
SURDP	=	Southern Uplands Rural Development Project
SURDU	=	Southern Uplands Rural Development Unit
TDA	=	Tihama Development Authority
UNDP	=	United Nations Development Programme
JICA	=	Japan International Cooperation Agency
GNP	=	Gross National Product
GDP	=	Gross Domestic Product

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I BACKGROUND

(1) Physical Condition

Location

1.01 The Yemen Arab Republic lies between latitudes 12°40' and 17°26' north, and longitudes 42°30' and 46°31' east, and located in the southwestern corner of the Arabian Peninsula. The country is bordered by Saudi Arabia in the north, the Peoples' Democratic Republic of Yemen in the south and south east, and the Red Sea in the west. East of the Yemen is the great Arabian desert, the Yemen quarter of Rub-al Khali.

Natural regions

1.02 Covering an area of approximately 200,000 km^2, Yemen is divided into four natural regions based on the particular topographic structure:

a) Tihama Coastal Lowlands
b) Foothills and Middle Heights of the Western Slopes
c) Central Highlands
d) Eastern Semi-Desert Plateau

Tihama coastal lowlands: This region covers an area 30-60 km wide stretching along the Red Sea. The elevation ranges from sea level to about 200 m at the foothills. It is plain or slightly undulating, and intersected by dispersed, wide shallow wadis which flow down from the central mountain range into the Red Sea.

Foothills and middle heights: The foothill and middle heights of the central mountain region are located between the Tihama and central highlands within the elevation range of 200 m to 1,500 m above sea level. The topography is very rugged, cut by deep wadis. Most of these wadis drain to the west on the Tihama,

while the wadis to the south and east of Taiz drain to the south into the Gulf of Aden.

Central highlands: This region includes the central mountain range exceeding 1,500 m elevation above sea level which extends from Ibb in the south into Saudi Arabia in the north. The area of the highest land is found between Ibb and Sana'a where mountain peaks frequently exceed 3,000 m. The highest of them is Nabi Shnayb (3,760 m). The Topography to the west is very rugged. The eastern slopes are gentle and terminate at the high plateau area above 2,000 m elevation. The major towns located in this region are Sana'a, Ibb, Yarim, Dhamar, Sadah, and Monacka.

Eastern semi-desert plateau: The land slopes gently eastward and forms rolling country dropping to an elevation of 1,000 m where it borders the Empty Quarter Rub-al Khali.

Climate

1.03 Yemen is located in the northern stretches of the tropical climatic zone with two rainfall seasons, one in April-May the other in July-September, and a long dry, almost rainless period, of four to five months during the late autumn and winter. Rain bearing winds blow from southeast and southwest. Amount of annual rainfall depends mainly on altitude. The rainfall steadily decreases from the south to north.

1.04 In the Tihama along the coast, the average annual rainfall is generally less than 400 mm. The mean monthly temperature does not vary considerably. The relative humidity is high and dew formation along the coastal strip is common. Winds generally blow from south west and north

west with high velocities and cause sand-movement in the coastal belt or soil erosion in the cultivated fields of inner lands.

1.05 The rainfall in the foothills and middle heights is over 400 mm and concentrated around August and September. The amount of rainfall increases as the elevation increases up to an average annual of 800 mm at an elevation of about 2,300 m. The temperature is moderate all the year round in the midlands. The relative humidity is lower in winter and higher in the rainy months of spring and summer.

1.06 In the central highlands, annual rainfall is said to be over 1,000 mm on the rain-exposed slopes of the most southern end (Ibb district). It decreases at first rapidly then gradually to the north. The mean annual rainfall is about 300 mm in Sana'a and 200 mm near Saudi Arabian border in the north. The temperature is moderate in summer, but frequently becomes around freezing point during winter. The relative humidity is low.

1.07 In the eastern semi-desert plateau, temperatures are high and rainfall is only about 100 mm to 200 mm which from desert conditions in the area.

Geology and soil

1.08 The country lies over a complex metamorphic rocks of Pre-cambrian basement rocks, Mesozoic sediments, Tertiary Volcanic ejecta and Quarternary unconsolidated materials. Pre-cambrian basement rocks are distributed in eastern, northern, and northwestern part of Yemen. Mesozoic sediment covering over Pre-cambrian basement rocks in uncomformity, can widely be seen in the northern part of Yemen. Moreover, the distribution of Tertiary volcanic ejecta is dominant in

northern part of Yemen. Craters formed by Quarternary volcanic activities can be seen around Sana'a and Marib. Quaternary alluvial and aeolian deposits cover the coastal Tihama plain and the extended depressions in the east.

(2) General Economy

Economic structure and its growth

1.09 The total area of YAR is about 200,000 km^2, with about 6 million population in 1975. Total resident population was estimated at about 4.5 million with population density of some 23 persons per km^2 in 1975. Administratively, it is divided into ten provinces, namely Sana'a, Hodeidah, Taiz, Ibb, Sadah, Hajjah, Dhamar, Al Beidha, Al Mahwit and Marib. Each province is further subdivided into Quada's, Nahiya's, Ozlah's and villages.

1.10 The GDP of YAR has recorded steady growth during 1969/1970-1975/1976 period except in 1973 fiscal year, with an average annual growth rate of 8.5 % in real terms. The GDP attained YR 5,181 million in 1975/76 fiscal year in current prices. GDP per capita, however, remained as low as some YR 1,150 in this year, indicating low productivity per worker in the country.

1.11 Agricultural sector is dominating in the economy of YAR. Value-added of this sector recorded YR 2,305 million in the 1975/76 fiscal year, contributing some 44 % of the GDP. Trade sector takes second place with YR 1,220 million or 23.5 % of the total GDP. Services sector follows with YR 835 million or 16.1 % of GDP. The GDP at current prices during the period of 1969/70-1975/76 is as shown in Table 1.1.

1.12 The significance of the agricultural sector has, however, been weakening gradually in these years. Its share in GDP dropped some 8 % from 53 % in the 1969/70 fiscal year to 44 % in the 1975/76 fiscal year. The average growth rate during this period was 7.8 % in real terms. Trade sector and services sectors grew at an average annual growth rate of 8.0 % and 8.3 % respectively during this period, which were higher than that of the agricultural sector. In terms of the number of workers employed, about 73 % were in agricultural sector in 1975, being followed by trade sector employing some 7 % of the total labour force. Though the number has been decreasing, the large majority of the people in YAR are still engaged in agriculture. Estimated employment by sector is as shown in Table 1.2.

Government revenues and expenditures

1.13 Until the 1975/76 fiscal year, the Government has been unable to cover its current expenditures from domestic revenue due mainly to the narrow tax base which did not allow the public sector to capture the country's growing money incomes. However, the Government has made strenuous efforts to improve this budgetary situation by raising additional revenue and keeping a strict control over current expenditure. As a result, it succeeded gradually in eliminating the current deficit and more recently, in achieving significant current surpluses as shown below:

Summary of Government Budget

(Unit: $\times 10^6$YRs)

	Description	1970/71	1975/76	1976/77
a.	Current Revenues	97	565	1,293
	Import Duties	(53)	(393)	(929)
	Others	(44)	(172)	(364)
b.	Current Expenditures	170	604	841
c.	Current Deficit/Surplus	-73	-39	+452
d.	Development Expenditures	83	340	463
e.	Foreign Assistance, Net	119	609	606

1.14 During the fiscal 1976/77, the current budget yielded its first surplus of YR 452 million and a similar result is expected for 1977/78. In the 1976/77 fiscal year, current government revenue amounted to some 12 % of GNP. The structure of the government revenue is dominated by import duties which in the 1976/77 fiscal year accounted for some 72 % of total revenue. Other indirect taxes contributed 8 % and direct taxes on incomes and profits represented only 3 % of the total.

1.15 During the past years, generous foreign aid has helped the Government to finance the development projects and programme. Especially, cash grants provided by Saudi Arabia has contributed much to easing the burden of current expenditures. Although substantial foreign aid is likely to continue in the foreseeable future, it is highly desirable to raise sufficient local revenue by improving the collection of existing taxes.

Foreign trade

1.16 Total exports amounted to about YR 50.5 million in the 1976/1977 fiscal year. Agricultural commodities played the

leading role, accounting for some 97 % of the total. Most of the commodities were exported as raw materials. Processed agricultural products accounted for only about 12 % of the total agricultural exports.

1.17 The major agricultural raw materials for export consist of cotton, coffee and hides and skins, accounting for 90 % to 95 % of the total agricultural raw materials exported. In the 1977/1978 fiscal year, significant change was observed. Cotton export recorded almost nil because of fall in cotton production due to the drop in yield per hecter and area under cultivation. Coffee exports decreased to mere YR 0.9 million or 2.6 % of the total exports in this year from YR 10.2 million in the previous year because of increase in local consumption and stagnation in its production. Exports of hides and skins recorded slight decrease. Exports of sweet and biscuits recorded, instead, sharp increase in the year. They together took the first place with some YR 15.6 million, accounting for nearly 47 % of the total exports, being followed by hides and skins which accounted for 15.7 % of the total.

1.18 The total exports doubled during the 1971/1972 fiscal year through the 1976/1977 in current prices with an average annual growth rate of 14.9 %. However, the figure is much lower than that for imports. Moreover, total exports dropped by some 34 % compared with the previous year to YR 33.4 million in the 1977/1978 fiscal year. Commodity composition of recorded exports during the period of 1971/1972 - 1976/1977 is as shown in Table 1.3.

1.19 Total imports[1] has been increasing steadily and very sharply. It recorded YR 3,087.5 million in the 1976/1977 fiscal year with an average annual growth rate of 50 % or same 650 % increase compared with the 1971/1972 fiscal year. The major thrust of this upsurge is attributable to the growing domestic demand for consumption goods due mainly to the increasing private remittances from abroad and to the strong demand for capital formation goods.

1.20 Major import components are foodstuffs, machinery and equipment and manufactured consumer goods. Until the 1975/1976 fiscal year, foodstuffs were dominating of the imports, accounting for more than 40 % of the total. In the 1976/1977 fiscal year and the 1977/1978 fiscal year, machinery and equipment increased sharply, accounting for some 31 % and 29 % of the total imports in there years, being the single largest import category replacing foodstuffs. Meantime, import of foodstuffs declined to some 29 % and 25 % of the total imports in these years. Commodity composition of private imports during the period of 1971/1972 - 1976/1977 is as shown in Table 1.4.

1.21 Due to the striking imbalance between exports and imports, a deficit in the trade balance has always recorded. The discrepancy has further been widening with sharp increase in imports and relatively slow increase in exports. The trade balance deteriorated to a deficit of YR 3,200 million in the 1976/1977 fiscal year from that of YR 391 million in the 1971/1972 fiscal year. Namely, the deficit has been magnified by 700 % during this period with an average annual growth rate of 50 %. In the 1977/1978 fiscal year particularly, export declined by some YR 17 million or

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[1] Private imports account for the large majority of the total imports.

34 % decrease compared with the previous year, and import upsurged by YR 903.4 million. The trade balance, consequently recorded a big loss of YR 3,905 million.

Private remittances from abroad

1.22 Historically, some Yemeni workers went abroad, earned wages and sent some portion of their earnings back home. In recent years, from 1974 onwards in particular, the number of Yemeni labour force working abroad has risen sharply, more than 90 % of which are employed in the neighbouring Arab oil producing countries, mostly in Saudi Arabia, due to the upsurge of the oil revenues and successive execution of a number of building and construction works, which aim at rapid economic growth of these countries. Though no reliable data are available for the number of Yemeni labour force working abroad, it is estimated that the number lies in the range of 1.2 to 1.5 million.

1.23 Total amount of the remittances sent from abroad by these Yemeni workers recorded sharp increase in recent years. It grew about eight times attaining more than YR 4,900/1 million in the 1977/1978 fiscal year from YR 504 million/1 in the 1973/1974 fiscal year. Accordingly, its ratio to GDP has risen sharply from 15.5 % in the 1973/1974 fiscal year to more than 50 % in the 1977/1978 fiscal year. Put another way, private remittance was as big as YR 800 on a per capita basis in the 1976/1977 fiscal year. It makes up for a huge trade balance deficit and thus plays a key role for the improvement of the balance of payments of YAR.

/1 These figures are underestimated, if these remittances which are not officially registered are taken into consideration.

Foreign aid

1.24 YAR receives various types of foreign aid from several countries and organizations. Main donors are IDA, Arab Fund for Economic and Social Development, Saudi Arabia, Kuwait, West Germany, USA, USSR and China. In the 1977/1978 fiscal year, net foreign aid totaled YR 743 million of which official grants accounted for YR 461 million and net official loan accounted for YR 282 million. Foreign aid has been playing significant role in improving balance of payment position of YAR next to the private remittances.

Balance of payment

1.25 Very distinctive features can be observed in the balance of payment situation of YAR. Namely, it is characterized by huge trade deficit, huge private transfer and big net capital inflow. Consequently, the current account balance marked surplus since the 1975/1976 fiscal year and the balance of payment position also marked surplus. The change in foreign exchange reserves recorded a large surplus of YR 2,013 million in the 1976/77 fiscal year. As a result, Yemeni currency (Yemen Rial) has held stable position against other currencies. The balance of payments of YAR during the 1971/1972 fiscal year through the 1976/1977 are summarized in Table 1.5.

Money supply and price trend

1.26 Money supply in YAR recorded sharp increase in recent years. It increased by YR 386 million in the 1974/1975 fiscal year, YR 1,367 million in the 1975/1976 and YR 1,861 million in the 1976/1977 fiscal year compared with the previous years, respectively. The principal cause for the increases in a sharp rise is foreign remittances. Other major causes are the large deficit spending by the Government and the increase in bank loans for the private sector.

1.27 The price in YAR has been recording a strong upward trend countrywide in recent years, mainly due to the sharp increase in money supply without being accompanied by a corresponding increase in domestic production and expansion of imports. In urban areas particularly, consumer prices went up sharply due to the rapid increase of population caused by massive inflow of migrants from rural areas. In Sana'a, Capital of the Republic, general price index reached 329 in the 1976/1977 fiscal year compared with 100 in the 1972/1973 fiscal year, with an average annual growth rate of some 35 %. Category-wise, dwelling costs recorded the highest hike with an average annual growth rate of some 50 % during the same period. Consumer price index for Sana'a during the period of 1973/1974 - 1976/1977 is as shown in Table 1.6.

1.28 Wages of workers in YAR, regardless skilled or unskilled, also increased radically in recent years. The wages are in the order of YR 60 to YR 80 per day for unskilled labour, YR 100 to YR 200 per day for semi-skilled labour and YR 200 and more per day for skilled labour, respectively in 1979, some 12 to 15 times as high as these in 1975. Consequently, the wage level in YAR has become close to these in the neighboring oil producing countries, in the neighborhood of 80 % of them. The following socio-economic changes are regarded as major causes for the wage hikes:

a. Outflow of labour force (especially able-bodied male workers) to the neighboring oil producing countries and resultant shortage of domestic labour supply.

b. Upsurge of domestic labour demand largely attributable to the recent construction boom in YAR.

c. Sharp increases in prices.

1.29 Between the public and private sectors, there exists a large disparity in wages in favour of the latter. The public sector, due to this disparity, suffers great difficulty in obtaining adequate number of qualified personnel.

(3) Institutional Background

Tribal system

1.30 Modern administration in YAR has a relatively short history of less than 20 years, beginning in 1962 with Revolution which established the Republic. Following the Revolution much efforts has been made to strengthen the administration. However, very little was achieved and the public administration including collection of tax, mediation of the troubles between villages and among villagers and execution of public works can actually be operative through the support of the traditional tribal system continuing from the Imam era.

1.31 The tribal system is managed by agils, who are leaders of the villages, small sheikhs who are leaders of the ozlahs, and large sheichs who are the leaders of moklafs. The moklaf contains, in general, several ozlahs but does not coincide with the nahiya which is a modern administrative unit introduced after the Revolution.

1.32 Agil is selected by the people in a village as their tribal leader. Amin, on the other hand, is only the collector of the zaqat tax records. The agil settles the small problems of the villagers or refers them to the small sheikhs who in turn may transfer them to the large sheikhs, or to the government amils for solution. The agil usually remains in his position for many years as long as the people want him.

1.33 Small sheikh is selected by the people of his villages, while the large sheikh is selected by the agils of the moklaf. The Central Government confirms the election results and gives acknowledgement of their positions. Large sheikhs may be selected from the same family for several generations. The position, however, is not transmitted by heredity. The function of sheikhs is to settle disputes between villagers and villages and to act as a conciliator for the villagers with the government. Most of the incomes of sheikhs and agils are earned through his own lands. One tenth of the zaqat tax is also usually allocated for sheikhs and agils.

Central Government

1.34 The Prime Minister of the government is responsible for the public administration of the country under the President, the Chief of the State. Under him, 14 ministries are organized for engaging in practical administrative affairs, including Ministry of Agriculture, Ministry of Public Works, Ministry of Communication, Ministry of Education and Ministry of Health. For efficient and effective execution of development planning, Central Planning Organization (CPO) was established in 1972. CPO is vested an important power of authorizing the disbursement of funds on individual projects, playing the leading role in the national development planning.

1.35 With short history of development, the public administration remains rather inoperative at present and much needs to be done in order to strengthen the absorptive capacity of the public administration. The major problems are as follows:

a. Critical shortage of qualified and trained personnel with 20 % of the total number of approved positions remaining vacant and as much as one-half

of the approved positions remaining vacant in the technical departments.

b. Ambiguities of the definition of the responsibilities and authorities of the departments created in a short period of time.

Institutions to serve agriculture

1.36 Almost all the institutions to serve agriculture are just at their early stages. Although noteworthy progress has been under way to strengthen the institutions, much remains to be done before all of the agriculture is adequately reached by essential services. The branch offices and the operations of the institutions are limited in only a part of the country. Only one agricultural engineer is, for example, available for nearly 20,000 rural households and one extension worker for 6,000 households. Branch offices of Agricultural Credit Bank (ACB) are not yet established in most of the provinces.

