

DRAFT

Environmental Profile of



prepared by the

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for

U.S. Man and the Biosphere
Department of State
Washington, D.C.
(National Park Service Contract
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DRAFT ENVIRONMENTAL REPORT

ON

YEMEN

(YEMEN ARAB REPUBLIC)

PREPARED BY THE
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An Introductory Note on Draft Environmental Profiles:

The attached draft environmental report has been prepared under a contract between the U.S. Agency for International Development (A.I.D.), Office of Science and Technology (DS/ST) and the U.S. Man and the Biosphere (MAB) Program. It is a preliminary review of information available in the United States on the status of the environment and the natural resources of the identified country and is one of a series of similar studies now underway on countries which receive U.S. bilateral assistance.

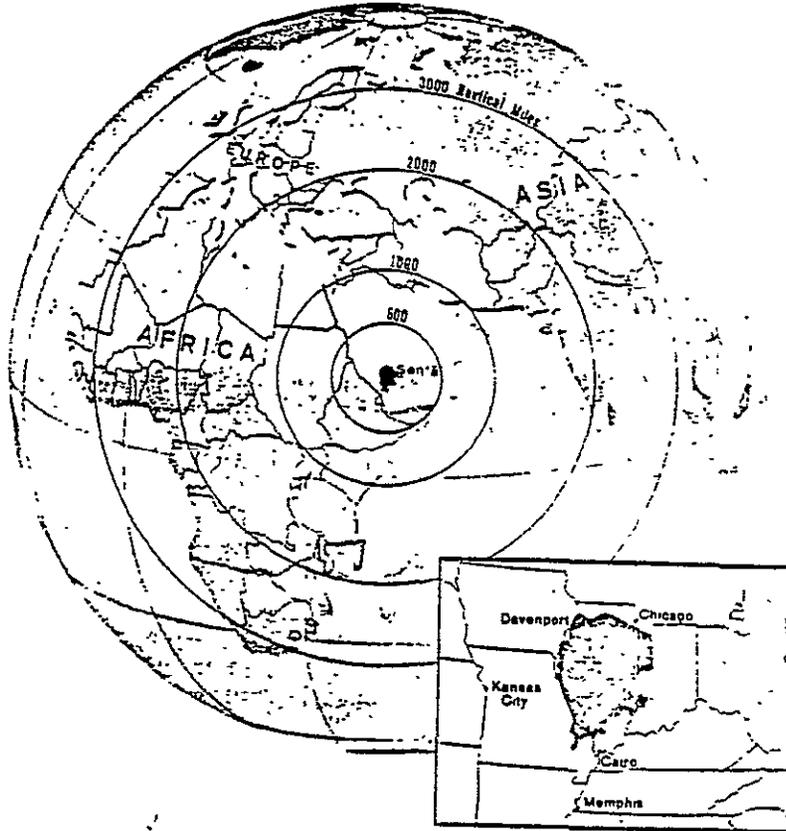
This report is the first step in a process to develop better information for the A.I.D. Mission, for host country officials, and others on the environmental situation in specific countries and begins to identify the most critical areas of concern. A more comprehensive study may be undertaken in each country by Regional Bureaus and/or A.I.D. Missions. These would involve local scientists in a more detailed examination of the actual situations as well as a better definition of issues, problems and priorities. Such "Phase II" studies would provide substance for the Agency's Country Development Strategy Statements as well as justifications for program initiatives in the areas of environment and natural resources.

Comments on the attached draft report would be welcomed by USMAB and DS/ST and should be addressed to either:

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DRAFT ENVIRONMENTAL REPORT ON YEMEN

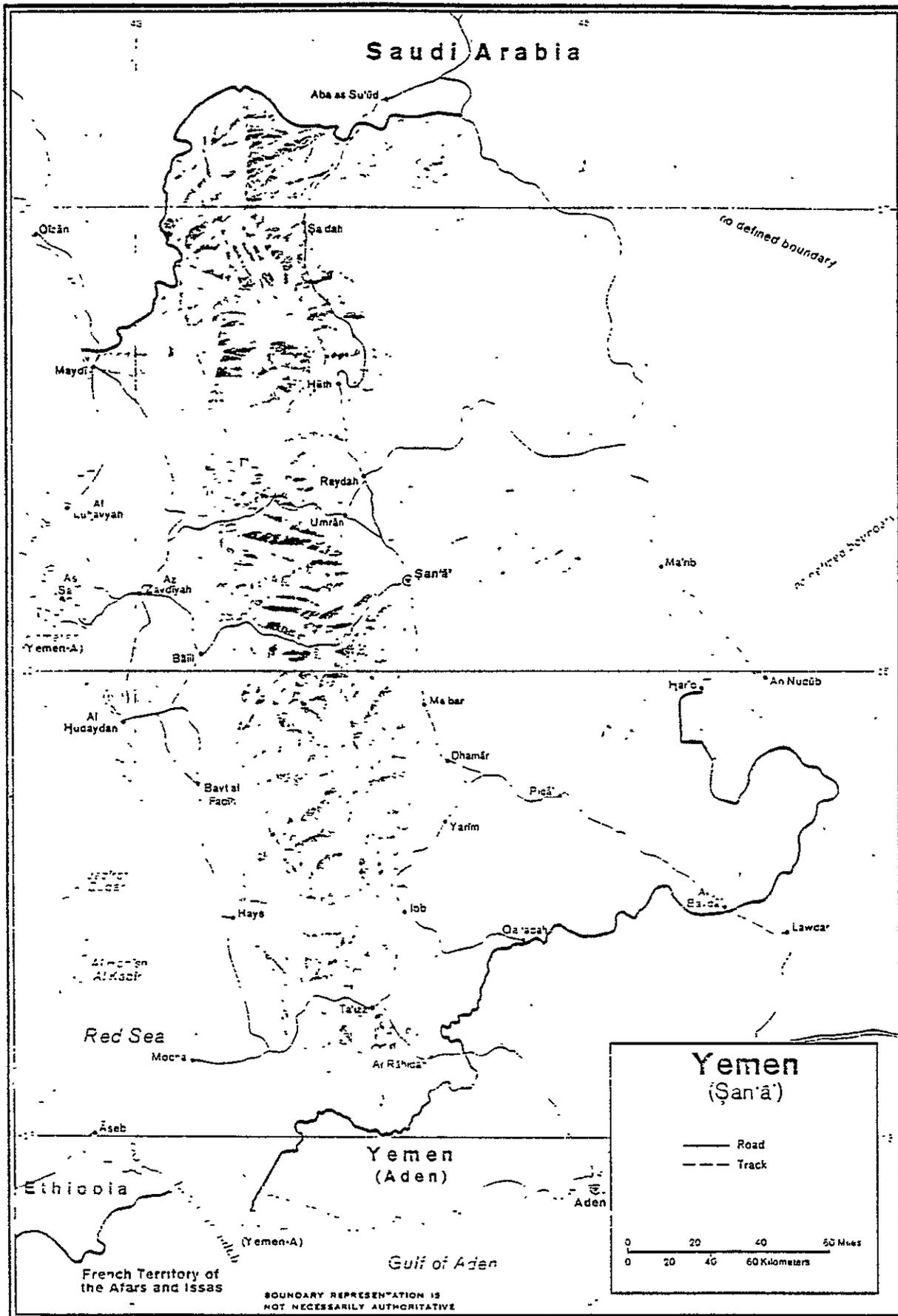
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SUMMARY

The Yemen Arab Republic is one of the least developed countries in the world. It is not blessed with any substantial mineral resources, so that its primary resource is its agricultural and range lands. Even these are not extensive. In general, the YAR has not yet addressed most environmental problems. For those few concerning which action is to be taken, work is still usually not in the implementation stage. The government is hampered by a lack of data on nearly every aspect of the country's resources and environment.

Major environmental problems in the YAR are nearly all tied to aspects of water or agriculture, or both. These problems include:

- 1) Pollution of drinking water. This is a serious problem, both in rural and in urban areas. Most drinking water is obtained from shallow wells, and is easily contaminated. The normal lack of sewage and waste disposal systems in both rural and urban areas compounds the problem.
- 2) Water shortages. Most of Yemen suffers from scant rainfall and little surface water. Thus groundwater is the major source of water for household use. Increases in this use and in groundwater irrigation are rapidly lowering the water table in many areas.
- 3) Soil erosion. Wadi areas have always been subject to unexpectedly heavy floods which can destroy irrigation systems and wash away much soil. Now, as labor leaves rural areas and terraces deteriorate, erosion is becoming serious in highland agricultural areas as well. The depletion of plant cover in range and woodland areas has made soil erosion a problem even in nonagricultural areas.
- 4) Soil salinization. This is a particular problem in the Tihama, where irrigation with groundwater, which can be quite saline in the coastal plains, is increasing rapidly.
- 5) A number of other problems exist which are not yet as critical or are more local in nature. These include spreading sand dunes in the Tihama, overgrazing and depletion of range plant cover (cf no. 3), soil depletion, and problems associated with rapid urbanization.

The best researched aspect covered herein is the water resources of the YAR, and even in this area data is very inadequate for any kind of comprehensive planning. Any future research on any aspect of natural resources or the environment is not likely to duplicate much of the currently available knowledge, since there is so little. Several areas which are of critical importance and have almost no data are aspects of soil erosion, and of range and woodland management.

Mark Speece
Compiler

1.0 General Information

1.1 Purpose and Scope

This report is a summary of current knowledge on the resources and environment of the Yemen Arab Republic. Major environmental problems are identified. Thus, the content itself is a fairly accurate guide to the extent of current knowledge and data available on the YAR, largely taken from post-1970 reference material. Older sources are included in the bibliography.

1.2 Geography and Climate^{1/}

The area of Yemen lies in the southwestern corner of the Arabian Peninsula. Politically, Yemen has been divided in modern times into two states: the Peoples Democratic Republic of Yemen (PDRY), often called South Yemen or Yemen (Aden); and the Yemen Arab Republic (YAR), usually called North Yemen or Yemen (Sanaa).

The Yemen Arab Republic covers approximately 200,000 square kilometers (75,000 square miles). The Red Sea provides the western boundary. Saudi Arabia borders the YAR on the north and northeast, and the PDRY borders on the southeast and south. The YAR's easternmost borders with its two neighbors are not yet demarcated.

Two major geographical regions are commonly recognised in the Yemen Arab Republic: The Tihama, or coastal plain, and the mountainous interior. Often the eastern part of the country, which slopes down from the mountains and fades into central Arabia and the Rub al Khali, is also called a separate region.

1.2.1 The Tihama

The coastal plain of the YAR extends nearly 600 km. from the Bab al Mandeb in the south to the border of Saudi Arabia. Geographically it continues into Saudi Arabia, as do the other regions. This 30 to 60 km. wide region ranges in elevation from sea level on the coast to about 200 m. at the foothills. Annual rainfall for the Tihama ranges between 50 to 300 mm., and falls quite erratically. Average temperatures are quite high year round (Hodeida 1974 low 19°C, high 38.8°C), often climbing over 54°C.

¹Source: The World Bank. 1979.
Nyrop, R. F. et al. 1977.
Farouqhy, A. 1947.
Council of Arab Economic Unity. 1977.

Humidity is usually between 50 to 70 percent. High winds often come in from the sea, causing sandstorms and soil erosion. Dryland farming can only be practiced under these semidesert conditions in years of exceptional rainfall, but about 70,000 ha are cultivated under spate irrigation and another 25,000 ha under well irrigation.

1.2.2 The Interior Highlands

In the interior of the country elevation climbs from the area of the western foothills (200 to 1500 m) to peaks exceeding 3000 m in the central highlands. Seven major wadis run out of the highlands to the Red Sea, three run to the east and two major ones flow southwards. Most of these are perennial in the upper reaches, but rarely reach the sea except at high flood times. Rainfall varies considerably in the interior. Generally it becomes wetter from north to south and from lower to higher elevation. Lower levels of the western foothills may get 250-300 mm annually. Annual averages in the northernmost areas of the highlands may be as low as 100 mm, while the figure for Taiz province is over 600 mm. Ibb recorded an annual average for 1970-73 of 1,100 mm. Temperatures in the highlands are quite comfortable, with average summer highs of ca 21°C and lows in winter around 4°C. The interior is traditionally the major agricultural area in the Yemen Arab Republic. Most cultivation must be practiced on terraced land, and most is rainfed rather than irrigated.

1.2.3 The Eastern Slopes

This approximately 80,000 sq km region slopes gently eastward into the Rub al-Khali. Very little climatic data is available on the area beyond the general observation that it may be classed as varying from semi-desert to desert. Little agriculture is practiced here; rather, it is primarily an area of nomadic herding.

1.3 Demographic Characteristics ^{2/}

1.3.1 Population

Population estimates for the Yemen Arab Republic vary widely, even when they are supposedly based on the same source. Population may be almost 6 million in 1980. Only 11% of this population lives in settlements of greater than 2,000 inhabitants. The largest cities/towns (1976) are the present capital, Sana'a (134,588); Hodeida (80,314); and Ta'iz (78,642). The only other towns of any size are Dhamar

²Source: The World Bank. 1979.

Nyrop, R. F. et al. 1977

Socket, J. A. and G. A. Sinclair. 1978

Middle East Economic Digest. 21 December 1979.

(19,167) and Ibb (19,066). Population densities are highest in the general area within the Sana'a-Hodeida-Ta'iz triangle, and are quite low elsewhere, especially in the northern Tihama and in the eastern foothills and desert. Net annual population increase of 1.86% is surprisingly low for a developing country.

1.3.2 Composition

Although the Yemen Arab Republic is almost completely Arab and Arabic speaking there are a number of divisions in the society which continue even now to cause some difficulties. One major division is along religious lines. About 60% of the population of the YAR is Sunni of the Shafi'i school. In general they inhabit the Tihama and western foothills, and the southern highlands around Ibb and Ta'iz. The other 40% are of the Zaidi branch of Shi'ism. Though a minority, the government was Zaidi until the 1962 revolution. Zaidis are concentrated in the central and northern highlands. Tribalism also serves to divide Yemeni society. Although the vast majority of Yemenis are sedentary cultivators, tribalism remains firmly entrenched, particularly in Zaidi areas. This can have effects on rural development schemes. For example, lineage groups rather than individuals may hold certain land or water rights.

1.3.3 Migration

Approximately 50% of the population of Yemen is under 15 years of age. The population pyramid for ages above 15 is quite distorted on the male side because of extensive migration out of the country for employment. An estimated 1.5 million Yemenis, mostly males, live outside Yemen. While remittances from their earnings help alleviate foreign exchange problems and help to raise the standard of living somewhat, this trend has led to severe manpower shortages within Yemen, especially in the agricultural sector. Rural to urban migration within the YAR is also occurring but is not well documented.

1.3.4 Public Health

Health conditions of the population are still quite poor. The death rate is nearly 29 per thousand, and life expectancy at birth averages about 37 years. Major reasons for the low standards of public health include inadequate nutrition, poor and overcrowded housing, lack of personal hygiene, and an acute shortage of medical personnel. Average daily per capita caloric consumption between 1972-74 fluctuated around

2000, about 83% of the estimated daily requirement. Shortage of medical personnel is compounded by the uneven distribution: 87% of the 234 physicians are in the provinces of the three major cities which contain 52% of the population and most of these are in the three cities themselves. Environmental problems have a direct effect on these health problems. For example, use of polluted water and lack of effective sewage disposal create favorable conditions for endemic diseases. The government began to tabulate diseases in 1975, when the following number of cases were reported:

gastroenteritis	17,909
malaria	8,118
amoebiasis	6,289
bilharzia	3,932
typhoid	3,705

The actual incidence must be assumed to be much higher. Many other diseases are known in the YAR, including tuberculosis, trachoma, helminthiasis, cholera, hepatitis, and bacillary dysentery.

1.4 Economic Characteristics ^{3/}

The economy of the YAR is heavily oriented toward agriculture. By World Bank figures, 45% of the GDP in 1975/6 was accounted for by agriculture, fishing, and forestry. It is more common to read estimates of over 60% for agriculture's share. 73% of the workforce is employed by agriculture, and 85% of export earnings were for raw agricultural goods in 1976/77. Processed agricultural products accounted for another 11% of exports by value.

³ Source: The World Bank. 1979.
 Nyrop, R. F. et al. 1977.
 Socknet, J. A. and C. A. Sinclair. 1978.
 Quarterly Economic Review of Bahrain, Qatar, Oman, the
 Yemens, Annual Supplement. 1979.
 AID All Data. 1979.
 AID Project Design Information (INQUIRE). 1980.

Yemeni agriculture is still predominately subsistence, though in recent years cash cropping has increased. Only about 8% of Yemen's land area was cultivated in 1976, and another 10% was classified as marginally cultivatable. Of the 1,515,000 hectares cultivated, 85% was dependent on rainfall. Sorghum and millet are the major crops. Maize, wheat and barley are also extensively planted, as are vegetables and fruits. The main cash crops are cotton and qat, a shrub very popular in Yemen for its narcotic leaves.

Agriculture in Yemen has been declining in recent years. A major factor in this has been the vast migration out of rural areas, especially abroad, which has led to serious labor shortages. Remittances sent back from abroad also reduce incentive to keep farming marginal land. Domestic popularity of qat has led to a decline in production of coffee, with which qat competes ecologically. Thus the YAR is not self-sufficient in agriculture at the present, and prospects seem to be worsening.

The government hopes to reverse this, and in the 5 year plan (1976/77-1980/81) is aiming to work towards self sufficiency in food production, reduce the trade deficit in agricultural goods, and improve the quality of agricultural products. About 14% of the total YR 16 billion budget for the plan is to be spent directly on agriculture.

Others sectors of the economy, in order of contribution to the GDP, are trade (24%), government (10%), industry, mining, and electricity (6%) and construction (4%). The major industries are light, such as textiles, food processing, and building materials. The investment in industry (including construction) under the five year plan is to be about 25% of the total expenditure, and nearly 31% is to go toward transport and communications.