Extension and training

1.37 Agricultural extension service in YAR was started for the first time in the Southern Uplands Rural Development Project (SURDP) and the Wadi Zabid Project in 1974. In the SURDP, each extension worker is in charge of 1,000 to 2,000 farm households. About 5 extension workers are working in an area under the supervision of an area superior. Six area supervisors are working in each of the two provinces, Taiz and Ibb, which are covered by the SURDP, under the supervision of a senior extension officer. The total numbers of senior extension officer, area supervisor and extension workers in SURDP are 2, 12 and 58, respectively at present. Number of extension workers in SURDP is contemplated to increase up to 100 at the final stage of the Project. In Wadi Zabid Project, about 130 extension workers

and extension officers are appointed at present.

1.38 Although there is a strong demand for extension services to improve the productivity of agriculture, only 17 extension workers are appointed in 5 provinces, i.e., Sana'a, Al Mahwit, Marib, Thamar and Al Bayda in the country, excepting 3 provinces covered by SURDP and Wadi Zabid Project. The constraints on the strengthening of extension service are acute shortage of qualified personnel and lack of adequate training facilities. There are only 2 training institutions for extension workers in the country, one in Taiz and the other in Hodeidah, with total capacity of 120 trainees. Even this limited capacity is not fully utilized due to the deficiency in qualified candidates.

Research

1.39 Central Agricultural Research Station (CARS) was establish at Taiz in July, 1974 with the assistance of UNDP and FAO. The main objective of the CARS is to carry out experimental works in order to identify the high yielding varieties suitable for highland region, including the provinces of Taiz and Ibb, for various crops such as sorghum, millet, sesame and other oilseeds and fodder and to find out the most appropriate cultivation techniques for them.

1.40 An agricultural research station was also established at Zabid in 1974 under the management of the Tihama Development Authority. In this station, a stress is placed on the field experiments under irrigated condition for possible crops in the Tihama plain region such as cotton and maize. A Central Agricultural Nursery set up in Sana'a is being conducting research activities for afforestation and for high yielding varieties of vegetables. A Government farm located in Ibb is concerned with research activities for

possible crops in the highland region. Though significant progress on agricultural research has been made in the 1970's, much still remains to be done to improve the productivity of agriculture.

Agricultural credit

1.41 Agricultural Credit Fund (ACF) was established in 1974 within the Central Bank of Yemen and commenced its full operation in the fiscal 1975/1976. Up to now, lending operation was made for four IDA development projects including Tihama Development Project, totalling some YR 180 million. The major purposes of the loans were groundwater irrigation, seasonal inputs, farm machinery and on-farm development. Interest rates are 8 % for long and medium term loans and 9 % for short term loans with repayment period of one year. Applicants must cover 20 % of the investment cost with their own funds. The ACF has a total staff of only 28. Its activity is, therefore, severely limited.

1.42 Agricultural Credit Bank (ACB) was established in 1975, with a capital of YR 100 million and started its operation in 1976. Loan priorities are placed on a) seasonal imputs, b) development of wells and irrigation systems, c) agricultural machinery, d) improvement of land, e) agricultural industry, f) livestock production and g) storage and processing facilities. Interest rates are set at 6 % for long and medium term loans and 7 % for short term loans. Applicants must cover 25 % of the investment costs. The ACB has a total staff of 59, as of February 1977, and branch offices in Sana'a, Hodeidah and Beit El Fakih. As of September 1978, ACB had committed YR 52 million.

1.43 Agricultural credit operations are constrained by severe shortage of qualified personnel. Further, the loan categories set up for agricultural credit do not fully meet the actual credit needs of farmers.

Local administrative organization

1.44 The history of the local administration is rather short and it has not fully filled its function. There exists ambiguities in the relationships between the central and local administration. In particular, there is no clear definition for the responsibilities and authorities of the provincial governor. Though governor is held responsible for the police or traffic control, for instance, he has no administrative supervision over these departments. His financial responsibilities are also ill-defined.

1.45 At the Quada and Nahiya level, administrative officers and a judge are dispatched from the Central Government. Their responsibilities and functions are as follows:

a. Amil-al-Nahiya: He is an administrative officer representing the Central Government at Nahiya level. Though his duties vary according to Nahiyas, he usually has four major functions; i.e.,

   i. to settle disputes which are brought to him by the inhabitants of the Nahiya, including quarrels over ownership of land, failure to fulfill debt repayment and refusal to pay taxes.

   ii. to forward the zaqat tax lists received from the amins in the Nahiya to the Amil of the Quada.

   iii. to promote the cooperation of the people of the Nahiya for LDA activities.

iv. to oversee the people of the Nahiya for keeping the faith in Islamic religion.

He faces, however, the difficulty in fulfilling his duties due to lack of transport facilities and lack of understanding and acceptance of his judgements.

b. Amil-al-waqf: He is an administrative officer appointed by the Central Government at Quada level. His function is to keep accounts of the rental income from the waqf lands, belonging to the local mosques.

c. Hakim: He represents the judicial authority of the Central Government at Quada level. On the basis of Islamic law, he gives decisions on these cases which can not be solved by agils, sheikhs and amils-al-nahiya. The types of the cases he most frequently deals with are encroachments on another's lands, husband-and-wife disputes and inheritance disputes. High Court in Sana'a reviews all of his cases and sends back for reconsideration these which they believe need further investigation and study.

d. Amil-al-quada: He is a chief governmental officer in the Quada, presiding usually Amil-al-nahiya, Amil-al-waqf, representative of Ministry of Finance, representative of Ministry of Education and Hakim. His main duties are, though varying according to Quadas; i.e.,

i. to receive the policies of the Central Government which are transmitted to him through the Governor of the Province.

ii. to ensure the life and safety of the people of the Quada.

iii. to send the zaqat tax records to the Central Government.

iv. to solve the problems of the villagers which can not be solved by the agils or sheikhs.

v. to make coordination between LDAs and the Central Government.

Local Development Association (LDA) and Confederation of Yemen Development Associations (CYDA)

1.46 LDAs were established according to a law issued in 1963, i.e., one year after the Revolution, principal objective of which was to encourage local self-help based on the strong family and tribal ties rather than relying on initiatives and programme launched by the Central Government. The formation of LDAs and their activities were held back by the civil war but afterwards the movement spread quickly throughout the country. As of 1977, some 150 LDAs are in operation, most of them concentrating in the provinces of Sana'a, Taiz, Ibb and Hajjah.

1.47 Each LDA is managed by an administrative committee which is democratically elected by the association members. At the province level, Coordinating Councils have been established. Though Governor presides over the Council, his position is rather honourary and administrative responsibilities are delegated to the secretary general of the Council. At the national level, the LDAs are supervised by the Ministry of Social Affairs and supported by CYDA which was established in 1973 for efficient coordination between LDAs and the governmental institutions, operating under the direct supervision of the President of the Republic. In reality, LDAs are organized and operating on the basis of the tribal system and LDA committee members usually are the representatives of the tribes.

1.48 The scope of the activities undertaken by LDAs includes the construction of rural access roads, water supply systems, schools, health facilities and electrification schemes. Individual projects identified by the individual LDAs are submitted to the Coordinating Council for consultation. They will then be sent to the Central Government for approval. After examination by the CPO, the Ministry of Social Affairs and other relevant government agencies, the approved project will be implemented by the LDA concerned. Upon completion of the project the LDA concerned usually takes responsibility for maintenance of the facilities.

1.49 These projects undertaken by the LDAs are usually financed from three major sources: the Central Government, the LDA concerned and voluntary contributions of the association members. The Central Government earmarks 2.5 percent of custom duties for these projects. These finances together with special budget allocations and some foreign aid are channeled through CYDA. Three quarters of the zaqat tax is allocated for the LDAs which provides the major financial resources of the LDAs. LDA members often make contributions to these projects mostly in kind, often in the form of labour.

1.50 According to the Five-Year Development Plan, the LDAs are expected to invest a total of YR 1.5 billion. The breakdown of these investments by category of projects is shown below:

	(YRs million)
Access roads	615
Schools	268
Water supply	103
Public health	58
Other	94
Unidentified	325
Total	1,463

1.51 Since the establishment in 1963, the LDAs have attained remarkable achievements in the rural development, with estimated accomplishments of over 5,000 km of rural access roads, some 850 water supply projects and nearly 600 schools during the Three-Year Development Plan. Moreover, they encourage active participation of the major beneficiaries, stimulate community spirit and help develop local leadership.

1.52 LDAs are facing, however, serious constraints on which the success of the implementation of ongoing and future development projects of LDAs depends. Major factors of them are as follows.

a. Severe shortage of qualified personnel for planning, administration and supervision of implementation.

b. Inadequacy of financial resources to cover the costs of rapidly expanding development projects.

c. Insufficient coordination between LDAs, CYDA and various relevant government institutions.

1.53 With these constraints and the confinement of their past experiences to rural infrastructure and social service projects, it would probably be too premature to expand their scope of activities. In the longer run, however, they could also play a crucial role in agricultural development and in strengthening the economic viability of rural areas through the following activities:

a. to set up agricultural cooperatives.
b. to disseminate modern production techniques.
c. to improve marketing organization and arrangements.
d. to establish local credit associations with a view to collecting savings in the rural communities and making funds available for farmers.

(4) Present Condition of Rural Areas

Socio-economic situations

1.54 The country has a total resident population of some 4.5 million. The population of the town and villages with more than 2,000 inhabitants occupies about 11 % of the total resident population. The rest or some 90 % of the total, is living in the rural areas. Agriculture plays dominant role in the economy of the rural area, employing some 80 % of the residents labour force. Other economic activities in rural areas, which include local crafts, stone quarrying and trading, are still primitive.

1.55 Present rural condition is characterized by low income level and lowstandards of living with poor infrastructural facilities as well as meager social services. Although no precise records are obtainable, incomes of the rural inhabitants are much lower than those of the people in urban areas. This is attributable, in the first place, to the low productivity of the agricultural sector. Secondly, there exists inequality in income distribution. At present, some 80 % of the total farm land is cultivated by landless farmers under crop sharing arrangements. Though almost all the farming operations are carried out by such tenants, their share is kept as low as about 50 % of the total proceeds. Most of the independent farmers own and cultivated small tract of farm lands, mostly less than 1.5 ha, using family labour. Accordingly their earnings are low. Wages of agricultural labour have been uprising rather sharply in recent years. However, taking into consideration the seasonality of their employment, their annual incomes are still low and also unstable. While the land owners enjoy high incomes, the large majority of the rural inhabitants spend their earnings only for subsistance. In recent years, significant progress has been made in providing infrastructure

and social service facilities especially in urban areas. However, rural areas are rather left behind in the march of such progress.

1.56 Higher earning opportunities both in the urban areas of YAR and in the neighbouring oil producing countries have accelerated outmigration of labour from rural areas, especially from agricultural sector, in recent years. Resultant imbalance in supply-demand condition of labour in rural areas has brought about sharp increases in wages. Consequently, the agricultural sector which is mainstay of the economy of rural area, has been experiencing drastic changes in socio-economic framework. The most immediate effects of the emigration of labour from agriculture and the resulting wage increases have been on the following:

a. higher production costs leading to a reduction in area planted for low value crops, mainly cereals, and rapid abandonment of marginal lands.

b. intensification of land use, where water resources are available, and substitution of high value crops for low-value crops.

c. partial farm mechanization, mainly for ploughing.

d. pressures on the land owners to alter crop sharing arrangements in favor of the tenants.

e. greater use of women and children in farm operations, particularly in weeding, harvesting and tending livestock.

g. realization of higher real incomes in rural areas.

h. cost escalation of development projects employing rural labour.

Present agriculture

1.57 Agriculture in YAR is not richly endowed in physical resources. Out of a total land area of about 20 million ha only 1.5 million ha are regularly cultivated. In addition, 2 million ha of marginal agricultural lands are cropped only during high rainfall years. Woody vegetation or shrub area covers 1.6 million ha. Mountainous and semi-arid to arid range lands account for the rest of about 15 million ha. Land use of the country during the 1976/77 fiscal year is shown in Table 1.7.

1.58 The farmers have achieved noteworthly degree of agricultural efficiency within the confines of traditional techniques. Agriculture in midlands and highlands are characterized by the terraced farm lands. Millions of terraces have been constructed on the mountain slopes to provide a level area and to collect runoff water through the centuries, which now produce much of the foodgrain products of the country. Irrigation also has a long history. Smaller dams are being used in wadi agriculture to divert flood flows into farm lands. Shallow wells, perennial springs and diverted perennial stream flows are other traditional forms of irrigation in the country. Agriculture, however, is still largely dependent on rainfall. About 84 % of the total cultivated land or 1.3 million ha are solely dependent on rainfall, 8 % or 120,000 ha is supplied with irrigation water by spate flood flow, and only 8 % or 110,000 ha is supplied with regular irrigation either by perennial stream, spring flows or wells. Cultivation area classified by type of irrigation and by province is as shown in Table 1.8.

1.59 Crops represent about 75 % of the production value of agriculture, about 20 % is from livestock, 4 % from forestry and 1 % from fisheries. Since the early 1970s, crop output has augmented, livestock production has remained about the

same, and fisheries and forestry have steadily declined. The decline in fisheries is mainly attributable to the pull out of a large commercial trawler fleet and the decline in forestry reflects the thorough depletion of the country's woodlands.

1.60 Foodgrains consisting of sorghum, millet, wheat and barley account for the major portion of the crop production. Historically, about 95 % of all crop acreage was planted to these cereals. In recent years, diversification of cropping has been encouraged and this acreage has been reduced to about 90 % of all planted land. Despite this predominance of grain crops, the varied ecological zones in the country permit the growing of a wide range of crops. In the highland regions, potatoes, grapes, deciduous fruits and various legumes are successfully grown. In the southern middle heights, sorghum, millet, maize and barley are the major crops. In the Tihama plain, millet and sorghum are the principal crops. Cotton, tobacco and sesame can also be planted with irrigation. Melons, edible beans, tomatoes and onions are also suitable crops in the plain. In the highlands, qut growing has expanded rapidly in recent years, reflecting a strong consumer demand, high prices and relatively low production cost. It is extremely profitable to farmers and thereby has been replacing competing crops, especially coffee.

1.61 Despite the efficient use of agricultural resources through traditional production techniques, absolute levels of productivity remain very low. For instance, cereal grain yields of 0.8 to 1.1 ton per ha, cotton yields of about 1.0 ton per ha are low even compared with the countries with similar physical conditions. Productions cultivation areas and yields of major crops are shown in Table 1.9.

1.62 Livestock, consisting of sheep, cattle, camels and donkeys, is fed all over the country. The domestic animals are used mainly for the production of meat and milk. They also serve as beasts of draft and of burden. Current husbandry practices are primitive and feed supplies are meager. There is also general lack of modern veterinary care. These all together cause heavy losses and keep productivity at a very low level. Number of livestock is given in Table 1.10. Estimates of meat production is also shown in Table 1.11.

1.63 The total catch of all fish from Yemen waters was estimated at 17,000 tons in 1976. Although the potential is roughly estimated at 25,000 tons per annum, further study would be required in order to make it precise. The number of fishermen, who earn a meager livelihood from artisanal fishing, is estimated at about 4,000. Most of the fish catch is sold in the immediate coastal region. However, increasing amounts of fish are coming into the urban centers of Sana'a and Taiz after being salted or dried for transport. Fishermen receive relatively low prices for their catch at the landing points. Moreover, the price fluctuates widely according to the amount of fish catch and season.

1.64 The forestry resources are sparse and being depleted gradually. They are mainly used for poles and fuel. Farmers are increasingly planting trees because of high market prices for woods. This trend of afforestation would have other beneficial effects including soil retention and watershed protection.

Rural infrastructure and sccial services

1.65 The main truck roads are mostly paved and connected the major population centers. However, a considerable portion of the paved roads were deteriorated due to axle overloading and rapid traffic growth. The Highway Authority,

which is an autonomous government organization under the Ministry of Public Works, is responsible for the design, construction and maintenance of the national highway network. Construction of much of the secondary and feeder roads has been financed by local authorities and LDAs, while foreign aid has been a major source for financing the trunk roads. The betterment of the transport system is of urgent necessity, aiming at the economic development of the country as well as national unity. During the last Three-Year Development plan, the transport and communication sector received the largest share in the total investments. The current Five-Year Development Plan also places the highest priority on this sector.

1.66 At present, very few people can afford hygienic water supply in YAR. It is reported that only about 10 % of the occupied dwellings are supplied with piped water as of 1975. In rural areas, no piped water is eventually existent. Inhabitants in the mountainous area generally have their houses on the tops of the mountains, located away from the water sources: wadis, wells and springs. There is usually no water conveyance facilities which connect the houses with the water sources. The villagers are, therefore, compelled to engage in the labourious work of water fetching from distant water sources or use the water stored in the cisterns which are usually contaminated. In the Tihama plain, wells have been dug to secure drinking water. However, most of them are shallow and tend to be dried up during drought periods.

1.67 Health conditions also remains very poor. As of 1975, death rate averaged some 27 per thousand inhabitants. Life expectancy averaged only 37 years. Infant mortality reported was as high as 24 %. Insufficient nutrition, general lack of consciousness of health and sanitation and environmental problems including the use of polluted water are the

major reasons for this low standard of public health in the country. Diarrhoeal diseases, tuberculosis, schistosomiasis and Malaria are the most prevalent in the country. The Government's health programme is still at its early stage. In 1976, there were only 234 physicians practising in the country, or one doctor for every 23,000 inhabitants. Modern health installation was quite limited, comprising 24 hospitals with 2,637 beds; i.e., one bed for every 2,064 inhabitants. Moreover, in many cases, these facilities were inadequately equipped and suffered from shortage of qualified staff and financial resources.

1.68 Modern education in YAR started to grow only after the civil war. Although a significant progress has been made, the present level of education is still far from being adequate. Only 27 % of the age group 6 to 11 were enrolled in primary schools in the year of 1974/75. Only 11 % of total enrollments were girls in the 1975/76. There are marked disparities with regard to total enrollments between provinces and between urban and rural areas. The total enrollment ratio, for instance, was as high as 52 % in Sana'a Province, whereas it was only 9 % in the Hajjah Province during the 1975/76 year. Moreover, out of 1,952 primary schools in the 1974/75 year, only 234 or 11 % of the schools are offered the full range of six classes and about 68 % had only three classes or less. Primary schools are also suffering from the problems of the inadequate quantity and quality of teachers as well as the shortage of instruction materials. Under these low educational conditions, the illiteracy rate in YAR is extremely high; close to 90 % for the adult population.