The Yemen Arab Republic's ambitious five year plan is nearly 85% dependent on foreign aid. A good proportion of this aid is expected from various Arab sources, and the rest from the World Bank, the United Nations, and from the industrial nations, both east and west. USAID in the late 1970's has been involved primarily in implementing and improving water systems in urban areas, and in several agricultural projects, particularly sorghum and millet improvement and poultry planning. A common problem in many of the projects has been the inability of the YAR to provide qualified Yemenis to take part.

PARTIAL LIST OF AID PROJECTS IN THE YEMEN ARAB REPUBLIC

<u>Title</u>	<u>Project No.</u>	<u>Begun</u>	<u>Final</u>
Taiz Water Rehabilitation	2790017	73	75
Yemen Sorghum Production	2790018	73	78
Poultry Development	2790019	75	80
Training for YAR Development	2790020	73	78
Sana'a Emergency Water Supply	2790021	73	78
Rural Water Supply	2790022	73	77
Tropical Fruit Improvement	2790024	76	81
Water and Mineral Survey of North Yemen	2790025	74	79
Yemen-Taiz Water and Sewerage Design	2790027	75	79
Sorghum and Millet Crop Improvement	2790030	76	80
Al-Olofy Hospital-Yemen	2790034	76	79
Applied Health Nutrition-CRS	2790035	76	79
Taiz Water/Sewerage Construction	2790039	77	82
Development Training II	2790040	78	86
Water Resource Planning Management	2790043	79	84
Agricultural Development Support	2790052	79	80

Source: AID Project Design Information (INQUIRE). 1980.

2.0 Natural Resources

2.1 Water Resources

2.1.1 Surface Water ^{4/}

Compared with the rest of the Arabian Peninsula, Yemen receives a large amount of rainfall. Rains come in two distinct periods: March through May, and July through September, which is the heavier rainfall season. Since the rains result from the Indian Ocean monsoon system, the most well watered province is Ibb, where 1468 mm was the average at the town between 1970-1976. In general, rainfall drops off the further from Ibb an area is. For example, at Taiz, southwest of Ibb, a 24 year average ending 1976 was 580 mm; at Yarim, to the northeast, it was 497 mm (1970-76). As far north as Sana'a, this six year average was only 181 mm, and at Zabid, in the Tihama, 140 mm.

However, rainfall can be quite erratic, and an extended drought such as the one between 1967-73 may severely damage agriculture in all but the most heavily watered areas around Ibb. A system of wadis drain the highlands, with seven major wadis draining into the Red Sea, two to the Gulf of Aden, and three major ones eastwards into the deserts. One estimate for the volume of water flowing down Wadi Mawr (north of Hodeida) is ~ 560 million cubic meters annually at the base of the mountains. There is not yet enough basic water resources data available to allow similar estimates for most areas of the country. Under normal conditions none of the water in Wadi Mawr will reach as far as Luhayyah on the coast. Not only will the extremely dry soils of the Tihama absorb any water that reaches it, but also every effort is made to harvest as much as possible for agriculture. In general, surface water is available all year only in the highland areas in the major wadis.

2.1.2 Groundwater ^{5/}

Groundwater is in most cases the only year-round reliable source of water. In the highlands groundwater is slightly alkaline (250-450 mg/liter), while along the

⁴Source: The World Bank. 1979.
Nyrop, R. F. et al. 1977.
Escher, H. A.. 1976.
AID, Report on Water Resources Sector Study in the
Yemen Arab Republic. 1977.

⁵Source: The World Bank. 1979
Nyrop, R. F. et al. 1977.
Escher, H. A. 1976.
AID Report on Water Resources Sector Study in the
Yemen Arab Republic. 1977.

coast it is usually quite saline (2000-3000 mg/liter). The water table in the Wadi Mawr region is between 5-25 m deep, and this is probably typical for coastal areas. In many other parts of the country it may be so deep that it is not economically feasible to develop at present.

The area around Sana'a is estimated to have a ground-water potential of about 26.5 million cubic meters per year, which is estimated by ITALCONSULT to be sufficient until about the year 2000. Others consider this figure of groundwater availability overly optimistic. In the area of Taizz it is estimated that a potential of about 12.6 million cubic feet per year could be developed from presently known sources. Projected annual water demand for 1995 in million cubic meters is 17.6 at Sana'a and 14.4 at Taiz. Obviously, if these figures prove to be relatively accurate, water supply for Taizz will soon become crucial and Sana'a will be having problems by the beginning of the 21st century. The following table forecasts Sana'a's water use through 1985.

FORECAST OF POPULATION AND WATER CONSUMPTION

Total Population	Water Served			Water Consumption 10 ³ x M ³ /Year				Precipitation 10 ⁹ m ³ /Year	Statistics		
	Population Connected	Population Served	Number of Connections	Domestic	Industrial	Public	Total		Number of Connections	Population Connected	% Population Served
42,500	54,000	38.1	9,000	985	765	1,037	2,768	3,485	-	-	-
50,000	67,200	44.5	9,700	1,226	947	906	3,081	3,351	-	-	-
58,500	72,000	45.4	12,000	1,495	1,731	943	4,177	3,221	-	-	-
67,000	103,000	64.6	16,000	2,453	1,906	649	5,008	4,222	-	-	-
76,400	144,000	81.6	24,000	3,627	2,117	355	6,099	7,624	-	-	-
85,700	154,800	83.4	25,300	4,232	2,357	338	6,873	8,321	8,745	82,107	49.6
95,400	163,000	84.4	27,500	4,878	2,474	332	7,685	9,216	9,455	89,361	51.0
105,200	177,000	86.2	29,500	5,556	2,646	310	8,512	10,640	10,153	107,070	51.0
115,800	188,000	87.7	31,500	6,378	2,345	290	9,413	12,764	10,373	114,346	51.0
126,500	201,000	88.5	33,500	7,043	2,030	274	10,347	14,900	12,703	121,500	54.6

: AID Project Assistance Paper: Yemen Water Supply Systems Management

There have been a number of studies done on water resources of the YAR (cf. bibliography under "water"). Aside from the problem that these are often not readily available, they are mostly local in nature. Water resources available to the three major urban areas have been most studied. There has also been some work done for a few rural areas, mostly some of the major wadis.

2.1.3 Water Use and Management ^{6/}

The YAR has no comprehensive system of law in the modern sense concerning water resources. According to the 1970 constitution, the Shari'ah is the source of all laws; in practice this means that in the absence of modern legislation on water, the Shari'ah governs all aspects. While it was developed to suit the needs of a pre-modern society, because of its case by case approach Shari'ah can often be adapted to modern situations. In general, water is regarded as part of the public domain. In practice, many conventions, such as ownership of a well but not the water, may seem to confer de facto (private) ownership of water. However, there is ample legal precedent for the community to step in, if need be, to protect the public interest in water. For example, since groundwater resources extend beyond the property of a well owner, Islamic law would not allow the owner to pollute the well. To prevent misuse of areas around water resources, the principle of harim, protected area, may be invoked. Thus, while traditional Islamic law has not directly addressed many modern water problems, it certainly can provide the legal basis for modern legislation.

Yemen has taken a first step in this direction with Law No. 13, 1973, which set up the Water and Sewage Public Corporation, now called the National Water and Sewerage Authority (NWASA). Agricultural uses of water remain outside the domain of this office's power, but it is charged with developing water for domestic use and providing for sewage. NWASA has been given legal powers over many aspects of water to insure that it can function properly. The definition of duties tends to restrict NWASA to the immediate vicinity of the major cities.

2.1.4 Water Management in Practice ^{7/}

Traditional water management practice naturally varies widely with area and according to whether the water is in rural or urban areas. In the highlands, a centuries old elaborate system of terracing on mountain slopes is able to trap runoff in millions of small plots containing a deep soil layer. In the wadi floors, networks of dams and weirs divert spate flood water into irrigation channels

⁶Source: Caponera, D. A. 1973.
AID, Report on Water Resources Sector Study in the Yemen Arab Republic. 1977.

⁷Source: World Bank. 1979.
Nyrop, R. F. et al. 1977.
Escher, H. A. 1976.
ECWA/FAO Joint Agricultural Division. 1978.

wherever there is available land. These traditional methods have been very efficient in harvesting for agriculture whatever surface water is available. For example, at an estimated annual yield of 150 million cubic meters of water in Wadi Zabid, the traditional system can capture about 60 million cubic meters for irrigation.

Drinking water in rural areas is usually obtained from wells. In recent years the use of pumps has increased dramatically, especially in the Tihama, and groundwater is now being extensively used for irrigation. In the area of Wadi Zabid again, pumping is now extracting another 62 million cubic meters of water from the aquifer annually.

Water resources are one of the most crucial factors for the YAR, and various aspects of water are receiving high priority in the 5 year plan. The following lists give some indication of the kinds of projects and of the aid the YAR is receiving in this field.

LISTS OF WATER RESOURCES PROJECTS

(from AID Report on Water Resources Sector Study in the Yemen Arab Republic. 1977)

(List of all organizations which have worked in or collected data for any aspect of hydrology)

Berger/Kampsax, U.S. and Danish Consultants

Urban planning for Sana'a, Hodeida, Taiz, Dhamar and Ibb

British Ministry of Overseas Development

Montane Plain and Wadi Rima

Electrowatt-Swiss Consultants

Marib Water Projects

Food and Agricultural Organization (UN)

Uplands, Midlands and Lowlands Agricultural Projects

Gibb (Sir Alexander Gibb and Partners) British Consultants

Wadis Bana, Rasyan, Kharid and Jawf

Halcrow (Sir William Halcrow & Partners) British Consultants

Wadi Surdud

Hazed-Sawyer, U.S. Consultants

Taiz Water and Sewer Systems

Ilaco-Netherlands Consultants

Wadis Rima, Banya

Italconsul-Italy Consultants

Sana'a and Hodeida Water and Sewerage Systems

Kochs (F. H. Kochs KG) West German Consultants
Hodeida Water and Sewerage Systems

Montgomery (James M. Montgomery, Inc.) U.S. Consultants
Taiz Water and Sewerage Systems

Peoples Republic of China
Some wells along road North and West of Sana'a

Saudi Arabia
Rural Well-Drilling Projects-36 Wells

Tesec-Vizitery-Vituki, Hungarian Consultants
Wadis Mawr and Zabid

Tihama Development Authority
Wadis Mawr and Zabid

Tipton & Kalmbach, U.S. Consultants
Wadis Mawr and Zabid

U.S. AID
Sana'a, Taiz and Yemen Rural Areas

U.S.S.R.
Wadi Surdud, Al Kadan State Farm

West Germany
German Farm, Sana'a

World Health Organization (UN)
Scattered climatic data

World Meteorological Organization (UN)
Meteorological Data-Sana'a, Taiz, Hodeida, Mocha, Al Baida

Part B

(Experimental wells for measuring the amount and depth of groundwater level in the following regions)

Midlands	10 wells
Al Baida	10 wells
Rida	5 wells
Khawlan	10 wells
Al Ganad	5 wells
Marib	10 wells
Al-Turba	5 wells
Mawza'a	5 wells
Surdud	10 wells
Al-Jawf	10 wells
Saada	10 wells
Rest of Tihama	10 wells

Estimated Cost (One YR equals about \$0.22 in the U.S.) YR (Yemen Riyals)
6,000,000,000.00

Dams

- a. Small Dams-construction of 300 dams for the exploitation of wasted rain water. 100 dams in the first 5-year plan. Estimated Cost YR 150,000,000.00.
- b. Large Dams-three sites have been chosen for the construction of large dams. One of these sites is Marib, where there is a probability of re-constructing the ancient Marib Dam. Estimated Cost YR 105,000,000.00.

Irrigation

- a. Water Storage Projects
 - (1) Wadi Mawr
 - (2) Wadi Rima'a
- b. The Development of the Eastern Wadis
 - (1) Wadi Al Kharid (est YR 101,000,000.00)
 - (2) Wadi Jawf (est YR 1,500,000.00)
 - (3) Wadi Abied (est YR 50,000,000.00)
 - (4) Wadi Harib (est YR 30,000,000.00)
 - (5) Wadi Bana (est YR 100,000,000.00)
 - (6) Wadi La'ab (est YR 30,000,000.00)
- c. Development of the Tihama
 - (1) Wadi Zabid (est YR 149,500,000.00)
 - (2) Wadi Mawr (est YR 250,000,000.00)
 - (3) Wadi Rima (est YR 175,000,000.00)
 - (4) Wadi Siham (est YR 200,000,000.00)
 - (5) Wadi Surqad (est YR 190,000,000.00)
 - (6) Wadi Rasyan (est YR 350,000,000.00)

As in most other fields, progress is often hampered because of lack of the proper administrative and managerial structure, and due to an acute shortage of qualified personnel for nearly every aspect of implementation.

2.2 Mineral Resources ^{8/}

The Yemen Arab Republic seems to have very few mineral resources which could aid in economic development, although medieval writers regarded the area as rather rich in minerals. Rock salt is currently being exploited in the area of Salif (75 km north of Hodeida). There may be as much as 4 million tons in that area. Otherwise, exploitation of mineral resources is still largely in the preliminary study phase.

²Source: Farouqy, A. 1947.
Quarterly Economic Review of Bahrain, Qatar, Oman, the
Yemens, Annual Supplement. 1979.
UNESCO. 1976.

Copper exists in al-Beida and Taiz provinces, iron ore near Sa'ada, and saltpeter in the eastern areas and near Taiz. Marble and coal exist in various areas. There is some question whether any of these are present in sufficient quantity to make exploitation economically worthwhile. Gypsum and limestone is present in sufficient quantities in Taiz and Sana'a provinces to supply local cement production. Oil has been and is currently being prospected for, but without success so far.

2.3 Soils and Land Use

2.3.1 Soils ^{9/}

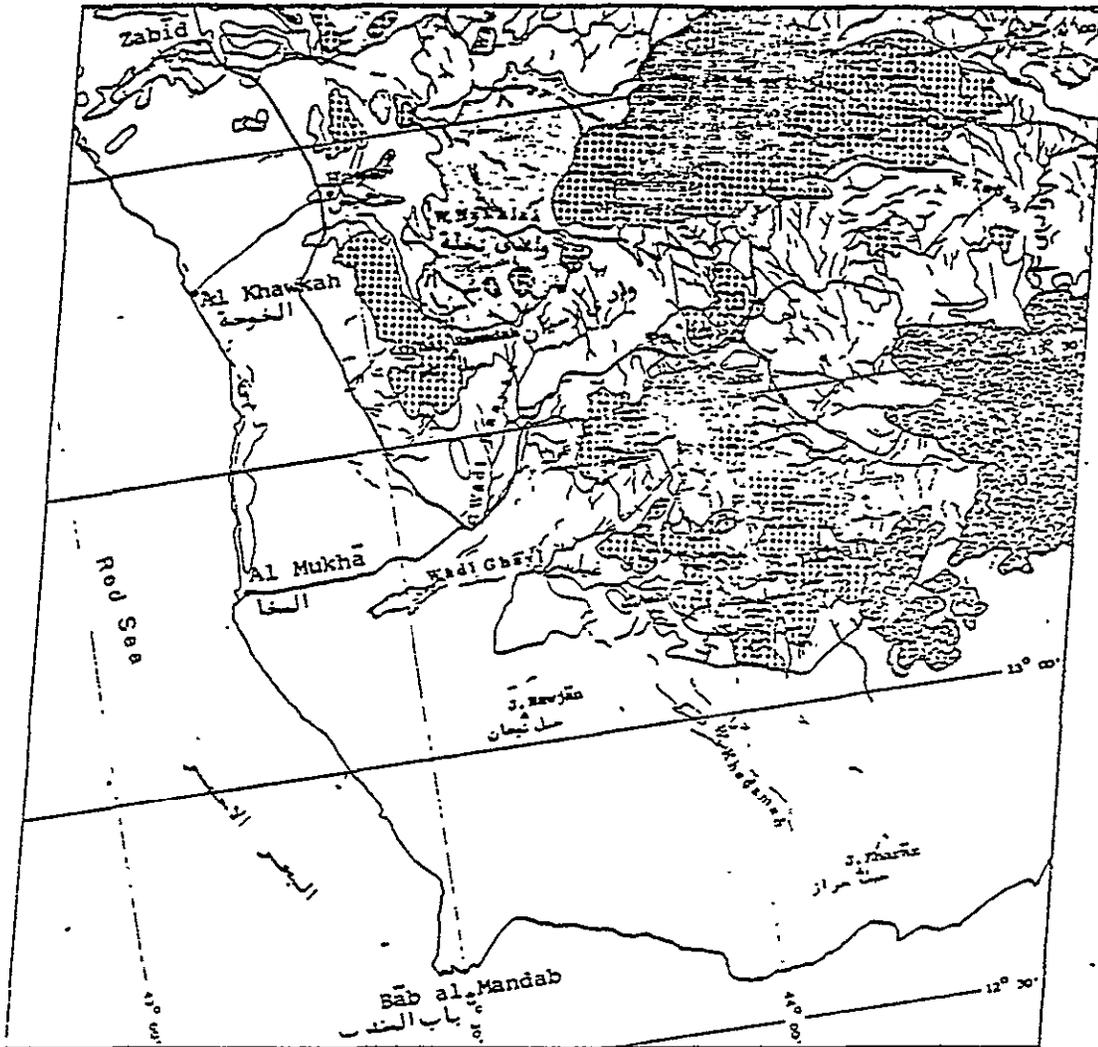
More than half the area in the highlands is steep, rugged, rocky and stony to the extent that agriculture is impossible. The most widespread soils are light colored calcareous silt loams and silty clay loams. These bear a strong resemblance to loess, and are found on gentle slopes. On steeper slopes, stony colluvial soils predominate; these are brown to red-brown and have a high clay content. They are formed on the weathering products of the rock, mostly basalts and volcanic tuffs. Soils in wadi basins contain transported elements of both of these soils, transformed by high water tables in places to form hydromorphic soils.