1.69 A significant progress has been made in the development of telecommunication and electric power supply in recent years. The number of subscribers of telephone

increased from 3,400 in 1972 to 40,485 in 1976. The number of recipients of electric power supply also increased from 24,178 in 1971 to 41,653 in 1976. However, these facilities are presently confined within the big urban centers. No such facilities have covered the most of rural areas.

(5) Integrated Rural Development

Necessity of Integrated Rural Development

1.70 About 90 percent of the total population of Yemen Arab Republic are living in the rural areas. Although recently urbanization is in progress, especially in the areas of the three big cities: Sana'a, Hodeidah and Taiz, majority of the people will remain in the rural at least in the foreseeable future. About 80 percent of the people in the rural areas are engaged in agriculture. However, very limited agricultural resources especially land and water, are available and the productivity is low, even compared with those countries under similar physical conditions, resulting in low income level of the farmers. Living conditions in the rural areas is also at low level, lacking adequate hygienic drinking water, road access, electricity, health facilities, education facilities and the like. On the other hand, residents in the urban areas are enjoying relatively high income receiving better social services. This disparity between rural and urban areas is the major cause for the massive migration of the rural inhabitants into urban areas.

1.71 The outmigration of the rural inhabitants is accelerated by the higher labour wages offered by neighbouring oil-producing countries which have been experiencing spectacular economic growth in recent years. In consequence, a large number of the rural inhabitants who should carry the task of agricultural development have left their villages. The resulresult is the desolation of the terrace lands in the

mountainous area as well as millions of the abandoned farmlands in the Tihama coastal plain, posing the serious problem of the weakening of the key economic sector in the rural areas.

1.72 From the viewpoint of national economy, agriculture has been playing the leading role in the development of the economy of the country, contributing some 40 to 50 % of GDP and employing more than 70 % of labour force. In the year of 1975/76, base year of the Five-Year Development Plan, value added of the agricultural sector was YR 2,305 million in current prices, taking 44 % or the biggest share in GDP. Although its share has been declining, it is predicted in the Plan that in the fiscal 1980/81, agricultural sector will remain in the first place with 39 % share in GDP. In the fiscal 1990/91, 10 years after the last year of the Plan period, it would still be the leading sector, contributing 29 % of GDP, assuming the same average annual growth rate as in the Plan period for the period of 1980/81 - 1990/91. In 1975, the agricultural sector employed labour force of 785,000 or 73.2 % of the total. According to the Five Year Plan projection, about 22,500 manpower are to be additionally required in this sector in the 1980/81 fiscal year, raising the total manpower of the sector to 808,000. Consequently, the sector would employ 70.4 % or the biggest share of the total manpower.

1.73 In 1976, agricultural products with cotton, coffee, hides and skins as major components, accounted for 97 % of the total export value. Food import, about half of which were cereals, accounted for more than 47 % of the total import value. Although at the present moment the country is enjoying her favourable foreign reserve position, it is anticipated that balance of payments will be deteriorated drastically as described before, if urgent measures are not

taken, due to the rapid expansion of imports of capital formation goods as well as consumption commodities. In these circumstances, it is highly desirable to expand the agricultural production for the export promotion as well as import substitution with a view to improving the imbalance in foreign trade and thereby improving the balance of payment position of the country.

1.74 Progressive reduction in the number of the workers abroad is anticipated due to the following reasons:

a. The wage level in Yemen has recently become close to those in the neighbouring oil-producing countries.

b. It is very likely that in the medium and long run, the building and construction works in the neighbouring countries would be slowed down.

c. Growing labour demand is in existence in Yemen herself, particularly in building and construction sectors.

The agriculture should be the largest absorptive sector for the anticipated returning workers, though some portion would be employed in other sectors, considering that most of them were once engaged in farming.

1.75 Furthermore, a new problem of population pressure would be brought up, if the present population growth is continued. Assuming the population growth rate of 2 % per annum, the total population of YAR will be about 6.6 million in 1980 and about 8 million in 1990. The principal effects on the economy of the natural population increase and the social population increase due to the reduction of the number of migrant workers are twofold. In the first place, rapid expansion of employment opportunities will be required. Secondly, capacity of food supply must be expanded by big

margin. Meanwhile, urbanization is making rapid progress, resulting in rapid increase in nonagricultural population who depend on the agricultural population for their foods.

1.76 Agriculture could grow substantially in the coming years even under the limiting physical conditions. Although the present productivity is very low, there is much scope for increasing yields of crops, making use of high yielding plant varieties, chemical fertilizer and insecticides under the guidance of appropriate extension services. Shifting from low value crops to higher value crops would further stimulate agricultural production. Livestock production could have a greater contribution to the economy by increasing in the feed base through improving range land and growing fodder crops in rotation with food grains. Agriculture is likely to remain by far the most important commodity producing sector and the majority of the additional manpower will be absorbed in it. Rapid expansion of agricultural production is of vital importance for securing food for growing population in YAR. Expansion of crop production for marketing is of urgent necessity for providing growing urban population with adequate food. Under these circumstances, restoration of agriculture is essential and of vital importance for the development of rural areas.

1.77 Improvement of infrastructures and social services is another sine qua non for the effective development of rural areas. The construction of new roads and the up-grading of the existing road network would be a significant step to break up regional isolation and to realize solidarity between the historically scattered villages. It would make a great contribution to expanding marketing area of farm products that is usually confined within wadi flood basins and sub-range of mountains and thereby stimulate agricultural production. Water supply projects would substantially improve the public health, leading to higher physical

performance and longer life expectancy and also save time of women and children by relieving them from labourious work of water fetching. They would thus enhance the labour force which has an accute shortage at present and thereby improve significantly the productivity of the rural economy. Construction of schools and health facilities would provide the rural people with better access and opportunities for education and health services and thereby ameliorate the social and cultural environment of living in the rural areas.

1.78 Improvement of infrastructure and reinforcement of social services would raise the standard of living and improve the productivity of the rural economy and thereby make a substantial contribution to preventing massive out-migration of rural manpower. Considering all these, the rural development which is founded on agricultural development, accompanied with improvement of rural living conditions, is of vital importance for the well-being of the rural inhabitants as well as the overall development of the Yemeni economy.

On-going integrated rural development projects

1.79 Aiming at breaking seclusion of regions and stopping internal migration from rural areas to towns and cities, the Five-Year Development Plan envisages integrated rural development projects, major components of which are developing agriculture, making roads, supplying hygienic water and spreading education and health services for providing higher incomes and better conditions of living. Brief description of planned and on-going projects are given below:

a. Southern Uplands Rural Development Project (on-going)

This is the first integrated rural development project ever executed in YAR. This project started

in the beginning of 1976 and will go on for a period of six years. The project covers an area of 50,000 ha in the provinces of Taiz and Ibb. The principal aims of the project are to increase productivity of crops and to improve the living condition of the area. Main components of the project are:

i) establishing 60 agricultural extension offices.
ii) Establishing a branch of the Agricultural Credit Fund.
iii) establishing two veterinary units.
iv) constructing and repairing of 180 km of rural roads.
v) implementation of 90 drinking water projects.
vi) providing necessary administration requirements and helping the establishment of co-operative societies for farmers.
vii) planting 350 ha with trees and protecting 20 km of river courses.

It is a first priority project for which some YR 96 million has been allocated.

b. Integrated Rural Development at Radaa (under study or negotiation) The major components of the project are:

i) establishing a center for agricultural development.
ii) raising land productivity, water and man-power in the area.
iii) development of livestock production.
iv) securing drinking water.
v) constructing 270 km of feeder roads.

It is a first priority project for which YR 31 million has been allocated.

c. Integrated Rural Development Project at Al Mahwit (under study or negotiation)

The project covers an area of approximately 5,000 ha of agricultural land in the province, including the following major activities.

i) establishing an agricultural research center and extension service offices.
ii) securing a network of roads in the Province.
iii) securing clean water in the provincial capital in the first phase and in all the villages of the Province in the ultimate phase.

It is a first priority project for which YR10 million has been allocated. In addition YR10 million will be defraied during the second five-year plan.

d. Integrated Rural Development Project in Eastern Areas of Khawlan and Beni Hushaish (under study or negotiation)

The project aims at achieving integrated rural development for these areas which require strongly the services of integrated rural development and the development of crop and livestock production. The components of the project will be determined after the study undertaken by the Arab Organization for Agricultural Development is completed. It is a first priority project for which YR 15 million has been allocated. In addition, YR 5 million will be disbursed during the second five-year plan.

c. Integrated Rural Development Project for Northern Areas of Sana'a and Sa'ada (under study or negotiation)

The project basically aims at expanding private activities through the development of agricultural production in these areas by enhancing agricultural extension services, establishing service and research stations and rationalizing water use. The details of the project are to be determined later. It is first priority project for which YR 20 million has been allocated. In addition, YR 5 million is to be financed during the second five-year plan.

f. Integrated Rural Development Project at Hajjah Province (under study)

The project aims at achieving integrated rural development at the Hajjah Province where there is strong need for achieving a balanced development. The project would comprise agricultural development, extending educational and health services, securing a road network and securing hygienic drinking water. At present, a master plan study is in progress with the technical assistance of the Japanese Government. It is a first priority project for which YR18.5 million has been allocated. In addition, YR1.5 million will be spent during the second five-year plan.

(6) Five-Year Development Plan

1.80 The Five-Year Development Plan (1975/76 - 1980/81) is the first attempt at comprehensive national development planning in YAR, in continuation of The Three-Year Plan (1973/74 - 1975/76), with due consideration for overall investment and manpower requirements. The Plan contemplates

to further develop the human and natural resources; to reinforce the physical infrastructure; to improve the productivity of the commodity producing sectors; and to raise the standard of living of the people, giving due attention to their basic needs for food, water supply, inland transport, health services, education and other social infrastructures.

1.81 During the Plan period, YR 15,971 million in 1975/76 prices altogether will be invested for fixed capital formation. In the same manner as in the Three-Year Plan, the biggest portion will be defraied in the transport and communication sector followed by industry, mining and power sector. Their shares in the total investments are 31 % and 25 %, respectively. In the agricultural development, YR 2,276 million or some 14 % of the total will be invested.

1.82 Out of the total investments of YR 15,971 million, YR 5.4 billion or one third will be carried out by the central Government. Public and mixed sector will be responsible for the implementation of YR 4.9 billion or some 31 % of the total and private sector YR 4.5 billion or some 28 % of the total. The rest or 7 % of the total will be carried out by LDAs. Of the total capital requirement, some 59 % will be from domestic fund. The dependency on the foreign financing will be raised to 41 % from 31 % in the Three-Year Development Plan. The detail of the investment in the Five-Year Plan is shown in Table 1.12.

1.83 During the five years of the Plan, GDP is planned to grow to YR 7,671 million in the 1980/81 fiscal year, the last year of the Plan from YR 5,181 million in the 1975/76 fiscal year, base year of the Plan with the average annual growth rate of 8.2 % in real terms. The industrial sector including construction is envisaged to grow at the highest growth rate of 12.9 % per annum, expanding their value added to

YR 971 million from YR 529 million, being followed by the distribution sector the value added of which is planned to grow to YR 2,450 million from YR 1,512 million with the average annual growth rate of 10.1 %. The planned growth rate of the value added of the agricultural sector is the lowest, 5.5 % per annum. Agricultural sector, however, still is to have the biggest share in GDP with some 39 % of the total, being followed by the distribution sector with some 32 % of the total GDP in the 1980/81 fiscal year.

1.84 Slower annual growth rate of 6.8 % is expected for GNP, compared with GDP due to the lower growth rate of workers' remittances. The planned GNP in the 1980/81 fiscal year is YR 10,757 million, some 39 % increase over that in the 1975/76. The details of the growth trend for the macro-economic frame of YAR are shown in Table 1.13. Exports will almost be doubled to YR 778 million in the 1980/81 fiscal year from YR 398 million in the 1975/76 with an average annual growth rate of 14.3 %. However, imports are to grow at a faster growth rate of 27.2 % p.a. from YR 1,868 million in the fiscal 1975/76 to YR 6,225 million in the 1980/81. Consequently, trade deficit is to be expanded rapidly from YR 1,470 million to YR 5,447 million. Though net factor income is to grow to YR 3,086 million in the 1980/81 from YR 2,570 in the 1975/76, it would not be sufficient to off-set the huge trade balance deficit. Current account balance, consequently, is expected to be deteriorated from YR 1,100 million surplus to YR 2,361 million deficit. The details of the projected external accounts are shown in Table 1.9.

1.85 An improvement of in the Government's budgetary position is assumed in the Plan, mainly due to the fast growing import duties. The deficit experienced in the 1975/76 fiscal year is expected to turn into the surplus of YR 192 million in the 1980/81 as shown in Table 1.13.

Table 1.1 Gross Domestic Product at Current Price

(Unit: $\times 10^6$ YRs)

	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76
Commodity Sectors	884	1,143	1,324	1,532	1,977	2,760	2,834
Agriculture, Fishing & Forestry	742	969	1,113	1,263	1,582	2,335	2,305
Industry, Mining & Electricity	66	87	109	142	213	249	302
Construction	76	87	102	127	182	176	227
Distribution Sectors	331	366	453	577	795	1,060	1,512
Trade	283	300	360	460	629	826	1,220
Finance & Banking	13	19	25	40	57	96	141
Transport & Communication	35	47	68	77	109	138	151
Services Sectors	184	237	314	405	488	654	835
Government	91	127	185	252	291	401	509
Housing	64	73	83	94	118	150	199
Other Services	29	37	46	59	79	103	127
GDP at Market Prices	1,399	1,746	2,091	2,514	3,260	4,474	5,181
Net Indirect Taxes	50	75	113	151	202	283	453
GDP at Factor Costs	1,349	1,671	1,978	2,363	3,058	4,191	4,728

Source: CPO and ECWA, National Accounts of YAR. 1969/70 - 1975/76

Table 1.2 Estimated Employment by Sector, January, 1975

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

Sector	Employment	
	Number	Percentage
Agriculture (incl. forestry livestock & fishing)	785	73.2
Manufacturing (incl. mining, quarrying, power and water)	39	3.6
Construction & Building	47	4.4
Trade, Restaurants & Hotels	72	6.7
Transport, Storage & Communication	26	2.4
Finance, Insurance, Real Estate & Business Service	2	0.2
Community, Social & Personal Services	101	9.4
Total	1,072/1	100/1

/1 : Excluding unemployed (64,000)

Source: CPO, An Analysis of Manpower Situation in YAR (December 1976)

Table 1.3 Commodity Composition of Recorded Exports

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

Fiscal Years ending June 30	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77
Agricultural	22,703	23,693	51,648	41,982	41,582	43,205
Raw Materials						
Cotton	10,799	12,821	37,053	30,954	24,583	24,953
Cotton Lint	(9,912)	(10,785)	(35,180)	(28,188)	(24,221)	(24,593)
Cotton Seeds	(887)	(2,036)	(1,873)	(2,766)	(362)	(-)
Coffee	5,534	5,469	6,461	4,972	7,588	10,223
Hides & Skins	3,271	3,325	6,241	4,404	8,040	6,129
Dried Fish	58	382	781	736	325	56
Live Animals	341	768	643	443	6	-
Potatoes	239	394	195	141	135	17
Fruits	66	224	143	116	164	26
Tobacco	25	44	74	172	382	668
Others	2,370	266	57	44	359	1,133
Processed Agricultural Products	100	1,143	1,896	3,453	4,322	5,640
Cotton Products	100	317	325	1,590	1,384	637
Fabrics	-	-	-	(1,193)	(775)	(165)
Sheets	(100)	(317)	(325)	(257)	(609)	(472)
Yarn	-	-	-	(140)	-	(-)
Biscuits	-	636	1,315	1,131	2,093	3,156
Confectionery	-	119	54	582	845	724
Oil Seed Cakes	-	71	202	150	-	1,123
Non-Agricultural Exports	1,898	433	1,838	7,531	4,159	1,689
Salt	1,412	27	26	-	1	-
Metal Scrap	247	102	356	9	343	-
Others	239	304	1,456	7,522	3,815	1,689
TOTAL	24,701	25,269	55,382	52,966	50,063	50,534

Source: Central Bank of Yemen.

Table 1.4 Commodity Composition of Private Imports

(Unit: $\times 10^6$ YRs)

Fiscal Years ending June 30	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77
Foodstuffs:	93.2	181.5	367.3	422.2	748.6	879.6
Cereals & Products	45.0	74.3	154.4	165.1	235.1	296.7
Sugar & Products	20.7	40.8	101.7	119.4	242.1	166.6
Fruits & Vegetables	9.1	18.6	32.3	43.5	70.4	180.4
Margarine & Edible Oils	9.6	22.3	33.8	40.5	95.0	75.3
Coffee, Tea, & Spices	5.9	16.4	23.4	24.7	48.1	29.1
Dairy Products & Eggs	2.2	7.3	14.6	20.4	34.6	69.5
Meat & Live Animals	0.3	0.7	0.7	2.2	13.3	44.3
Fish & Fish Products	0.3	1.1	5.6	4.6	7.1	16.7
Others	0.1		0.8	1.8	2.9	1.0
Tobacco & Beverages	8.7	14.1	13.1	29.1	44.4	52.2
Tobacco & Products	7.9	13.7	12.5	27.9	43.0	45.8
Beverages	0.8	0.5	0.6	1.2	1.4	6.4
Manufactured Consumer Goods	23.7	61.8	114.1	151.3	271.2	425.9
Textiles	11.1	27.5	48.7	75.4	142.3	171.4
Clothing	3.2	10.4	22.7	29.5	51.0	94.1
Footwear	3.4	7.3	11.3	11.6	32.2	31.6
Soap & Cosmetics	3.3	9.4	20.3	20.7	22.9	42.5
Furniture & Lighting fixtures	1.8	3.7	5.9	5.8	10.7	35.5
Watches, Jewelry, Photographic supplies, Sound recorders, Toys	0.9	3.5	5.2	8.3	12.1	50.8
Mineral Fuel, Gas, & Lubricants	12.5	19.1	33.9	36.8	82.4	61.1
Chemicals:	6.0	16.1	25.3	45.0	57.2	112.8
Medicines	3.6	10.5	16.3	25.6	32.6	56.1
Fertilizers	0.6	0.4	1.3	6.6	6.8	1.4
Pesticides	0.6	1.2	2.1	1.9	4.0	12.4
Others	1.2	4.0	5.6	10.9	13.8	42.9

Continued

Fiscal Years ending June 30	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77
Rubber, Wood, Leather & Paper Products	11.1	16.7	33.7	52.1	70.6	186.0
Construction Materials	14.3	19.0	30.2	40.6	44.3	141.6
Cement	9.0	9.6	12.1	6.3	17.3	57.9
Iron Bars & Rods	4.1	6.6		27.8	16.0	54.6
Iron Pipes	1.2	2.8	5.9	6.5	11.0	29.1
Machinery and Equipment	25.2	56.5	85.9	149.6	289.6	965.6
Transport Equipment	13.5	27.9	42.9	70.9	121.4	527.2
Non-electrical Machines	8.3	17.9	25.9	50.2	123.5	333.4
Electrical Machines	3.3	10.8	17.2	28.5	44.7	105.0
Other Products	9.7	25.9	41.5	54.3	99.9	262.7
Total Private Imports (Customs basis)	204.4	410.7	745.0	981.0	1,708.2	3,087.5

Source: Central Bank of Yemen, Annual Reports.