The inter-mountain plains, at elevations between 2000-3000 meters, are highly calcareous silty loams and silty clay loams, often encompassed by extensive lava fields. In the Tihama plains, soils are calcareous silty and alluvial, intersected by wadi channels flanked by narrow belts of saline soils, and by stony alluvial fans at the base of the mountains.

Beyond this summary on soils, very little current data is readily available. Preliminary work has been done in applying remote sensing to some aspects of soils and land use in the YAR (cf following maps). AID has also done some work on soils (cf Wambeke & Hardi in bibliography).

⁹ Source: Checchi and Company. 1978.

DYNAMICS OF VEGETATION GROWTH AS INTERPRETED FROM IMAGERY OF DRY SEASON (JAN. 1973) AND WET SEASON (SEPT. 1972)



Extent of rainfed areas in the wet period:

low density vegetation

medium density vegetation

high density vegetation

Extent of rainfed areas in the dry period:

low density vegetation

medium density vegetation

Pump-, spring- and flood-irrigated fields:

low to medium density vegetation

high density vegetation

intensive vegetation in the wadi channels

clouds

Source: Haefner, H. et al. 1978.

SYNTHETIC LAND CLASSIFICATION COMPILED FROM LANDSAT-IMAGERY



Delineation of land facet units		large valley bottom
	land region	 intramountainous plain
	land system	 plateau
	land facet	 hilly area
	vegetation delineation	 mountainous area
Units of land facets		 low density vegetation
	sand plain	 high density vegetation

Source: Haefner, H. et al. 1978.

In general the agricultural soils have been somewhat depleted due to several thousand years of continuous use. Farmers traditionally counteract this somewhat by applying manure and ashes at planting time, by crop rotation, and by mixed cropping. Fertilizer is not yet widely used, and lack of water in many areas decreases its efficiency.

2.3.2 Land Use ^{10/}

Land use is somewhat better documented especially on local levels, for which several detailed studies are available. In the Wadi Mawr, of a total cultivable area of ~ 87 000 ha., 70% depends on rainfall, 21% is irrigable every year, and the other 9% may be irrigated in wet years. A survey of farmers whose holdings covered 2% of this area showed that sorghum was by far the most common crop, planted on 76% of irrigated land and 70% of non-irrigated land.

CULTIVATED AREA AND PERCENT BY CROP IN WADI MAWR

Kultur	bebaute Fläche			ENGLISH
	in ha	in %	in % von Wādī, resp. Khābt	Cultivated Area
Dhura bewässert	351	25	76	Irrigated Sorghum
Sesam bewässert	16	1	3	Sesame
Baumwolle bewässert	96	7	21	Cotton
total Wādī	463	33	100	
Dhura nicht bewässert	664	47	70	Unirrigated Sorghum
Dukhn nicht bewässert	249	18	26	Millet
Sesam nicht bewässert	36	2	4	Sesame
total Khābt	949	67	100	
Total	1'412	100		
in % der Projektfläche		2		Total Project Area

Source: Escher, H. A. 1976.

¹⁰ Source: The World Bank. 1979.
Myrop, R. F. et al. 1977
Escher, H. A. 1976.

In the YAR as a whole, about 8% of the total land area is cultivable, while another 10% is classified as marginal, but possibly usable in wet years. 85% of the normally cultivated land is watered by rainfall.

CULTIVATED LAND AND IRRIGATION BY SOURCE OF WATER

('000 hectares)

<u>Governorate</u>	<u>Cultivated land</u>	<u>Rainfed</u>	<u>Spate flood irrigated</u>	<u>Perennial</u>	<u>Wells</u>
Sana'a	400	375	-	20	5
Hodeida	235	105	100	5	25
Ta'iz	250	221	10	18	1
Ibb	300	279	-	20	1
Hajja	130	115	10	5	-
Saada	60	60	-	-	-
Dhamar	100	92	-	5	3
Beida	<u>40</u>	<u>38</u>	<u>-</u>	<u>-</u>	<u>2</u>
Total	1,515	1,285	120	73	37

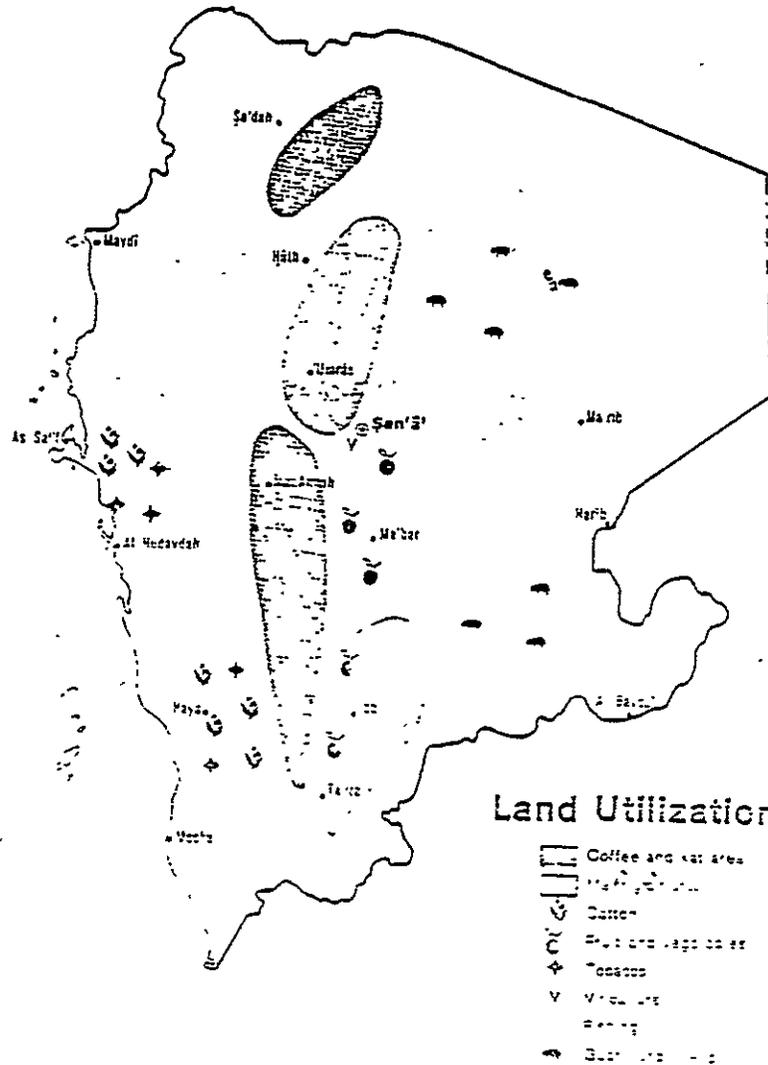
Source: The World Bank. 1979.

MAJOR LAND USE BY GOVERNORATES
('000 hectares)

<u>Governorate</u>	<u>Total Area</u>	<u>Cultivated Land</u>	<u>Marginal Agriculture</u>	<u>Forest and Shrubs</u>	<u>Other</u>
Sana'a	8,000	400	600	100	6,900
Hodeida	3,500	235	500	450	2,315
Taiz	1,200	250	100	500	350
Ibb	1,300	300	50	400	550
Hajja	1,700	130	250	50	1,270
Sabda	1,800	60	200	-	1,540
Dhahar	1,000	100	200	100	600
Beida	<u>1,500</u>	<u>40</u>	<u>100</u>	<u>-</u>	<u>1,360</u>
Total	20,000	1,515	2,000	1,600	14,885

Source: The World Bank. 1979.

Sorghum and millet are by far the most common crops, both in terms of area planted and in total production. In general, grains are usually found in the highlands, around Ibb-Taiz and north of Sana'a. The cash crops cotton and tobacco are mostly found in the Tihama, and cat and coffee in the highlands.



2-73 Yemen (Sana'a)

AREA AND PRODUCTION OF MAIN AGRICULTURAL CROPS
(area: '000 hectares, production: '000 tons)

Crop	1969/70		1970/71		1971/72		1972/73		1973/74		1974/75		1975/76	
	Area	Production												
Cereals														
Sorghum & millet	886	610	973	730	920	627	1080	809	952	639	1215	1008	1145	859
Rice	4	8	16	30	20	16	50	70	52	80	50	79	50	72
Wheat	35	16	30	33	25	25	50	50	70	71	50	56	50	57
Barley	145	160	140	154	125	140	110	120	77	85	73	80	68	75
Legumes, Vegetables														
Legumes	50	50	50	60	60	60	60	56	65	64	71	71	76	76
Green vegetables	8	50	10	100	15	137	17	150	16	150	18	168	20	187
Potatoes	4	20	6	55	5	50	6	64	6	64	7	71	7	76
Fruits, tree crops														
Fruits	4	23	5	25	5	28	10	60	10	60	12	60	12	65
Grapes	4	10	7	30	8	35	8	35	8	31	9	40	9	42
Dates	-	3	-	5	-	5	-	5	-	5	-	5	-	5
Coffee	5	4	5	4	5	4	5	4	5	4	4	3	4	3
Industrial Crops														
Cotton	5	2	10	10	15	15	20	19	20	20	28	27	14	11
Tobacco	4	2	4	3	4	5	4	5	4	5	4	5	5	6
Seaweed	4	2	8	4	8	5	8	4	8	4	9	5	10	6

Source: The World Bank, 1979.

2.3.3 Management and Problems ^{11/}

As is the case with water, the legal background is the Shari'ah, combined with traditional practices. Land tenure still largely follows feudal patterns. Most small farmers are sharecroppers on land rented from some larger landholder. A typical share arrangement gives one-fourth of the crop to the landlord. If groundwater irrigation is provided, the landlord may take one half. Obviously, unless an irrigation development scheme can increase yields by at least 50 percent, the farmer is going to be worse off. In 1965, about 60-70% of all arable land was privately held by large landowners, and leased for a share of the crop. Another 15-20% was waqf (religious trust) and similarly leased. Privately owned small farms were only somewhere between 4 to 10%. State owned land was ca 2-3%, and communally owned land about 1-3%. About 90% of all pasture was also communally owned.

Typical plots are small; even the owner of a lot of land usually has many small plots rather than a few large ones. This pattern is partly a result of the topography, but it is often aggravated by Islamic inheritance law, which tends to cause further fragmentation of holdings.

Migration has also had numerous effects on agricultural land. Migrant remittances often go into land acquisition, reinforcing the pattern of large holdings by a few people. Labor shortages have caused more marginal land to be abandoned; without upkeep, the terraces decline and become susceptible to erosion. On the other hand, the value of agricultural labor has risen.

2.3.4 Summary of Problems ^{12/}

A number of the problems associated with land could be solved by increased training or the implementation of specific programs. Proper instruction in the use of tractors would prevent plowing too deep and the resulting loss of soil moisture. Programs of tree plantings could be used for afforestation of the marginal terraces to prevent further deterioration, and to provide windbreaks to prevent crops damage and soil erosion from wind. Local problems in the Tihama with spreading sand dunes could also be dealt with by tree plantings. Fertilizers could increase yields with sufficient water.

¹¹Source: The World Bank. 1979.
Checchi and Company. 1978.
Tutwiler, R. W. et al. 1976.

¹²Source: The World Bank. 1979.
Checchi and Company. 1978.

Other problems are more serious in that no quick or even relatively quick solutions are available. The YAR is still in the beginning stages of developing its infrastructure which deals with agriculture. It simply does not have the resources or personnel to make any sweeping changes in rural areas. The traditional land tenure system is also somewhat of a problem. First of all, the sharecropper does not often have the means or the incentive to make improvements, and secondly landholdings are often so fragmented that modern methods cannot be economically applied. Labor shortages are not likely to decline either, even as the YAR develops, because many of its close neighbors are developing much more rapidly. In fact, as the YAR develops, internal migration to urban areas is likely to increase, further aggravating the situation.

2.4 Vegetative Resources and Rangelands

2.4.1 Woodlands ^{13/}

The Yemen Arab Republic has no forest in the strict sense. However, large areas, about 8% of the total area, are covered by sparse woody vegetation. These woodlands may be grouped into 5 types:

- 1) mangroves of the coastal belts that occupy the saline coastal marshes from Hodeida northward to the Saudi border;
- 2) savannah-type woodlands that run close to the western foothills. Acacia species are dominant, growing in gravelly or sandy sediments;
- 3) trees growing on the large fans of the big wadis that open onto the Tihama;
- 4) acacia scrub woodlands in the foothills and highlands. These extend over large areas of the western and southern slopes of the central mountain range;
- 5) wadi bottom vegetation, which includes the *Ficus* species that provide some lumber for construction of local buildings.

This woody vegetation is for the most part so sparse that it is of very little importance beyond the local level. Acacia is used as a fuel, and some wood is used in construction. Because of these kinds of local uses, it is thought that these resources are being depleted at a rapid rate. However, there is very little current data readily available on any aspect of these resources.

¹³Source: The World Bank. 1979.

2.4.2 Rangelands ^{14/}

Most of the area of the YAR, including areas which might also be called woodlands, could be classified as rangeland. As with nearly every other aspect concerning natural resources very little data is available. These lands are put to some use in supporting livestock. Livestock populations were estimated for 1973 as follows:

sheep & goats	9,500,000	(11.6 million 1965)
cattle	800,000	(1.3 million 1965)
donkeys	600,000	(500,000 1966)
camels	100,000	(55,000 1965)

Figures for sheep, goats, and cattle are declining, as are the numbers reported slaughtered from 1972 to 1975.

Severe erosion and depletion of plant cover is becoming a problem, and may be one cause for these declines in animals. These problems were perhaps brought on by the drought between 1967-73, as figures for 1974 show slight improvements. The World Bank has suggested that these arid to semi-arid rangelands could be restored to some extent, but no projects are being carried out to do so at present.

No data is available breaking down the animal population according to whether they are herded by nomads or kept by villagers. Most of the eastern part of the YAR is inhabited by nomads, but their total population is small. In general, most animals are owned by villagers and grazed communally near the village, so that any programs must start with these villages. The IDA is planning several pilot Village Development Associations and a Range Improvement Center which may be able to address some of the problems of the rangelands.

2.5 Fauna ^{15/}

The Yemeni Arab Republic is part of the Ethiopian zoogeographic region, which covers southern Arabia and central and southern Africa. Current information is almost non-existent on fauna in the Yemen. No current literature even mentions wildlife as being of any importance in the economy or daily life of the population, except for fishes.

¹⁴Source: The World Bank. 1979.
Nyrop, R. F. et al. 1977.

¹⁵Source: Scott, M. 1939.
International Union for the Conservation of Nature and
Natural Resources. 1976.

2.5.1 Rare and Endangered Species

The Red Data Book lists only three species in Yemen as being threatened, which the IUCN defines as being in its endangered, vulnerable, rare and indeterminate categories. These are as follows:

<i>Panthera pardus nimr</i>	South Arabian Leopard
<i>Dugong dugon</i>	Dugong
<i>Gazella gazella arabica</i>	Arabian Gazelle

Countries near the YAR are listed for comparison as many of these species may also be in the YAR.

ETHIOPIA

<i>Canis simensis simensis</i>	Northern simien fox
<i>Lycaon pictus</i>	African wild dog
<i>Panthera pardus</i>	Leopard
<i>Acinonyx jubatus</i>	Cheetah
<i>Dugong dugon</i>	Dugong
<i>Equus asinus</i>	African wild ass
<i>Equus grevyi</i>	Grevy's zebra
<i>Diceros bicornis</i>	Black rhinoceros
<i>Alcelaphus buselaphus tora</i>	Tora hartebeest
<i>Alcelaphus buselaphus swaynei</i>	Swayne's hartebeest
<i>Dorcatragus megalotis</i>	Beira antelope
<i>Ammodorcas clarkei</i>	Dibatag
<i>Capra ibex waliae</i>	Walia ibex

SOMALIA

<i>Lycaon pictus</i>	African wild dog
<i>Panthera pardus</i>	Leopard
<i>Acinonyx jubatus</i>	Cheetah
<i>Dugong dugon</i>	Dugong
<i>Equus asinus</i>	African wild ass
<i>Equus grevyi</i>	Grevy's zebra
<i>Diceros bicornis</i>	Black rhinoceros
<i>Damaliscus hunteri</i>	Hunter's hartebeest
<i>Ammodorcas clarkei</i>	Dibatag
<i>Gazella dorcas pelzelni</i>	Pelzein's gazelle
<i>Dorcatragus megalotis</i>	Beira antelope
<i>Gazelle spekei</i>	Speke's gazelle

SAUDI ARABIA

<i>Canis lupus</i>	Wolf
<i>Panthera pardus nimr</i>	South Arabian leopard
<i>Panthera pardus jarvisi</i>	Sinai leopard
<i>Acinonyx jubatus venaticus</i>	Asiatic cheetah
<i>Dugong dugon</i>	Dugong
<i>Gazella subgutturosa marica</i>	Sand gazelle
<i>Gazella dorcas saudiya</i>	Saudi Arabian dorcas gazelle
<i>Gazella gazella arabica</i>	Arabian gazelle

OMAN

<i>Panthera pardus nimr</i>	South Arabian leopard
<i>Dugong dugon</i>	Dugong (24)
<i>Oryx leucoryx</i>	Arabian oryx
<i>Gazella gazella arabica</i>	Arabian gazelle
<i>Hemitragus jayakari</i>	Arabian tahr

SOUTH ARABIAN FEDERATION

<i>Gazella gazella arabica</i>	Arabian gazelle
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SOUTH YEMEN

<i>Panthera pardus nimr</i>	South Arabian leopard
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2.5.2 Fishing ^{16/}

The estimated catch in 1976 of all fish from Yemen waters was 17,000 metric tons. The potential is estimated to be about 25,000 metric tons per year. This includes some fish types which are not now eaten by the local population. The main fish resources presently exploited by the artisanal fishermen are pelagic in habit; i.e., they are the fast-moving type that live in the water column. These species include the Indian mackerel, which makes up the largest part of the catch, the king mackerel, tuna, black cobia, large jacks, sharks and barracuda.