Table 1.5 Summary Balance of Payments

(Unit: $\times 10^6$ YRs)

Fiscal Years Ending June 30	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77
1. Trade Balance	-391	-539	-811	-1,105	-1,666	-3,200
Exports F.O.B.	42	34	62	58	55	84
Imports C.I.F.	-433	-573	-873	-1,163	-1,721	-3,284
(Government)	(-85)	(-73)	(-159)	(-163)	(-269)	(-292)
(Private)	(-348)	(-500)	(-714)	(-1,000)	(-1,452)	(-2,992)
2. Service Balance	-7	-53	85	135	196	197
3. Private Transfers, Net	293	505	504	859	2,057	3,791
Receipts[1/]	328	564	595	1,013	2,363	4,561
Payments	35	59	91	154	306	770
4. Current Account Balance (1 + 2 + 3)	-105	-87	-222	-111	587	788
5. M&LT Capital, Net	174	105	277	566	712	659
Official Grants	74	67	148	419	513	470
Official Loans, Net	100	38	129	147	199	189
(Disbursements)	(129)	(58)	(144)	(164)	(213)	(208)
(Repayments)	(-29)	(-20)	(-15)	(-17)	(-14)	(-19)
6. Other Capital,[2/] Net	52	120	51	-15	-11	566[4/]
7. Change in Reserves[3/] (increase = -)	-121	-138	-106	-440	-1,288	-2,013

1/ : Largely workers' remittances.

2/ : Including errors & omissions.

3/ : Held by Central Bank of Yemen; excluding balances with Central Bank of Egypt.

4/ : Largely net borrowings by private banks.

Source: Central Bank of Yemen and IMF.

Table 1.6 Consumer Price Index for Sana'a City
(1972/1973 = 100)

	Weight	Fiscal Years 1973/1974	1974/1975	1975/1976	1976/1977
General index	10,000	154	203	237	329
Foodstuffs	6,500	145	187	210	285
Cereals	1,735	156	185	169	159
Dry vegetables	130	142	209	280	331
Meat, fish and eggs	1,205	155	199	264	418
Vegetables	447	142	173	215	386
Dairy products	301	140	164	177	343
Oils and fats, edible	295	206	257	343	383
Fruits	513	123	169	221	247
Sugar and sweets	382	151	272	226	193
Soft drinks	148	140	179	202	383
Tobacco, etc.	967	134	141	158	297
Other	377	139	204	240	289
Clothes	581	155	229	263	435
Dwelling	1,946	186	259	337	500
Furniture	206	131	167	196	257
Durable goods	407	143	186	219	260
Rent and water	609	138	203	286	429
Fuel and lighting	724	266	374	487	766
Miscellaneous	973	152	180	206	274
Transportation	326	147	193	238	339
Education	87	143	170	205	239
Medical costs	268	166	181	188	263
Household cleaning items	166	153	172	191	216
Personal cleaning items	126	139	160	187	231

Source: Central Planning Organization

Table 1.7 Land Use by Provinces, 1976/77

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

Province	Total Area	Cultivable Area	Marginal Area	Forest & Shrubs	Other Uses
Sana'a	8,000	400	600	100	6,900
Hodeidah	3,500	235	500	450	2,315
Taiz	1,200	250	100	500	350
Ibb	1,300	300	50	400	550
Hajjah	1,700	130	250	50	1,270
Sa'ada	1,800	60	200	-	1,540
Dhamar	1,000	100	200	100	600
Al Beidha	1,500	40	100	-	1,360
TOTAL	20,000	1,515	2,000	1,600	14,885

Note: Al Mahweet & Mareb Governorates' figures are included in the Governorates to which they were previously attached.

Source: Statistical Year Book, 1976 - 1977, YAR

Table 1.8 Cultivation Area by Type of Irrigation and Province, 1976/77

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

Province	Total	Rainfed	Flood	Perennial	Wells
Sana'a	400	374	-	20	6
Hodeidah	235	102	100	5	28
Taiz	250	220	10	18	2
Ibb	300	278	-	20	2
Hajjah	130	115	10	5	-
Sa'ada	60	60	-	-	-
Dhamar	100	91	-	5	4
Al Beidha	40	37	-	-	3
TOTAL	1,515	1,277	120	73	45

Note: Al Mahweet & Mareb Governorates' figures are included in the Governorates to which they were previously attached.

Source: Statistical Year Book, 1976 - 1977' YAR

Table 1.9 Area, Yield and Production of Crops, 1969/70 - 1976/77

	Barley			Wheat			Maize			Millet & Sorghum		
Province	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield	Area
1969/70	160	1.1	145	16	0.5	35	8	2.0	4	610	0.7	886
1970/71	154	1.1	140	33	1.1	30	30	1.9	16	730	0.8	973
1971/72	140	1.1	125	25	1.0	25	16	0.8	20	627	0.7	920
1972/73	120	1.1	110	50	1.0	50	70	1.4	50	809	0.7	1,080
1973/74	85	1.1	77	71	1.0	70	80	1.5	52	639	0.7	952
1974/75	80	1.1	73	56	1.1	50	79	1.6	50	1,008	0.8	1,215
1975/76	75	1.1	68	52	1.0	50	72	1.4	50	859	0.8	1,145
1976/77	54	0.9	60	51	0.9	55	111	1.7	67	660	0.8	786
Sana'a	24.0	0.8	30.0	17.6	0.8	22.0	3.0	1.5	2.0	114	0.6	190
Hodeidah	-	-	-	-	-	-	5.6	1.4	4.0	112	0.7	160
Taiz	4.0	1.0	4.0	2.4	0.8	3.0	46.8	1.8	26.0	140	1.2	117
Ibb	15.4	1.2	12.8	22.1	1.2	18.1	51.2	1.6	32.0	156	1.3	120
Hajjah	0.2	o.0	0.2	0.4	0.8	0.5	0.8	1.5	0.5	56	0.8	70
Dhamar	4.6	0.8	5.7	3.7	0.8	4.6	3.0	1.2	2.5	29	0.7	41
Others	5.8	0.8	7.3	4.8	0.7	6.8	0.2	1.2	0.2	53	0.6	88

Source: Statistical Year Book, 1976 - 1977, YAR

- to be continued -

Production, Yield and Area of Crops, 1969/70 - 1976/77

Year & Province	Sesame			Tobacco			Cotton		
	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield	Area
1969/70	2.0	0.5	4.0	2.0	0.5	4.0	2.0	0.4	5.0
1970/71	4.0	0.5	8.0	3.0	0.8	4.0	10.0	1.0	10.0
1971/72	4.5	0.6	8.0	5.0	1.3	4.0	15.0	1.0	15.0
1972/73	4.0	0.5	8.0	5.0	1.2	4.2	18.5	0.9	20.0
1973/74	3.7	0.5	7.5	5.0	1.2	4.2	20.0	1.0	20.0
1974/75	5.0	0.6	9.0	5.0	1.2	4.2	27.2	1.0	28.3
1975/76	5.5	0.6	9.7	5.6	1.2	4.6	13.6	0.9	15.0
1976/77	6.4	0.6	10.2	6.4	1.2	5.3	5.1	1.0	5.2
Sana'a	0.1	0.5	0.2	-	-	-	-	-	-
Hodeidah	3.7	0.6	6.2	6.0	1.2	5.0	4.5	1.0	4.5
Taiz	1.5	0.7	2.2	0.3	1.5	0.2	0.5	0.8	0.6
Ibb	0.8	0.7	1.1	-	-	-	-	-	-
Hajjah	0.1	0.5	0.1	0.1	1.2	0.1	0.1	0.6	0.1
Dhamar	-	-	-	-	-	-	-	-	-
Others	0.2	0.5	0.4	-	-	-	-	-	-

- to be continued -

Production, Yield and Area of Crops, 1969/70 - 1976/77

Year & Province	Coffee			Date			Grapes		
	Prod.	Yield	Area	Prod.	Yield kg/tree	No. of trees	Prod.	Yield	Area
1969/70	4.0	0.4	10.0	3.0	-	-	10.0	2.5	4.0
1970/71	4.0	0.4	10.0	5.0	-	-	30.0	4.3	7.0
1971/72	3.5	0.4	9.0	5.0	-	-	35.0	4.7	7.5
1972/73	3.5	0.4	9.0	5.0	-	-	35.0	4.7	7.5
1973/74	3.5	0.4	9.0	5.0	-	-	31.0	3.9	8.0
1974/75	3.0	0.4	8.0	5.0	-	-	40.0	4.7	8.5
1975/76	3.0	0.4	7.0	5.0	-	-	42.4	4.8	8.8
1976/77	3.4	0.4	7.5	6.3	5	1,250	47.1	4.7	10.0
Sana'a	1.0	0.5	2.0	-	-	-	37.6	4.7	8.0
Hodeidah	0.1	0.3	0.2	5.0	5	1,000	-	-	-
Taiz	0.2	0.3	0.5	0.8	5	150	-	-	-
Ibb	0.9	0.5	1.7	-	-	-	-	-	-
Hajjah	0.4	0.4	1.0	0.5	5	100	4.8	4.8	1.0
Dhamar	0.3	0.4	0.8	-	-	-	-	-	-
Others	0.5	0.4	1.3				4.7	4.7	1.0

- to be continued -

Area, Yield and Production of Crops, 1969/70 - 1976/77

Year & Province	Fruits			Potatoes			Vegetables			Legumes		
	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield	Area
1969/70	23	5.8	4.0	20	5.0	4.0	50	6.2	8.0	50	1.0	50
1970/71	25	5.6	4.5	55	9.2	6.0	100	10.0	10.0	60	1.2	50
1971/72	28	5.6	5.0	58	11.6	5.0	137	9.1	15.0	60	1.0	60
1972/73	60	6.0	10.0	64	11.6	5.5	150	9.1	16.5	56	0.9	60
1973/74	60	6.0	10.0	64	10.8	5.9	150	9.4	16.0	64	1.0	65
1974/75	60	5.0	12.0	71	10.9	6.5	168	9.3	18.0	71	1.0	71
1975/76	65	5.3	12.3	76	11.2	6.8	183	9.2	20.0	76	1.0	76
1976/77	84	5.6	15.0	124	11.5	10.8	239	9.6	25.0	82	1.1	72
Sana'a	6.5	5.0	1.3	4.8	8.0	0.5	40.0	8.0	5.0	16.0	0.8	20.0
Hodeidah	35.0	6.0	6.0	0.8	8.0	0.1	40.0	10.0	4.0	7.0	0.7	10.0
Taiz	26.5	6.0	4.5	22.0	11.0	2.0	60.0	10.0	6.0	15.0	1.5	10.0
Ibb	15.0	5.0	3.0	96.0	12.0	8.0	93.0	10.0	9.3	40.5	1.5	27.0
Hajjah	-	-	-	0.8	8.0	0.1	1.6	8.0	0.2	0.8	0.8	1.0
Dhamar	0.5	5.0	5.0	0.8	8.0	0.1	2.7	9.0	0.3	0.7	0.7	1.0
Others	0.5	5.0	5.0		-	-	1.6	9.0	0.2	2.1	0.7	3.0

Table 1.10 Number of Livestock, 1961 - 1976

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

Year	Cattle	Sheep	Camels	Horses	Donkeys
1961	1,280	11,160	53	3	-
1962	1,270	11,270	53	3	-
1963	1,240	11,380	54	3	-
1964	1,250	11,500	55	3	-
1965	1,260	11,600	55	3	-
1966	1,200	10,572	75	3	512
1967	1,179	11,023	61	3	619
1968	962	10,510	53	3	596
1969	856	8,592	51	2	512
1970	813	8,769	52	3	511
1971	857	10,627	69	4	672
1972	900	9,561	117	4	600
1973	810	9,500	100	4	600
1974	900	10,000	100	4	600
1975	950	10,500	105	3	650
1976	800	11,000	110	3	700
Sana'a	40	3,000	5	0.4	100
Hodeidah	360	4,500	60	1.5	200
Taiz	150	1,500	20	0.4	170
Ibb	170	500	5	0.3	50
Hajjah	30	300	5	0.2	100
Dhamar	10	500	2	0.1	40
Other	40	700	13	0.1	40

Source: Statistical Year Book, 1976 - 1977, YAR

Table 1.11 Estimates of Meat Production, 1969/70 - 1975/76

(Unit: ton)

Year	Sheep	Cattle	Camels	Chickens	Total
1969/70	37,330	12,932	280	1,250	51,792
1970/71	32,340	11,468	280	1,275	45,363
1971/72	22,800	10,919	280	1,300	35,299
1972/73	24,860	12,079	640	1,325	38,903
1973/74	24,700	10,858	560	1,350	37,468
1974/75	25,230	11,651	560	1,375	38,816
1975/76	25,510	12,383	490	1,400	39,783

Source: Statistical Year Book, 1976 - 1977, YAR

Table 1.12 Investment in the Five-year Plan

(Unit: YR×10^6)

	YR Million	Percent
Total Fixed Capital Formation	15,971	100
Sector Allocation		
(a) Agriculture	2,276	14
(b) Industry	3,996	25
Manufacturing	(1,998)	(12)
Electric Power & Water	(1,373)	(9)
Construction	(451)	(3)
Mining	(174)	(1)
(c) Transport & Communications	4,925	31
(d) Other Services	4,774	30
Housing	(2,090)	(13)
Public Administration	(1,963)	(12)
Trade & Banking	(721)	(5)
Program Responsibility		
(a) Government	5,400	34
(b) Mixed Enterprise	4,949	31
(c) Cooperatives	1,101	7
(d) Private Sector	4,521	28
Investment Financing		
(a) Domestic Financing	9,365	59
Government	(2,649)	(17)
Enterprises	(1,109)	(7)
Private Households	(5,607)	(35)
(b) Foreign Financing	6,606	41

Source: A World Bank Country Report, YAR, 1979

Table 1.13 Macro-Economic Frame of Five-Year Plan
(YR million, 1975/76 prices)

	Base Year 1975/76	Last Year 1980/81	Plan Period 1976/77-1980/81	Annual Growth Rate (%)
GDP	5,181	7,671		8.2
Agriculture	2,305	3,010		5.5
Industry/1	529	971		12.9
Distribution sectors/2	1,512	2,450		10.1
Other services	835	1,240		8.2
GNP	7,751	10,757		6.8
Consumption	5,481	7,485		6.4
Government	681	1,098		10.0
Non-government	4,800	6,387		5.9
National Savings	2,270	3,272	13,830	7.6
Government	-12	192		
Non-government	2,282	3,080		6.2
Gross Investment	1,170	5,633	16,550	36.8
Fixed Capital Formation	773	5,536	15,971	48.3
Agriculture	106	842	2,276	52.0
Industry	61	1,370	3,996	86.0
Distribution sectors	265	1,991	5,646	50.0
Other services	341	1,333	4,053	32.0
Increase in Stocks	397	97	579	
Exports, Goods & NFS	398	778		14.3
Imports, Goods & NFS	1,868	6,225		27.2
Factor Income, net/3	2,570	3,086		3.7
Current Account Balance	1,100	-2,361	-2,720	
Official Loans	332	1,230	4,078	30.0
Current Government Revenue	605	1,185		14.4
Current Government Expenditure	617	993		10.1

/1 : Includes construction.
/2 : Transport, trade, finance, communications.
/3 : Includes official grants.
Source: A World Bank Country Report, YAR, 1979

Table 1.14 Illustrative Projection of External Accounts

(Unit: YR×10^6, current prices[/1])

		1976/77	1981/82
1.	Exports, G & NFS	291	700
2.	Imports, G & NFS	3,505	9,950
3.	Resource Gap (1-2)	-3,214	-9,250
4.	Net Factor Incomes	4,002	8,250
	(a) Workers' remittances, net	(3,791)	(7,950)
	(b) Investment income, net	(211)	(300)
	(i) Earnings	(215)	(400)
	(ii) Payments	(4)	(100)
5.	Current Account Balance (3+4)	788	-1,000
6.	Official Grants	470	900
7.	Official Loans, Net	189	600
	(a) Disbursements	(208)	(800)
	(b) Amortization	(19)	(200)
8.	Errors & Omissions[/2]	566	300
9.	Increase in Reserves	2,013	800
10.	Gross Reserves (end of FY)	4,142	10,000
11.	External Debt (disbursed)	1,314	4,000
12.	Debt Service Ratio	0.5%	4.0%

/1 : Assuming average price increase of 7% p.a.

/2 : Including private capital flows.

Source: A World Bank Country Report, YAR, 1979

REFERENCE

Central Planning Organization	Statistical Year Book, 1976 - 1977, YAR
Central Planning Organization	First Five-Year Plan, 1976/77 - 1980/81, YAR
Central Bank of Yemen	Seventh Annual Report, 1977/78
International Bank for Reconstruction and Development (1979)	A World Bank Country Report, YAR
Swiss Technical Cooperation Service (1978)	Final Report on the Airphoto Interpretation Project
USAID (1978)	Socio-Economic Problems, Hajjah and Hodeidah
IBRD (1979)	Effects of Migration of Rural Labor on Agricultural Development
USAID (1975)	Local Initiative in Yemen

II TOPOGRAPHY

Figures

II TOPOGRAPHY

(1) General

2.01 The Yemen Arab Republic lies between latitude 12°40' and 17°26'N and longitude 42°30' and 46°31'E, and located on the southwest edge of the Arabian Peninsula. The country extends over approximately 200,000 km^2. The mountains of Yemen have been formed as a result of block faulting along a north-south axis parallel to the Red Sea. The resultant uplift has formed the central mountain ridges extending from Taiz to Sadah. This central ridge drainage to the Red Sea is carried by seven major wadis, i.e., Wadi Mawr, Surdud, Siham, Rima, Zabid, Risyan and Mawza. These and many other minor wadis are running down steep mountain slopes forming deep gorges which eventually open to the coastal plain.

2.02 The topographic conditions of the Hajjah Province have been studied using topographic maps scaled 1 to 50,000, in conjunction with aerial-photo interpretation and ground surveys. The topographic data were computerized and the various maps were produced as shown in Figs. 2.3, 4.1 and 5.1.

2.03 The Hajjah Province is located on the northwestern corner of Yemen Arab Republic , extending from latitude 15°32' to 16°40'N and longitude 42°47' to 43°50'E. The total land area is 9,590 km^2. The area consists of coastal lowland and high mountains, ranging from sea level to 3,360 m in elevation. The general view of the Hajjah Province is drawn by computerized autoplotter and is shown in Fig. 2.1.

2.04 On the basis of topographic structure, the Hajjah Province would be conveniently divided into three regions

to study the physical resources and development constraints involved; i.e., lowland, midland and highland. The general boundaries in between each region are shown in Fig. 2.2.

(2) Geographical Regions

Lowland

2.05 The lowland forms about 40 km-wide belt along the Red Sea. The coast extends over about 70 km in north-south direction. The elevation ranges from sea level to about 500 m around the foothills. It is level or slightly undulating and intersected by shallow-wide wadis draining from eastern mountains toward the Red Sea. The lowland occupy an area of 4,690 km2 or 48.9% of the total land area. Most of the lowland consist of alluvial fans, low dunes and sand sheets.

Midland

2.06 The midland extends on piedmont and middle height region, ranging from 500 m to 1,000 m in elevation between coastal lowland and highland. The landscape is generally rugged, cut by deep wadis through narrow gorges which drain to the lowland in the west. This region is subdivided into three topographic units, i.e., piedmont (foothills), upland and plateau. The piedmont area forms talus and colluvial slopes. This unit is widely distributed along the foothills mainly in the north-eastern part of the Province. The upland is generally dissected with gentle slopes less than 13%, and occupy a large area extending on left side of the Wadi Mawr. The mountain plateau area is generally rugged with steep slope. The plateau with steepest slope is dominant on the mountains composed of limestone and green shale. The plateau developed on Yemen Volcanics has rather gentle slopes. Rugged topography is common on the plateau of granite and gneiss.

2.07 The area of the midland is 4,090 km^2 in total, corresponding to 42.7% of the total province area. Most of the area is covered by coarse-textured lithic soils with stones and rocks. In this region, soil erosion is very serious due to rugged topography and nature of prevailing soil conditions.

Highland

2.08 The highland region comprises higher mountain areas exceeding 1,500 m in elevation which extend around Al Mahabisha and Shahara. The topography is generally very rugged. The highland extends over about 810 km^2 or 8.4% of the total land area. A chain of highest land is found around southern areas of Hajjah town where mountain peaks exceed 2,500 m, including highest mountain, Al Mahdad (3,360 m). The highland region is subdivided into three units on the basis of geological composition, i.e., inter-mountain plain, mountains on Yemen Volcanics and mountains on granite and gneiss. The inter-mountain plain is developed on limestone and shale with slighly undulating topography. It is scattered around Al Mahabisha and Hajjah. The mountains on Yemen Volcanics form convex surface and very steep slopes, extending around the town of Shahara. The mountains developed on granite and gneiss have generally moderate slopes and occupy the areas around Bani Mawzaf and Al Mahdad in the southern part of the Hajjah Province.

(3) Slope Analysis

2.09 The land slope must be one of the most important factors when rural development programme is formulated. The land slope analysis is shown in Fig. 2.3. Areas of each slope class are summarized below:

Altitude (m)	Slope Class (%)						Total (km^2)
	0-2	2-6	6-13	13-25	25-55	55-	
0- 500	2,950	840	530	300	70	0	4,690
500-1,500	50	510	890	1,340	1,290	10	4,090
1,500-	0	20	60	160	540	30	810
Total	3,000	1,370	1,480	1,800	1,900	40	9,590

(4) Altitude and Administrative Division

2.10 The Hajjah Province is administratively divided into five Quada (districts); Midi, Al Mahabisha, Washha, Shahara and Hajjah. Each Quada is generally characterized by altitude and the resulting climatic conditions, especially rainfall, and is classified in areas under 100 meters interval contour as shown below:

Altitude (m)	Area (km^2)					
	Midi	Al Mahabisha	Washha	Shahara	Hajjah	Total
a. Lowland						
0- 100	1,517	0	0	0	0	1,517
100- 200	1,520	0	6	0	0	1,526
200- 300	260	61	193	0	15	529
300- 400	115	135	238	0	144	632
400- 500	74	85	221	0	106	486
Sub-total	3,486	281	658	0	265	4,690

Altitude (m)	Area (km^2)					
	Midi	Al Mahabisha	Washha	Shahara	Hajjah	Total
b. Midland						
500- 600	37	63	210	0	88	398
600- 700	33	36	176	0	114	359
700- 800	20	36	110	2	125	293
800- 900	10	55	116	7	103	291
900-1,000	3	40	90	19	105	257
1,000-1,100	2	49	77	117	73	318
1,100-1,200	0	60	88	208	93	449
1,200-1,300	0	71	120	301	80	572
1,300-1,400	0	54	81	479	78	692
1,400-1,500	0	47	90	259	65	461
Sub-total	105	511	1,158	1,392	924	4,090
c. Highland						
1,500-1,600	0	21	47	116	51	235
1,600-1,700	0	21	18	96	38	173
1,700-1,800	0	12	11	54	41	118
1,800-1,900	0	10	3	19	33	65
1,900-2,000	0	6	0	12	22	40
2,000	0	2	0	37	140	179
Sub-total	0	72	79	334	325	810
Total	3,591	864	1,895	1,726	1,514	9,590

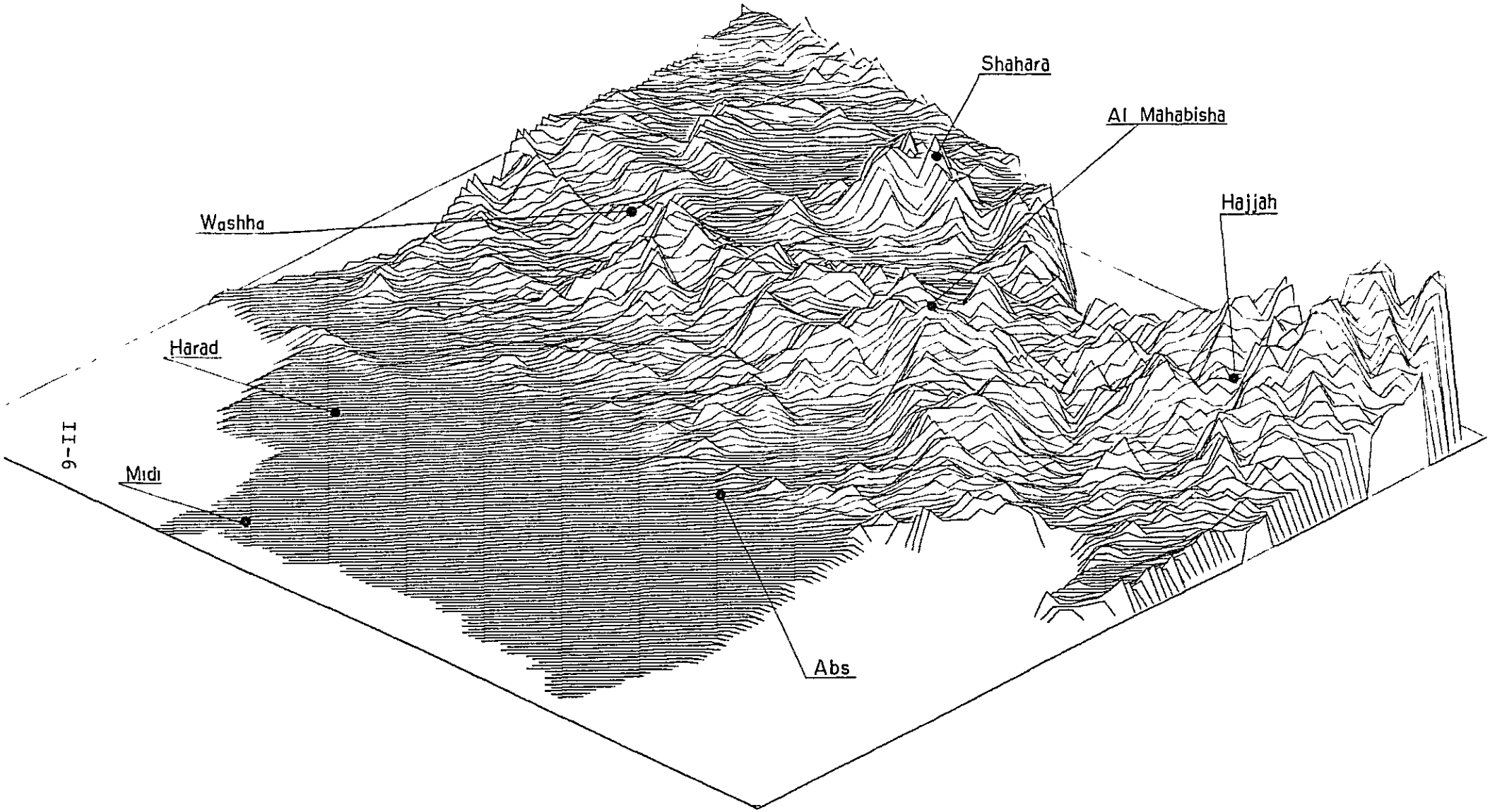


Fig. 2.1 Bird's-eye View of Hajjah Province

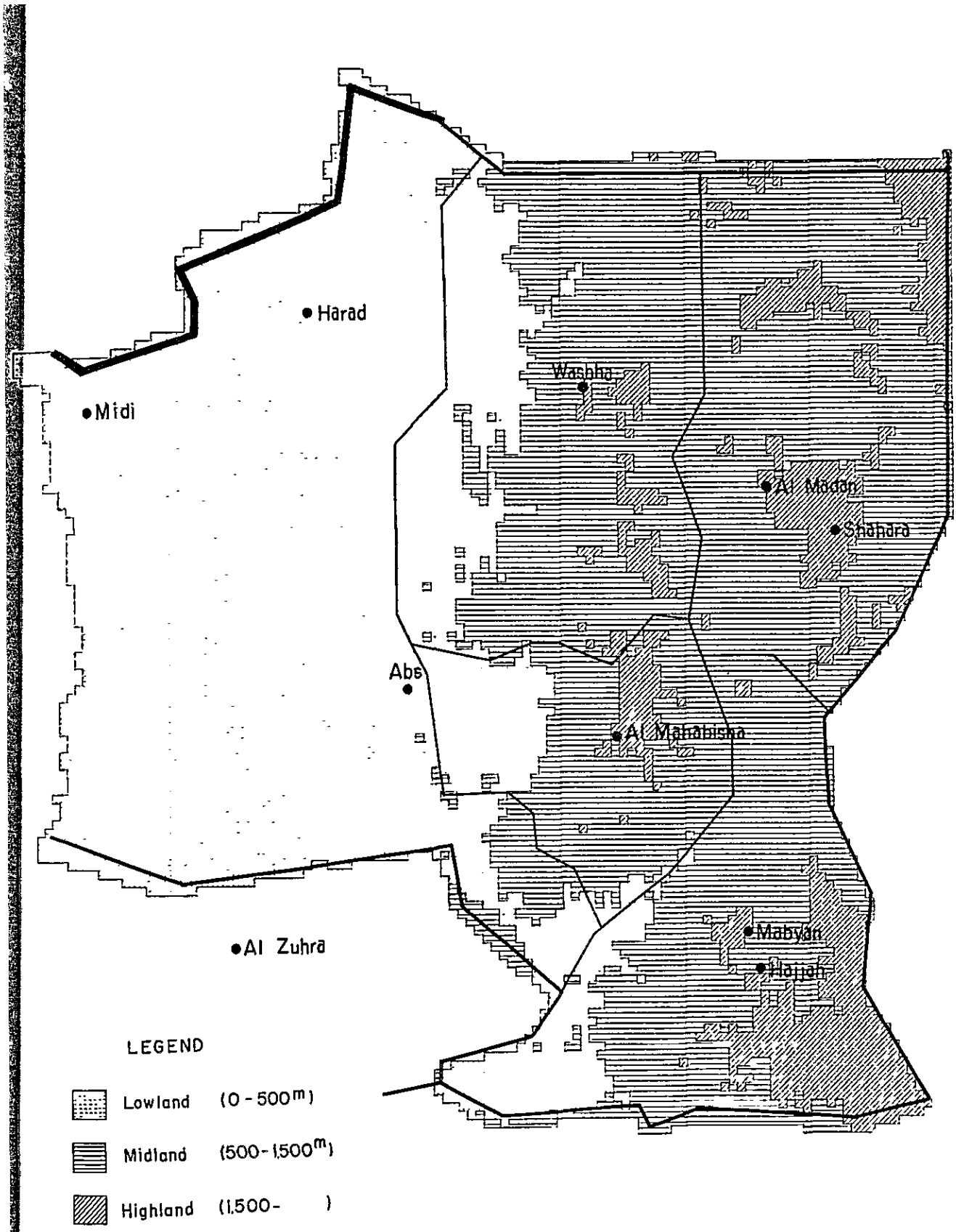
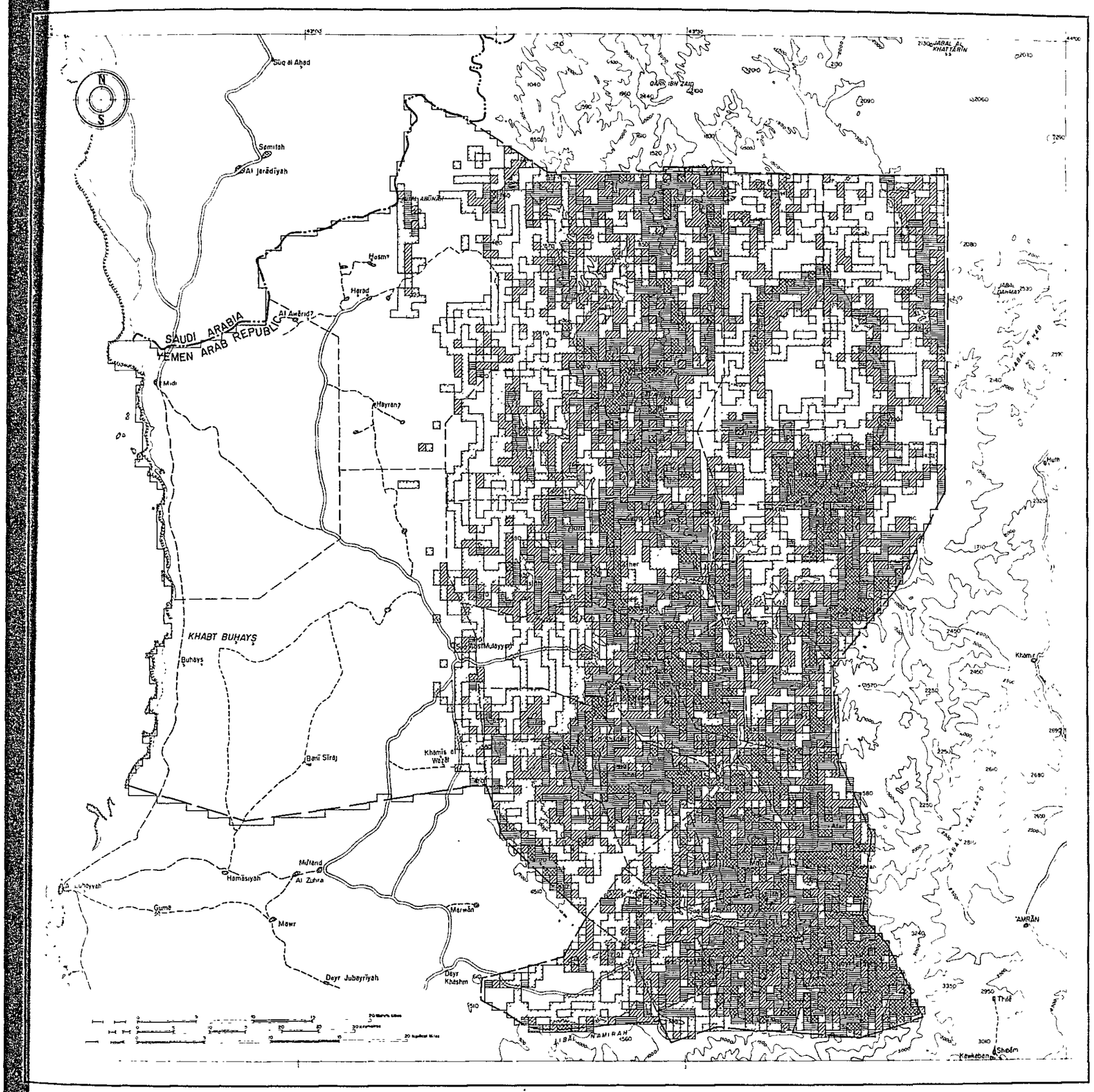


Fig. 2.2 Geographical Regions



LEGEND

- 0 - 2 PERCENT SLOPE GRADIENT
- 2 - 6 PERCENT SLOPE GRADIENT
- 6 - 13 PERCENT SLOPE GRADIENT
- 13 - 25 PERCENT SLOPE GRADIENT
- 25 - 55 PERCENT SLOPE GRADIENT
- OVER 55 PERCENT SLOPE GRADIENT

Fig.2.3 Slope Analysis

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Middle East Institute of Japan (1978)	Year Book of Middle East and Africa, Tokyo, Japan
Swiss Technical Co-operation Service, Berne (1977)	Population Distribution Administration Division and Land Use in the Yemen Arab Republic, Physical Geographic Division, Central Planning Organization, Sana'a

III GEOLOGY

Figures

III GEOLOGY

(1) General

3.01 The framework of geological configuration in Yemen, is composed of volcanic, pyroclastic rocks erupted by the orogenic movement in Proterozoic to early Paleozoic era, and the sedimentary rock series, alternation of mudstone and sandstone, limestone, chert and granites intruded into above-mentioned sedimentary series. These Pre-cambrian basement rocks are distributed in eastern, northern and north-western parts of Yemen.