The highly prized shrimp and lobster resources are substantial, but not as great as once assumed. Based on production potentials off West Africa of 3 metric tons per square mile, and a maximum of 500 square miles of shrimp grounds off Yemen, the production potential indicated would thus be 1,500 metric tons per year. On the basis of latest surveys, however, it has been found that the shrimp areas are mainly in the coastal waters, especially north of Hodeida around Kamaran Island. This area is not more than 150-300 square miles.

¹⁶ Source: The World Bank. 1979.

Another potentially exploitable marine resource would be the cray fish or spiny lobsters existing in the coral reef area. There is undoubtedly considerable suitable habitat for spiny lobsters fringing the reefs, but additional exploratory fishing trials need to be undertaken to estimate the quantities that might be exploitable.

The bivalve mollusca located in the shallow littoral regions along the beaches is possibly another potential marine resource. The local clams have a hard consistency but are quite delicious and are already exploited to a small degree by the foreign community in Hodeida . Development of this resource as a canned export is a possibility. However, further work on stock will be a necessary prerequisite.

An estimated 4,000 fishermen earn a meager livelihood from artisanal fishing . The estimated number of fishing vessels now in operation is as follows: 100 large motorized boats (sambuks), 140 small motorized boats (houris), 640 medium-sized boats (houris), and roughly 100 small rafts. Most of the local catch of fish is sold in the immediate coastal region. However, increasing amounts of fresh fish are reaching the urban centers of Sana'a and Taiz. A large part of the fish landed is salted and dried for transport to interior markets as well as for export.

Fishermen get relatively low prices for their catch at the village landing centers. In addition, the price fluctuates widely with availability and season. If their catches are too large they may not have a market at any price.

3.0 Parks, Reserves, Protected Areas ^{17/}

This section is inserted only to note that nothing is being done in the field. The lack of current data on wildlife, and the fact that wildlife is not part of the traditional or modern economy, translates into no governmental or social awareness or action in the sphere of parks or reserves. The IUCN in 1971 had no listings of national parks or equivalent reserves, and noted:

"No response yet received from the authorities at San'a, but private information suggests that no areas exist with the necessary qualifications for inclusion in the list."

¹⁷Source: International Union for the Conservation of Nature and Natural Resources. 1971.

4.0 Environmental Problems and Impacts

The Yemen Arab Republic is hardly even in the beginning stages of awareness about or ability in dealing with environmental problems. In fact, Yemen is so undeveloped that many modern environmental problems simply do not exist and are not likely to become even a minor concern for years to come. However, even if such things as industrial pollution, air pollution, or excessive noise levels do not exist, there are some major problems to be faced in areas such as water or land resources.

4.1 Legal and Administrative Background ^{18/}

The YAR is still governed essentially under Shari'ah, or Islamic law, combined with customary law. There is very little modern legislation that addresses any aspect of environment directly. Because Islamic law is basically concerned with the well-being of the community, and because it tends to approach problems on a case by case basis, there is certainly ample legal justification should the government need to step in on a specific case. Islamic law has already addressed many cases of water pollution, proper water management, and similar problems which have come up in traditional settings. However, as the YAR continues to develop, one of its aims will need to be some kind of comprehensive program to deal with such problems on a nationwide scale, rather than case by case.

A few institutions ^{19/} are beginning to appear which have been given powers to deal with some aspects of environmental problems on a restricted scale. For example, the National Water and Sewerage Authority (NWSA) was set up in 1973 (cf also sec. 2.1.3) and given power over most aspects of urban water supplies and sewage. In particular, NWSA's mandate gives it full power to take any steps necessary to protect the underground and surface waters under its authority from pollution. This mandate has been interpreted to include control over even agricultural water usage within established protected zones around urban areas. The Tihama Development Authority, charged with seeing to irrigation schemes and integrated rural development, may similarly concern itself with various environmental problems in the rural Tihama. A network of Local Development Associations is being established throughout the YAR. Many of the projects of this quite successful self-help program deal with environmental problems on a local level.

¹⁸ Source: Caponara, D. A. 1973.
AID Report on Water Resources Sector Study in the Yemen Arab Republic. 1972.

¹⁹ Source: The World Bank. 1979.
A Report on Water Resources Sector Study in the Yemen Arab Republic. 1972.
Quarterly Economic Review of Bahrain, Qatar, Oman, the Yemens. Annual Supplement. 1979.

4.2 Water Supplies and Water Related Disease

Water is the single most crucial element in the YAR's efforts to develop, and it is not surprising that the most pressing environmental problems concern various aspects of water.

4.2.1 Rural Water ^{20/}

Drinking water in rural areas is usually obtained from shallow wells which are often contaminated. A number of projects, including an AID Rural Water Supply project, have been constructing new village water systems, upgrading old ones, and providing training in maintaining the systems. In many cases, pumps are being installed for obtaining both drinking water and irrigation water.

Greatly increased use of pumps, especially for agriculture, is leading to serious depletion of the water table in many areas. It has also led to problems with soil salinity, especially in the Tihama where groundwater can be quite saline. Increases in surface water irrigation also are contributing to salinity problems. If expansion of irrigation continues according to plan (cf following table) these problems are likely to increase greatly if not addressed.

LONG-RANGE TARGETS

<u>Plan Period</u>	<u>Flood Irrigation</u>	<u>Perennial Irrigation</u>	<u>Well Irrigation</u>
	-----1,000 ha-----		
Present irrigation	120	73	37
1st 5-Year (1976/81)	134	79	33
2nd 5-Year (1981/86)	148	89	144
3rd 5-Year (1986/91)	158	96	194

Source: The World Bank. 1979.

²⁰Source: The World Bank. 1979.
Nyrop, R. F. et al. 1977.
AID Project Design Information (INQUIRE). 1980.
U.S. Department of State Telegram #3891.

4.2.2 Urban Water Problems ^{21/}

Urban water supplies, also primarily from groundwater, are being depleted. Recharge of aquifers is not keeping pace with increases in demand. The cities of Sana'a and Taiz are primarily affected by this, and projections expect demand to far exceed the resources by the end of the century (cf Section 2.1).

Inadequate urban sewage systems are a major problem also. Waste water in Sana'a often drains directly into the gutter, and eventually reaches the aquifer under the city. Sewage is usually disposed of in pit latrines or cesspools; only occasionally are septic tanks available. Taiz is the only city to have a limited sewage collection system as of 1975, but this served only about 2,000 people. Otherwise, problems are similar to Sana'a.

In Hodeida the situation is similar. However, while Sana'a's high altitude and low humidity somewhat check the resulting health problems, Hodeida does not have such mitigating factors. In addition, the water table is high in the area, and low-lying areas may not absorb wastewater at all. Stagnant pools greatly increase the transmission of typhoid, paratyphoid, cholera, parasites, infectious hepatitis, hookworm, and bacillary dysentery. In coastal areas such as Hodeida, solving water shortage problems without first installing sewage systems would only make conditions worse.

4.3 Other Rural Problems ^{22/}

Several other problems in rural areas are also indirect results of water management or lack of it. Soil erosion is a serious problem in the YAR. In some areas, modern trends are reducing the effects. During exceptional floods, high water could often wash away much of the irrigation network of a wadi, as well as substantial amounts of soil. Modern projects in wadi irrigation are beginning to solve this aspect. But abandonment of terraces in highland regions is causing soil erosion in these areas to get worse.

Depletion of rangeland and woodland plant cover and soil erosion in these areas have also become factors. Communal grazing leading to overgrazing is one cause. Widespread use of the scanty wood resources for fuel and for poles is another. The problem was greatly aggravated by the drought lasting from 1967-73. Spreading sand dunes is still another problem that has become important in some areas of the Tihama. High wood prices and use

²¹Source: The World Bank. 1979.
Nyrop, R. F. et al. 1977.
AID Report on Water Resources Section Study in the Yemen Arab Republic. 1972.

²²Source: The World Bank. 1979.
Nyrop, R. F. et al. 1977.
U.S. Department of State Telegram #3991.

as windbreaks for crops have encouraged farmers to begin planting trees. These problems may be somewhat alleviated if this trend can be increased.

Soil depletion and low yields are also problems in rural areas. Fertilizers and insecticides have been shown capable of greatly improving this situation. Use of them is so recent and so restricted (cf following tables) that there is not yet and will not be for many years any resulting environmental impact. The YAR is fortunate that it has a chance to address one potential problem while it is still in the future.