3.02 After severe orogenic movements in Pre-cambrian era, volcanic activities ceased, and the quiet continental environments continued until the end of cretaceous. In the general view of the geologic conditions in Paleozoic, steep mountain area became to peneplain by the severe land erosion.

3.03 In the Mesozoic era from Jurassic to cretaceous, great scale of transgression was repeated, during such time, Kohlan series deposited in lacustrine environment, and Amran series composed of river deposits, sublittoral Tawilah group and Medj-zir series were deposited in order. These Mesozoic deposits covered over Pre-cambrian basement rocks in unconformity, and are widely distributed in the northern part of Yemen.

3.04 At the end of the continental time, severe volcanic activities started and covered all over Yemen from later cretaceous to tertiary. By these volcanic activities, the great amount of basaltic lavas and pyroclastic materials (Yemen trap series) were erupted, and the total thickness of these volcanics reached about 1,500 m in the southern part of Yemen. At the same time, intrusive activities of

granites were progressed from miocene to pliocene.

3.05 In Quarternary, new volcanic activities started in the central ridges of Yemen, and great amount of volcanics covered over. Many craters can be observed near Sana'a and Marib.

(2) Geology of Hajjah Province

3.06 The geological conditions in the Hajjah Province was studied on the basis of the geological map prepared by U.S. Geological Survey. The geological information was also obtained from interpretation of Landsat imagery and aerial photographs, and was partially supported by field investigation.

3.07 The Hajjah Province area is divided into three geographical regions; i.e., lowland, midland and highland, each having different geologic conditions. The geologic features of each region are generally as follows:

a. Lowland

Lowland (Tihama plain) consists of terrace desposits and alluvial deposits. These deposits are composed of mud, sand and gravel transported by wadis. As the reflection of geologic conditions in upper reaches of wadis, sand and gravel are little in the northern part of Tihama plain, and comparatively much in southern part. In the rainy season, gravels are transported by wadis concentratively and are irregularly distributed along wadis.

b. Midland

Midland region consists of Pre-cambrian basement rocks and Jurassic sediments. Pre-cambrian

basement rocks are distributed in hillsides and mountain slopes, and consists mainly of crystalline schists, slate and conglomerate in the northern part and of granites in the southern part. Crystalline schists are heavily weathered and foliated along schistosity, and become to fragile fragments. On the other hand, granites are partially weathered, but hard in substance and original textures are remained comparatively. Jurassic sediments consisting mainly of dark grey hard shale (Kohlan series) and yellowish grey limestone (Amran series) are distributed near the mountain top covering over basement rocks with unconformity. In the distribution area of inclined Jurassic sediments, Cuesta can be observed, and in gentle slope of inclined side, the terraced croplands are developed, but in steep slope of opposite side, land collapes and falling stones are remarkable.

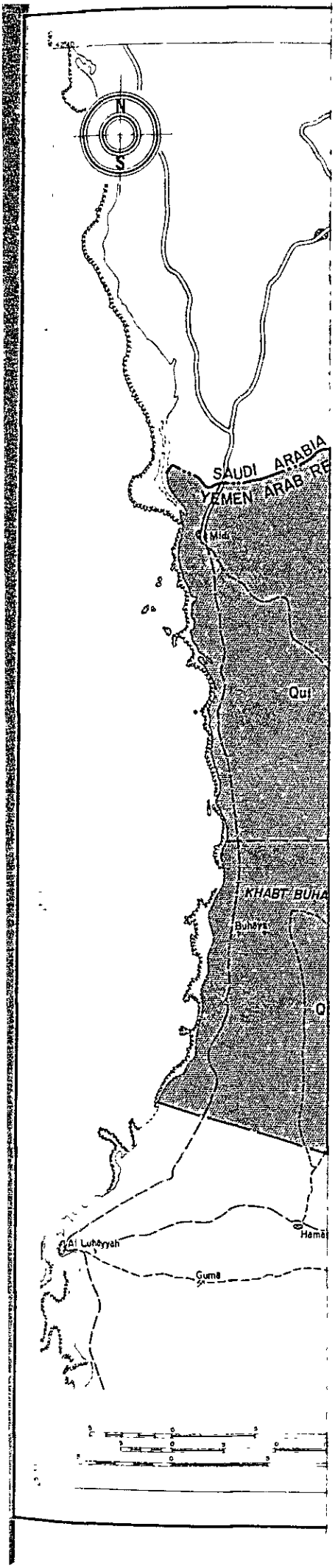
c. Highland

Highland region consists of great amount of lavas and pyroclastic materials (Yemen trap series) erupted in the depressed basin. Steep mountains ranging from 1,500 m to 2,500 m in elevation, are formed by the later volcanic activities. These pyroclastic materials are fairly subjected to thermal metamorphism, and become fragile in part.

3.08 Stratigraphic table of the Hajjah Province is shown below:

Quarternary	Holocene	River terrace deposits, loess deposits, alluvial fan deposits, coastal sand
	Pleistocene	
Tertiary	Pliocene	Andesite intrusive, baid formation, granite intrusives
	Miocene	Yemen trap series
	Eocene	Medj-zir series
Cretaceous		Tawilah group
Jurassic		Amran series Kohlan series
Ordovician		Wajid sandstone
Pre-cambrian		Basement rocks

3.09 The geological map is shown in Fig. 3.1. The geological section is also given in Fig. 3.2. Various photographs that show typical geological formations, are taken during the field investigation, and some of them are shown in Figs. 3.3 through 3.8.



LEGEND

QUATERNARY

Qu

- Qu1 Coastal sand
- Qu2 Alluvial fans
- Qu3 River-terrace deposits

TERTIARY ~ CRETACEDUS

Miocene

- Ta Hypabyssal andesite and diabase intrusives

Lower Miocene Tky — YEMEN VOLCANICS

- Tky4 Leucocratic felsic tuff with some dark basaltic flows
- Tky3 Predominantly felsic and tuffaceous older than Tky4
- Tky2 Predominantly felsic and tuffaceous older than Tky3

Eocene

- Tkt TAWILAH GROUP AND MEDJ-ZIR SERIES
  Continental type coarse crossbedded sandstone with lenses of conglomerate and gravel

JURASSIC

Upper

- Jam AMRAN SERIES
  Limestone, marl and shale

Lower

- Jko KOHLAN SERIES
  Green shale with sandstone and conglomeratic bands in lower part; sandstone and some conglomerates in upper part

PRE-CAMBRIAN

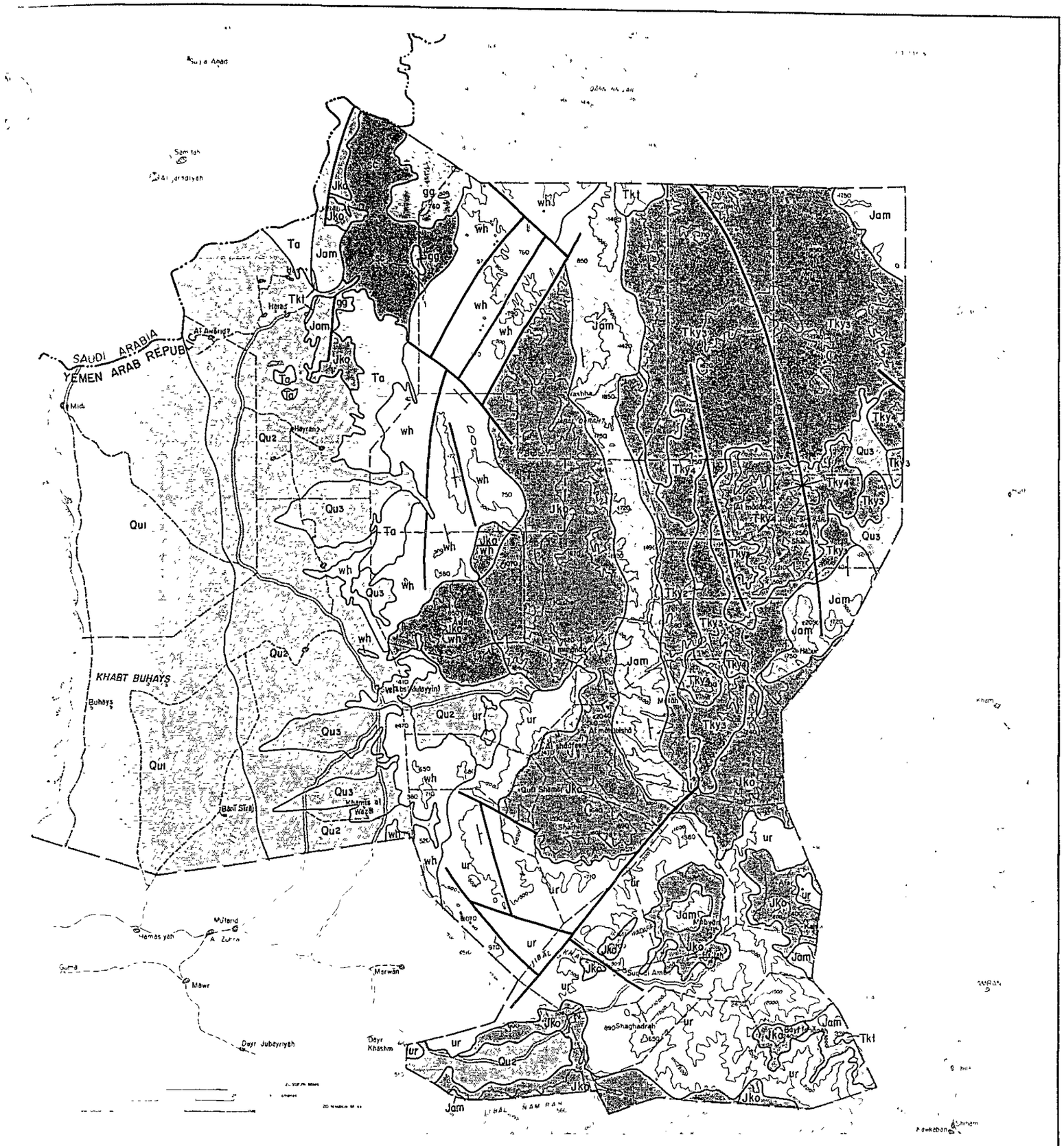
- ur Predominantly granite, gneiss
- wh Chlorite-sericite schist, amphibole schist, graphite schist, marble quartzite, slate, conglomerate and greenstone
- gg Gneissic granite, gneissic granodiorite and injection gneiss
- sc Low-grade metamorphosed sedimentary rocks
- Jko / wh Area includes two undifferentiated units

Fault

Dip and strike of bed

Syncline

Fig.3.1 Geology



LEGEND

QUATERNARY

Qu

- Qu1 Coastal sand
- Qu2 Alluvial fans
- Qu3 River-terrace deposits

TERTIARY ~ CRETACEDUS

Miocene

- Ta Hypabyssal andesite and diabase intrusives

Lower Miocene — YEMEN VOLCANICS

Tky

- Tky4 Leucocratic felsic tuff with some dark basaltic flows
- Tky3 Predominantly felsic and tuffaceous older than Tky4
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- Tkt TAWILAH GROUP AND MEDJ-ZIR SERIES
  Continental type coarse crossbedded sandstone with lenses of conglomerate and gravel

JURASSIC

Upper

- Jam AMRAN SERIES
  Limestone, marl and shale

Lower

- Jko KOHLAN SERIES
  Green shale with sandstone and conglomeratic bands in lower part; sandstone and some conglomerates in upper part

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- ur Predominantly granite, gneiss
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- gg Gneissic granite, gneissic granodiorite and injection gneiss
- Sc Low-grade metamorphosed sedimentary rocks
- Jko/wh Area includes two undifferentiated units

Fault — Dip and strike of bed

Syncline

Fig.3.1 Geology

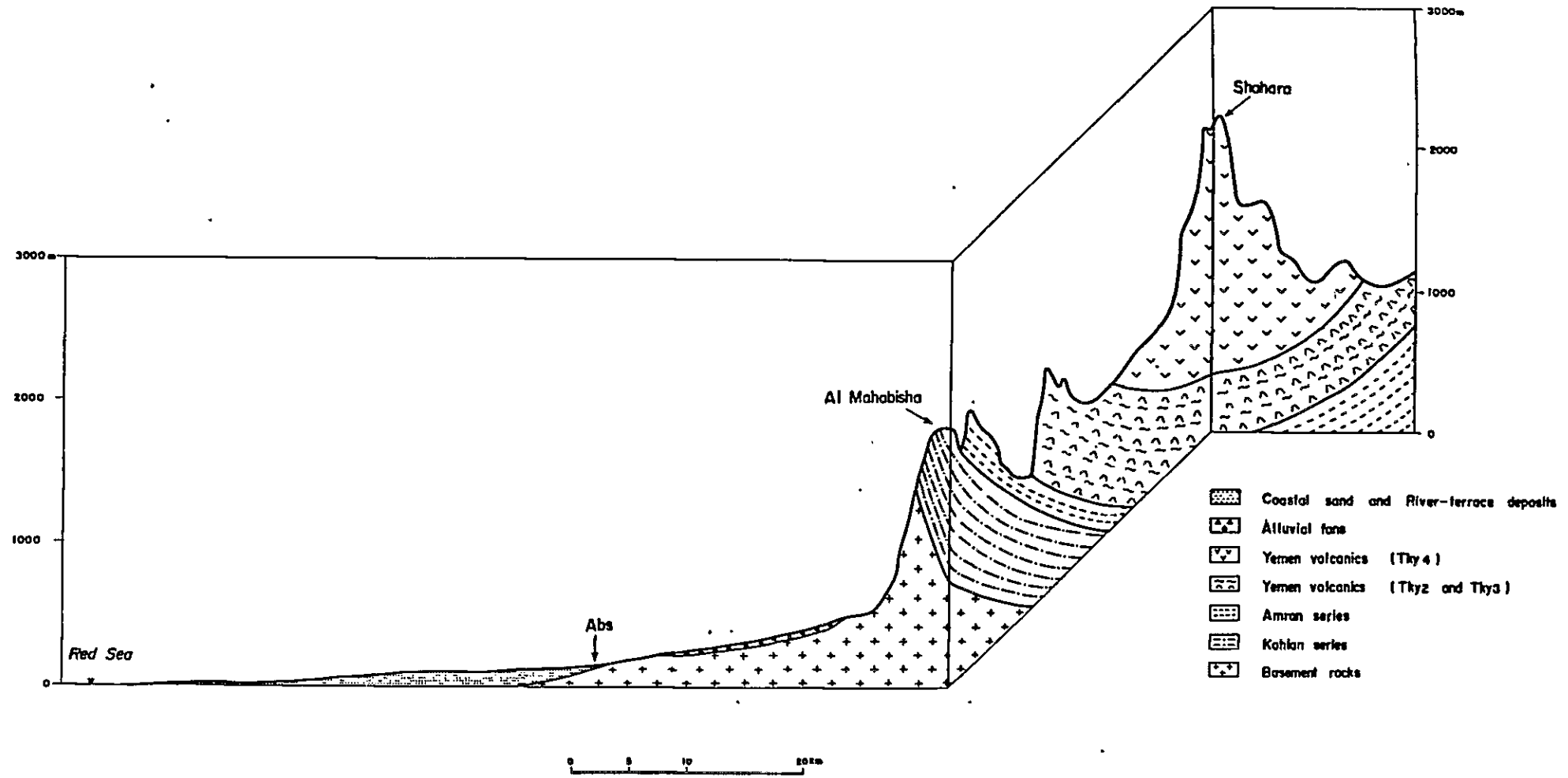

Fig. 3.2 Geological Section

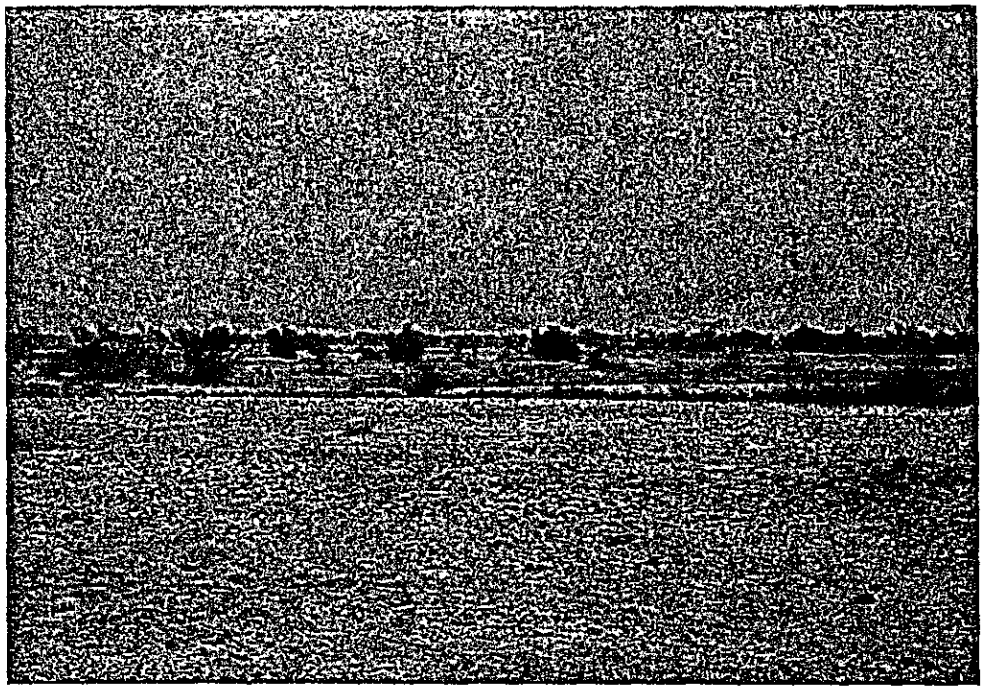

Fig.3.3 Alluvial Fan Deposits in Tihama Lowland

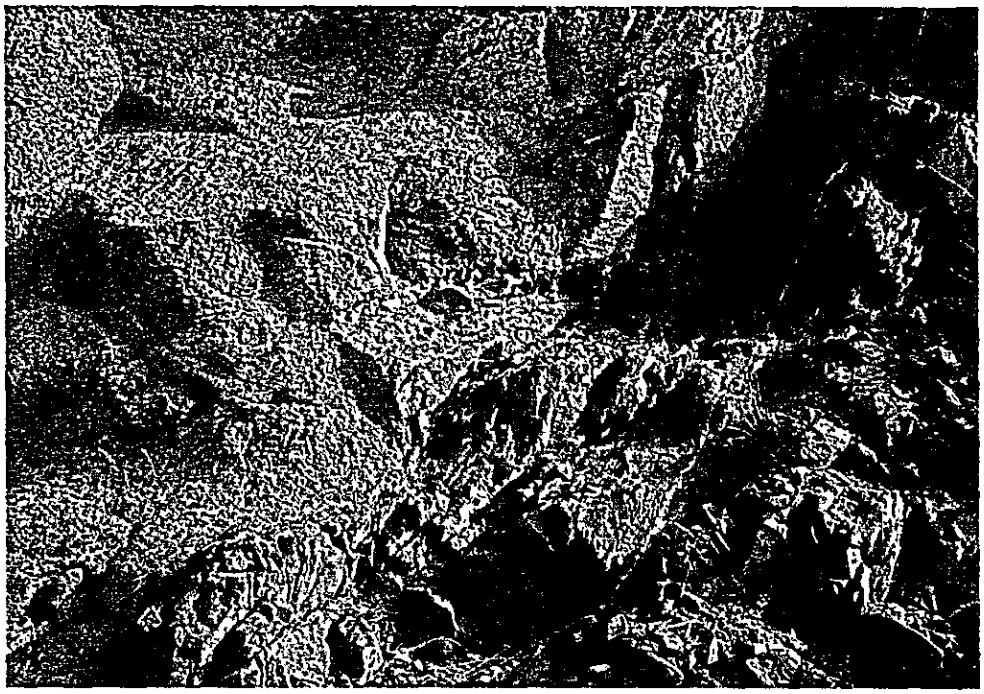

Fig.3.4 Pre-cambrian Besement Rocks near Hajjah

Fig.3.5 Cuesta near Almahabisha

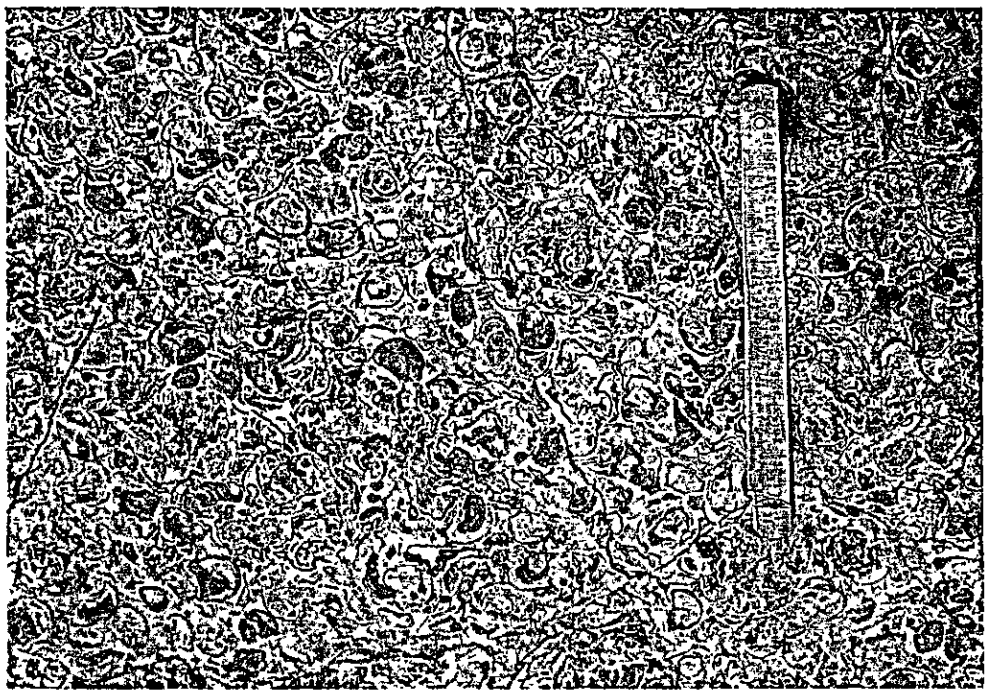

Fig.3.6 Shell Fossils in Kohlan Series

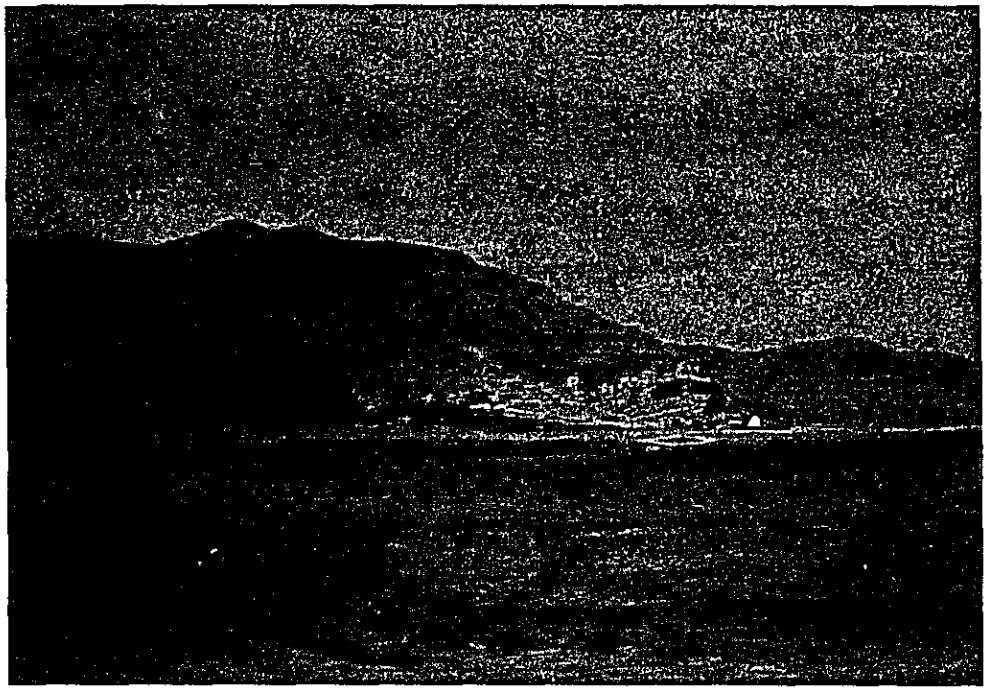

Fig.3.7 Amran Series (Rhythmical Alternation of Light-Grey Limestone and Shule)

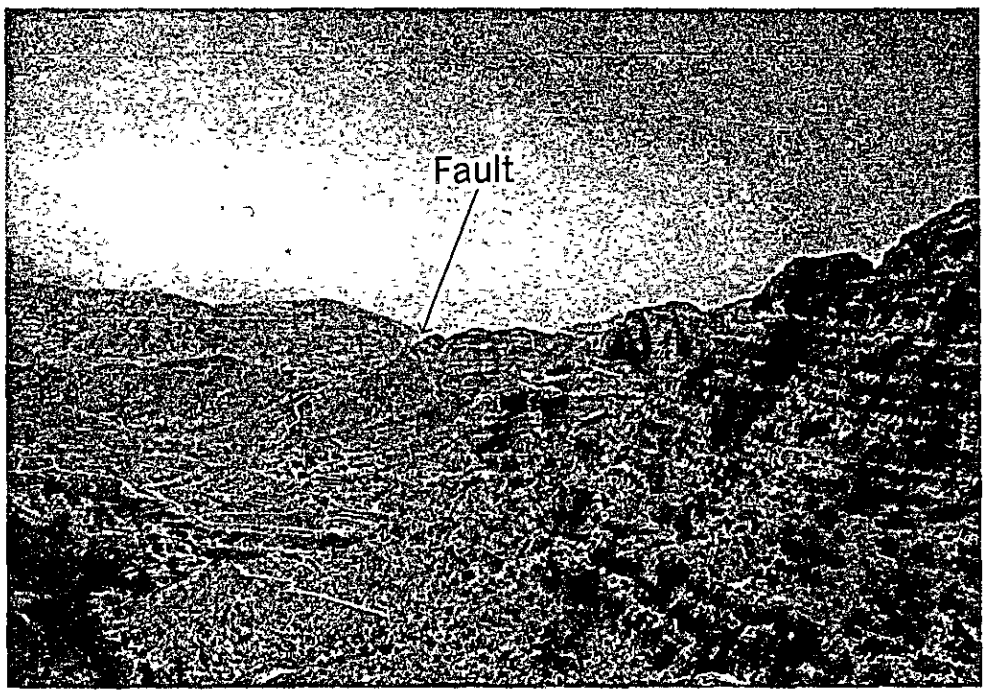

Fig.3.8 Yemen Trap Series around Shahara

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M. J. Grolier, U.S. Geological Survey (1976)	Geologic Map of the Yemen Arab Republic
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IV METEOROLOGY AND HYDROLOGY

Tables

Figures

IV METEOROLOGY AND HYDROLOGY

Meteorology

4.01 Depending on the topographical conditions, which are already described in Chapter II, Hajjah Province is divided into three geographical regions; coastal lowland, midland and highland.

4.02 No long term meteorological data are available in the Area. Systematic observation has been carried out only at the Chinese Farm in El-Bahana since 1976. The Chinese Farm is located northeast of Shahara and the elevation is around 1,200 meters above the sea level. The observation data represent the midland climate. No meteorological stations exist in the coastal lowland and the highland. The climate conditions in the coastal lowland and the highland were esti estimated from the observation data at the adjacent meteorological stations, i.e., Al-Zuhra and Sana'a respectively. The locations are shown in Fig. 4.1. The climatic data at these stations on temperature, relative humidity, actual sunshine hours, rainfall, evaporation and wind velocity are shown in Table 4.1. The representative patterns of rainfall and temperature in each geographical region are given in Fig. 4.2.

4.03 The coastal lowland has a tropical arid climate and is extremely hot except in winter season. The mean monthly temperature range from 26°C in December to 34°C in June. The mean monthly minimum temperatures range from 19°C to 29°C and mean monthly maximum temperatures range from 32°C to 40°C. The area generally receives less than 300 mm annual rainfall which concentrates in the periods between May and October. The average relative humidity is 60 to 80 percent and especially high in the morning. Strong winds blow frequently from the southwest to northeast causing sand dune movement.

4.04 The midland has subtropical climate. The mean monthly temperatures range from 21°C in January to 29°C in June. The mean monthly minimum temperatures range from 6°C to 15°C and mean monthly maximum temperatures range from 23°C to 30°C. The annual rainfall is over 300 mm in the foothills and it increases by altitude reaching 600 mm with two peaks in April/May and July/August. Annual rainfall decreases from southwest to northeast ranging 950 mm at At Tur to 520 mm at El Bahana near Shahara. Main wind direction is east in winter and spring, and west in summer and autumn.

4.05 The highland, comprising mountainous area above 1,500 m in elevation, extend around Al Mahabisha and Shahara. The climatic conditions are similar to those of the midland. The annual mean temperature go down by altitude as illustrated in Fig. 4.3. The annual rainfall reaches to 800 mm in Al Mahabisha and decreases towards the northeast. The temperature fluctuation in a day is considerable. The sunshine intensities are very much affected by the slope directions as illustrated in Fig. 4.4.

River basins

4.06 The project area, in terms of river basins, can be roughly divided into two by the ridge running from north to south in the central part of the Hajjah Province. The one is the Wadi Mawr basin which covers most of mountainous area in the east of the ridge and the other is the basin composed of coastal lowland and midland in the west of the ridge, as shown in Fig. 4.5.

4.07 Wadi Mawr, the largest of Tihama wadis, has a catchment area of about 7,900 km^2 and most of the catchment area lie in the Hajjah Province. It flows away into the Tihama area which is entirely outside the Hajjah Province.

Rainfall

4.08 In the project area and its adjacent area, total 17 rain gauge stations are located as shown in Fig. 4.1. The altitude of the rain gauge stations and periods of observations are shown in Table 4.2. The observation periods are insufficient for hydrological analysis and all the rain gauge stations in the Hajjah Province are located in the catchment area of Wadi Mawr. Several new stations will be required in the coastal lowland and the midland in the west of the ridge. The monthly mean rainfall records at 17 stations are given in Table 4.3. In illustration of the local distribution of annual rainfall, an isohyetal map is shown in Fig. 4.6. The rainfall distribution makes a cone with the center at At Tur, where the average annual rainfall is 950 mm and it gradually decreases toward northeast.

Runoff

4.09 The discharge records of Wadi Mawr are only available runoff data. The observation has been carried out by the Tihama Development Authority especially for the development of Wadi Mawr since 1975. The monthly discharge and the monthly mean are shown in Table 4.4. The specific discharge is extremely small as seen from Table 4.5. The monthly mean specific discharges range from 1.2 mm in February to 3.8 mm in August. The annual runoff coefficient is 5.4 percent. The relation between average rainfall and specific discharge are illustrated on Fig. 4.7.

Sediment

4.10 The sediment runoff data of Wadi Mawr are available. Due to the high intensity of rainfall and the steep slope of the river course, Wadi Mawr is a swift running stream, and a considerable amount of sediment is carried by the surface runoff. The river bed of Wadi Mawr is composed of pebble

and cobble and rock in some portion. It gives little sediment. Most of the sediment is supplied from erosion of uncultivated hillslope through the tributaries. The daily sediment load has been estimated for the period of April 1975 through December 1976 by the Tihama Development Authority. The average concentration is 5,700 ppm.

Ground water

4.11 The subsurface of the Tihama coastal plain, which is composed of alluvial deposits, constitutes groundwater aquifer. The seepage from the wadis and the infiltration of rainfall from land surface replenish the groundwater. Unconfined groundwater table can be found in most of the Tihama coastal land. The depth from the land surface to the water surface ranges from less than 5 m to 30 m. Shallow hand-dug wells for domestic use are found near the villages everywhere in the Tihama coastal land. These wells are insufficient in yield capacity, some of which dry out during dry season. Deep drilled wells were perforated into semi-confined aquifer and confined aquifer in Harad and Abs for the purpose of potable water and irrigation water. The groundwater development can be expected in the vicinity of wadis, though the further comprehensive study is required.

Water quality

4.12 The results of water quality analysis for well, wadi and spring are given in Table 4.6. The water quality does not vary much in different water-sources. The specific electric conductivity is below 1,000 micromhos/cm and pH values range from 7.7 to 8.2, which will be acceptable for both irrigation and drinking purposes. The values of sodium absorption ratio (SAR) range from 1.3 to 2.1 and the water can be applied without any restriction to almost all the types of soils and crops.

Water right

4.13 The water rights for streams are administrated under Islamic Law 'al ala falala', whereby the higher lands have priority to the lower land. The priority of a main canal is related to the point of diversion on the wadi, and that of the secondary canal, on the main canal. The field nearest to the canal head has highest priority. The priority is nullified when the diversion structures are damaged or destroyed by floods. A water master is assigned to each canal, and he operates the water distribution. He often re-arranges the field priorities in order to deliver water when needed.

Table 4.1 Meteorological Records
at Al Zuhara, El Bahana and Sana'a

Monthly Mean Evaporation

Unit: mm/day

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual mean
Al Zuhra	6.2	6.4	7.0	8.8	10.3	10.5	10.6	10.1	9.2	7.9	7.1	6.5	8.4
Bahana	6.4	8.5	8.6	8.6	8.4	9.3	6.6	6.3	7.4	7.5	7.7	7.1	7.7
Sana'a	5.1	5.5	7.4	6.8	6.6	10.0	7.8	5.7	9.4	5.4	4.6	5.0	6.6

Monthly Mean Wind Velocity

Unit: m/sec

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual mean
Al Zuhra	2.1	2.3	2.4	2.2	2.2	2.3	2.8	2.5	1.9	1.8	1.9	2.1	2.2
Bahana	2.0	2.7	3.1	1.8	1.4	2.1	1.9	1.3	1.1	2.0	2.6	2.0	2.0
Sana'a													

- to be continued -

Monthly Mean Temperature

Unit: Centigrade

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual mean
Al Zuhra	25.7	26.3	28.0	30.6	32.8	34.1	33.7	33.7	32.1	31.2	28.6	26.4	30.3
Bahana	20.8	22.2	24.7	26.1	27.2	29.2	27.1	26.5	26.5	25.0	22.9	21.5	24.9
Sana'a	14.7	13.0	16.9	19.4	19.4	21.0	22.4	20.3	20.3	17.1	14.2	14.7	17.8

Monthly Mean Relative Humidity

Unit: percent

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual mean
Al Zuhra	79	78	77	72	65	67	65	68	70	72	73	77	72
Bahana	54	44	48	52	53	49	63	71	60	52	46	49	53
Sana'a	59	40	47	47	46	39	45	52	38	50	52	42	46

- to be continued -

Monthly Mean Actual Sunshine Hours

Unit: hours/day

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual mean
Al Zuhra	5.9	6.2	7.9	9.3	8.6	7.8	6.7	6.7	7.3	8.2	8.6	7.9	7.6
Bahana													
Sana'a	8.2	9.0	8.2	8.5	7.2	8.2	5.4	6.2	8.1	6.2	9.2	9.1	7.8

Monthly Mean Rainfall

Unit: mm

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual mean
Al Zuhra	5.2	4.7	0.5	1.6	9.8	4.7	38.4	34.1	13.2	42.9	8.9	0.1	164.1
Bahana	12.8	4.8	47.9	36.1	77.6	28.1	137.5	115.3	38.8	23.4	7.6	0	529.9
Sana'a	1.7	1.0	18.1	47.3	38.9	2.3	27.3	63.3	3.4	24.5	6.7	1.1	235.6

Table 4.2 Location and Observation Period of Rain Gauge

Station	Location		Elevation (m)	Period of Observation
	Latitude	Longitude		1972 1973 1974 1975 1976 1977 1978
Sakain	16°50'N	43°27'E	2,230	
Bani Uwair	16°46'N	43°41'E	2,100	
Washhah	16°26'N	43°21'E	500	
Huth	16°14'N	43°58'E	1,850	
Shaharah	16°11'N	43°42'E	1,300	
Al Mahabishah	16°00'N	43°30'E	1,600	
Khamir	16°00'N	43°58'E	2,350	
Shibam	15°31'N	43°54'E	2,650	
Mahweet	15°29'N	43°36'E	2,100	
Hajjah	15°41'N	43°36'E	1,650	
At Tur	15°35'N	43°24'E	200	
Al Mikras	15°39'N	43°16'E	260	
Al Zuhra	15°44'N	43°01'E	70	
Gebel Al Milh	15°41'N	42°49'E	20	
Surdud	15°15'N	43'15'E	250	
Bahana	16°15'N	43°50'E	1,200	
Sana'a	15°21'N	44°12'E	2,300	

Table 4.3 Monthly Mean Rainfall

Unit: mm

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Total
Sakain	0	5.2	53.9	124.7	30.2	16.8	37.4	113.8	8.3	0	0	0	390.3
Bani Uwair	0	0	9.5	73.6	29.0	4.0	22.0	72.0	10.0	0	0	0	220.1
Washhah	48.3	ND	11.6	117.3	64.7	8.5	13.3	2.4	38.4	ND	ND	ND	ND
Huth	3.5	15.2	38.1	71.4	9.2	1.5	0	48.5	32.7	0	0	0	220.1
Shahara	0	0	44.6	62.3	19.5	43.4	107.0	91.7	99.3	0	0	0	467.8
Al Mahabisha	35.1	23.4	37.5	238.7	100.7	38.0	51.1	137.5	51.6	37.2	23.4	19.5	793.7
Khamir	2.4	1.0	36.9	126.2	39.5	14.0	58.6	105.4	2.6	0	0	7.7	394.3
Shibam	16.7	1.3	42.5	81.0	69.3	34.7	104.7	168.3	15.0	23.8	16.8	2.8	576.9
Mahweet	0	16.3	8.7	98.1	65.3	42.2	72.6	234.4	98.2	65.0	16.4	0	717.2
Hajjah	0.1	6.7	36.6	153.8	79.3	19.5	87.4	149.8	62.2	3.1	0.4	7.7	606.6
At Tur	9.1	1.0	18.7	125.2	115.9	106.5	85.5	235.5	127.0	88.9	34.4	0	947.7
Al Mikras	0	0	ND	ND	ND	ND	ND	59.0	44.4	8.2	0	0	ND
Al Zuhra	5.2	4.7	0.5	1.6	9.8	4.7	38.4	34.1	13.2	42.9	8.9	0.1	164.1
Gebel Al Milh	5.3	0	0.1	0	0	0	1.3	36.8	0	12.0	ND	ND	ND
Surdud	0	17.9	8.0	1.1	57.4	21.7	30.4	124.7	97.5	70.5	37.2	3.9	470.3
Baitna	12.8	4.8	47.9	36.1	77.6	28.1	137.5	115.3	38.8	23.4	7.6	0	529.9
Sana'a	1.7	1.0	18.1	47.3	38.9	2.3	27.3	63.3	3.4	24.5	6.7	1.1	235.6

Table 4.4 Monthly Water Discharge of Wadi Mawr

Drainage Area 7,912 sq.km
Unit: million cubic meters

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Total
1975	6.9	5.4	6.3	19.6	8.2	24.2	25.0	27.4	17.8	9.8	5.1	6.4	162.1
1976	4.4	4.0	6.4	22.8	18.0	13.3	23.8	33.3	24.0	11.8	11.0	10.4	183.2
1977	11.6	9.0	11.0	38.8	33.8	13.1	12.1	9.6	14.3	27.8	18.3	16.6	216.0
1978	20.7	19.3	17.4	20.1	40.1	20.3	36.1	50.6	42.9	27.5	28.3	21.1	344.1
Mean	10.9	9.4	10.3	25.3	25.0	17.7	24.3	30.2	24.8	19.2	15.7	13.6	226.4

Table 4.5 Monthly Specific Water Discharge of Wadi Mawr

Unit: mm

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Total
1975	0.9	0.7	0.8	2.5	1.0	3.1	3.2	3.5	2.2	1.2	0.6	0.8	20.5
1976	0.6	0.5	0.8	2.9	2.3	1.7	3.0	4.2	3.0	1.5	1.4	1.3	23.2
1977	1.5	1.1	1.4	4.9	4.3	1.7	1.5	1.2	1.8	3.5	2.3	2.1	27.3
1978	2.7	2.4	2.2	2.5	5.1	2.6	4.6	6.4	5.4	3.5	3.6	2.7	43.5
Mean	1.4	1.2	1.3	3.2	3.1	2.2	3.1	3.8	3.1	2.4	2.0	1.7	28.6

Table 4.6 Result of Water Quality Analysis

Water samples		Hajjah Well	Wadi Masana	Bab el Hal Spring	Wadi Laah	WHO Criteria
PH		7.7	7.9	8.2	8.1	7.0 ∿ 8.5
E.C. Millimhos/cm		0.56	0.48	0.43	0.44	
Ca	meq	2.0	4.8	4.0	5.2	
	ppm	40	96	80	104	75
Mg	meq	4.4	2.8	2.2	0.6	
	ppm	53	34	27	7	50
K	meq	0.01	0.01	0.01	0.01	
	ppm	0.4	0.4	0.4	0.4	
Na	meq	2.8	2.3	2.3	3.5	
	ppm	64	53	53	81	
HCO_3	meq	5.76	5.28	4.48	6.24	
	ppm	351	322	273	381	
CO_3	meq	NIL	NIL	NIL	NIL	
	ppm					
Cl	meq	2.40	1.68	1.92	1.68	
	ppm	85	60	68	60	200
SO_4	meq	0.60	0.55	1.00	1.70	
	ppm	29	26	48	82	200
NO_3	meq	0.22	0.22	0.25	0.21	
	ppm	14	14	16	13	
Sum of Cations	meq	9.21	8.91	8.41	9.31	
	ppm	157.4	183.4	160.4	192.4	
Sum of Ca + Mg	meq	6.4	6.6	6.2	5.8	
	ppm	93	130	107	111	
Sum of Anions	meq	8.98	7.73	7.97	9.83	
	ppm	479	422	405	536	
SAR		1.6	1.3	1.3	2.1	

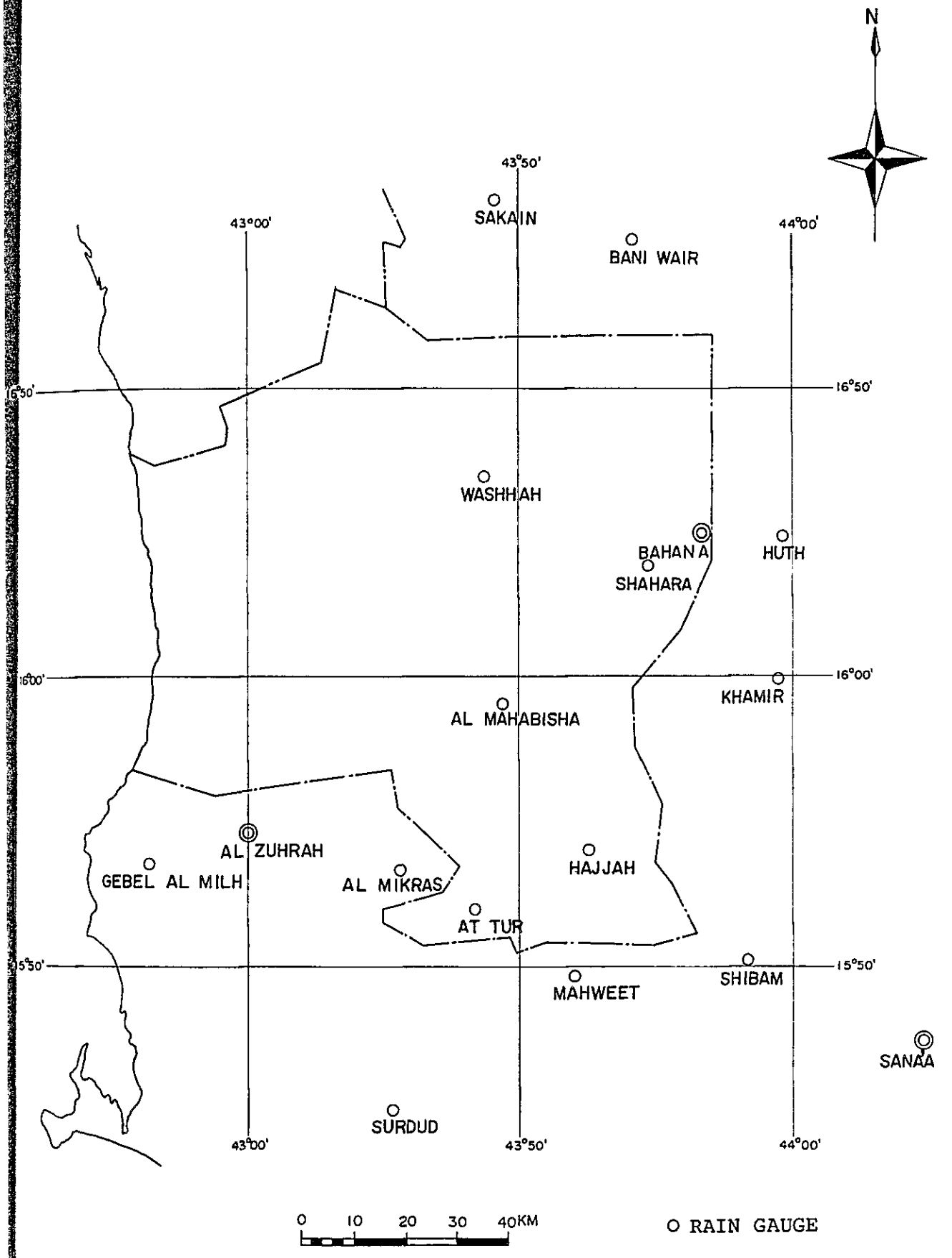

Fig. 4.1 Location of Gauge Station

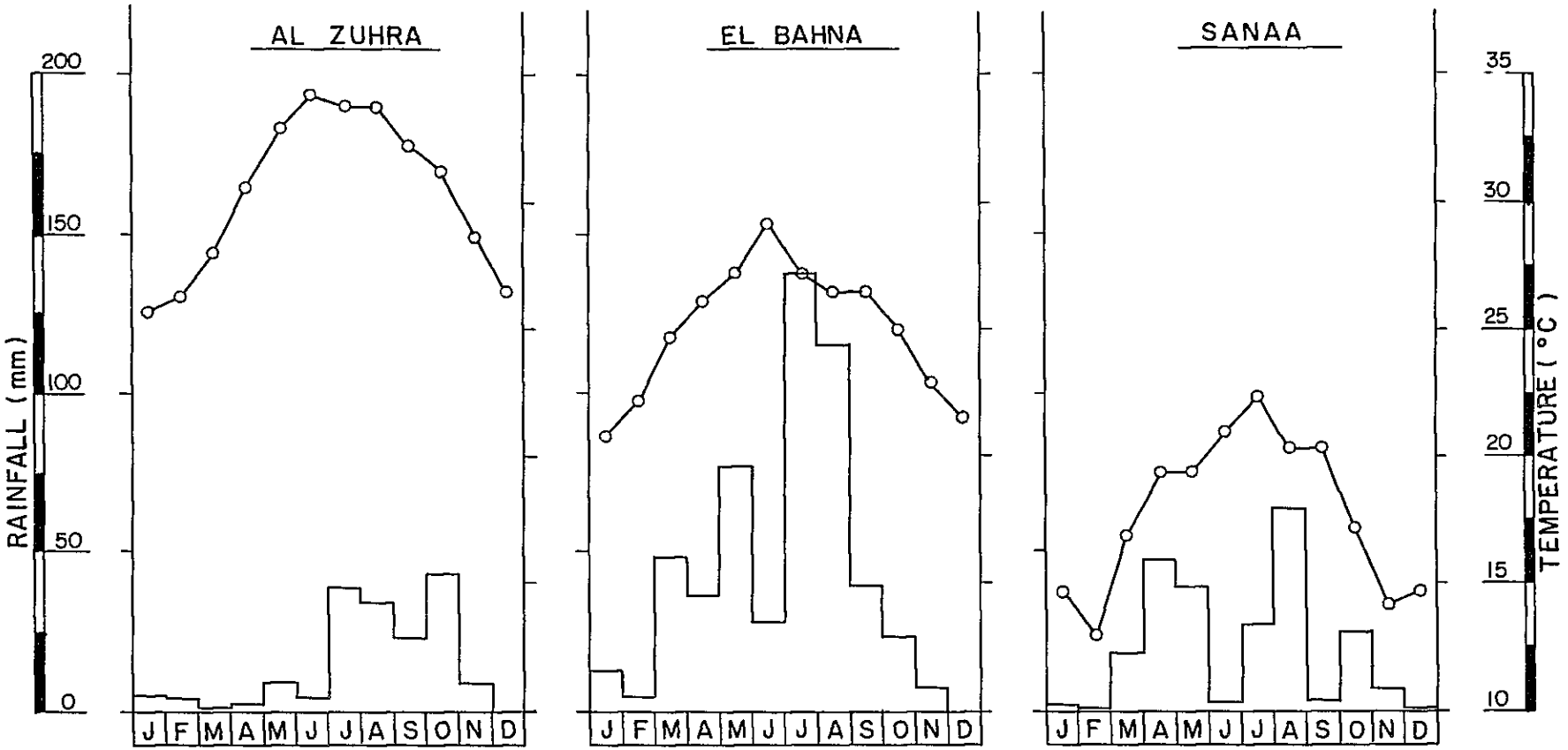

Fig. 4.2 Monthly Rainfall and Temperature

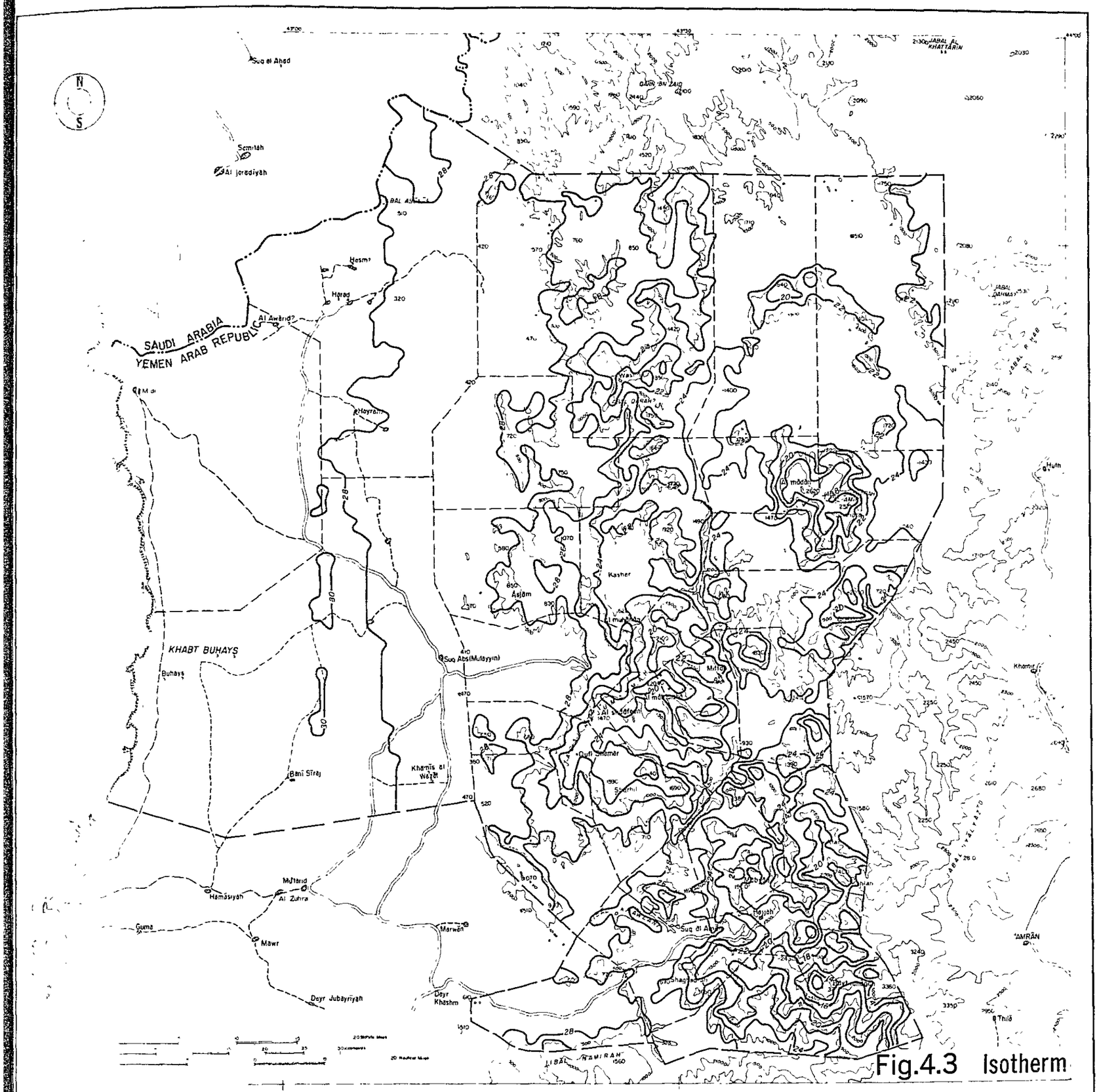

Fig.4.3 Isotherm