FERTILIZER AND INSECTICIDE IMPORTS

<u>Year</u>	<u>Fertilizers</u>		<u>Insecticides</u>	
	<u>Tons</u>	<u>CIF Value</u> (YRLs 1,000)	<u>Tons</u>	<u>CIF Value</u> (YRLs 1,000)
1969/70	1,997	900	118	300
1970/71	3,153	200	135	300
1971/72	4,046	500	218	500
1972/73	1,799	800	382	800
1973/74	4,256	1,500	375	1,200
1974/75	3,869	1,700	717	2,100
1975/76	7,932	1,400	2,510	2,900

Source: The World Bank. 1979.

COMPARISON WITH OTHER COUNTRIES OF AVERAGE FERTILIZER USE
PER HECTARE OF ARABLE LAND AND LAND UNDER PERMANENT CROPS; 1974

<u>Country</u>	<u>Nitrogen</u>	<u>Phosphate</u>	<u>Potash</u>	<u>Total</u>
	-----kg per ha-----			
Y.A.R.	2.0	-	-	2.0
Libya	4.0	1.6	0.6	6.2
Syria	4.5	2.2	0.3	7.0
Sudan	8.4	-	-	8.4
Saudi Arabia	6.5	3.5	4.5	14.5
Bahrain	10.0	5.0	5.0	20.0
Egypt	126.1	22.8	1.9	150.8
Europe	78.4	55.6	57.2	191.3
The World	25.8	15.1	13.2	54.1

Source: The World Bank. 1979.

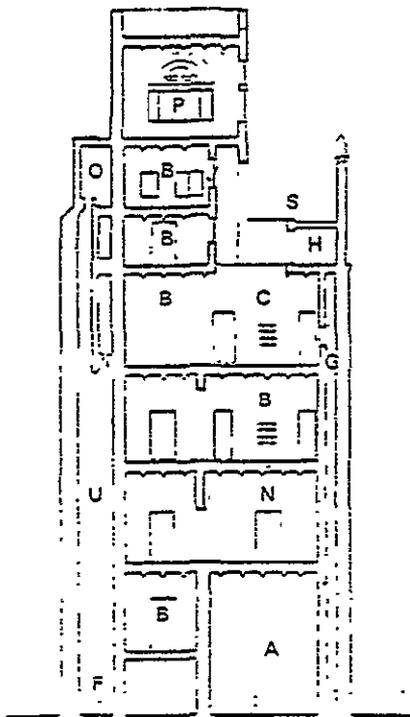
4.4 Other Urban Problems ^{23/}

Traditional Yemeni houses in urban areas have a latrine shaft which runs from the lavatory-bathroom on an upper floor of the house to the ground floor. Excrement is collected in a small room at the bottom of the shaft, and eventually used for fuel when dried. Liquids are led down a vertical drain on the outside of the building. At ground level they disappear into an under-ground drainage sump, which usually leads to the street gutter. The ground floor also usually has rooms used as stables for animals. A typical house plan is shown below. This system is essentially what exists even at present as a modern urban infrastructure is still in the rudimentary stages.

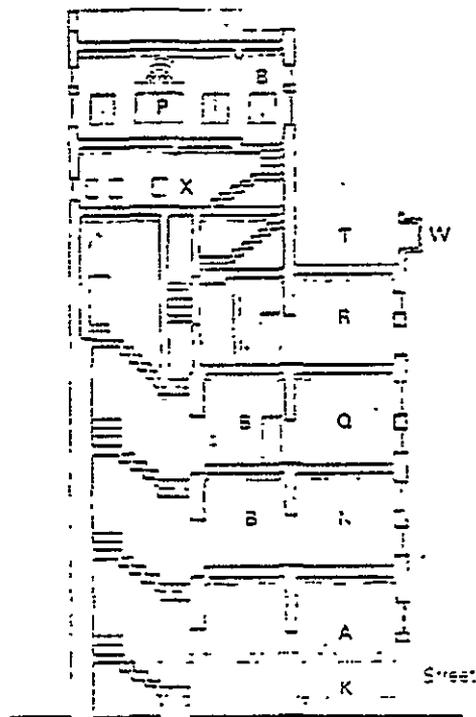
²³ Source: The World Bank. 1979.
Museum of Mankind, Department of Ethnography, British
Museum. 1976.

YEMENI HOUSE PLAN

- A Entrance hall
- Aa Entrance hall upper level
- B Lobby
- C Court
- Cc Court upper level
- D Animal stall
- E Sheep pens
- F Excrement room
- G Well
- H Store
- J Grain and fruit store
- K Loading
- L Grinding mill
- M Personal room
- N Living room
- O Bathroom
- P Mafraj
- Q Diwan
- R Kitchen
- S Terrace
- T Laundry terrace
- U Shaft
- V Rain water
- W Water collecting box
- X Women's room and wardrobe



Cross section



Long section

Source: Museum of Mankind, Dept. of Ethnography, British Museum. 1976.

Rapid urbanization has been taking place since about 1970, although the total urban population is still a small percentage of total population. The 332,077 inhabitants of the five main cities (1975) is nearly double the urban population at the end of the 1960's. This growth has proceeded almost without any planning. In addition to water and sewage problems, many others are worsening due to this trend. Inadequate housing springs up in suburb areas. Nearly one fourth of all urban housing is huts, tents, or other temporary structures. There is also crowding; in 1975 about two-thirds of all living quarters had only one or two rooms. The average occupancy rate per room was:

Sana'a	1.6
Tai'z	1.4
Hodeida	2.9

Since 1975, population density in urban areas has greatly increased. Transportation, solid waste collection and access to electricity are all still very inadequate.

The Yemen Arab Republic cannot be said to be facing some of the major pollution problems of more developed countries. Industrial pollution is still practically non-existent, as is air pollution.

4.5 Public Health Implications ^{24/}

Beyond the incidences of disease noted in section 1.3.4 there is no current data available beyond the mention of certain diseases being present. However, environmental conditions which foster these diseases have not changed much since a survey was taken in 1951, so that the results may still give an idea of health conditions. Incidences of intestinal protozoa and helminth parasites are shown in the following table.

²⁴Source: Mount, R. A. 1953.
 Mount, R. A. and J. R. Baranski. 1953.
 Kuntz, R. E. et al. 1953.

Percentage of people infected with intestinal protozoa and helminth parasites (parasites identified from urine and fecal specimens, and perianal swabs)

PARASITES	LOCALITY			
	Hodeida	Ta'izz	Ma'bar	San'a
Intestinal protozoa				
Number of fecal specimens examined	72	100	26	24
<i>Endamoeba histolytica</i>	37*	33	65	37
<i>Endamoeba coli</i>	51	49	65	63
<i>Endolimax nana</i>	31	24	35	35
<i>Iodamoeba bütschlii</i>	19	31	42	75
<i>Chilomastix mesnili</i>	8	10	15	5
<i>Giardia lamblia</i>	19	11	0	13
<i>Trichomonas hominis</i>	4	2	0	0
Helminths				
No. fecal and urine specimens and perianal swabs examined...	182	218	26	70
<i>Ascaris lumbricoides</i>	8	49	89	14
<i>Enterobius vermicularis</i>	7	14	21	26
<i>Hymenolepis nana</i>	18	4	4	10
<i>Schistosoma haematobium</i>	2	10	0	0
<i>Schistosoma mansoni</i>	7	56	4	18
<i>Taenia saginata</i>	0	0	16†	0
<i>Trichuris trichiura</i>	15	5	15	7

* Percentage infection is given as the nearest whole number.

† Two fecal specimens contained gravid proglottids as well as ova.

Source: Kuntz, R. E. et al. 1953.

Waterborne parasites such as *Schistosoma mansoni*, *S. haematobium*, as well as other diseases, were often transmitted via polluted water in ablution pools of mosques. Snail vectors were found in some mosques. Bacteriological and seriological sampling shows the incidences where typhoid, paratyphoid (from *Salmonella*) and bacillary dysentery (from *Shigella*) may be present.

The percentage distribution of *Salmonella* non-specific "H" agglutinins and *S. typhi* "O" agglutinins by age group and location in the Yemen

Age in years	PER CENT OF SERA AGGLUTINATING AT 1:20 OR ABOVE, BY AGE GROUP*				Total
	11-15	16-20	21-30	over 30	
No. sera from					
Ta'izz (number)	31	30	50	42	162
San'a "	14	31	4	7	56
<i>Salmonella</i> N.S.H (per cent)					
Ta'izz "	13	12	24	10	16
San'a "	14	13	0	0	11
<i>S. typhi</i> "O"					
Ta'izz "	38	33	51	16	37
San'a "	0	76	100	50	32

* Percentages are given as the nearest whole number.

Source: Mount, R. A. and J. R. Baranski. 1953.

Distribution by age groups of *Shigella* and *Salmonella* types in the Yonkers on the basis of a single stool culture

	AGE IN YEARS					TOTAL
	6-10	11-15	16-20	21-30	over 30	
No. examined.....	43	97	64	94	60	358
Per cent of pop. sample	12	27	18	26	17	100
Pos. for <i>Shigella</i>	6	12	12	10		51
<i>Shigella</i>						
<i>ambigua</i>					3	3
<i>sonnei</i>		2	5	5	6	18
<i>flexneri</i>						
I.....	2		1			3
II.....	1	2	2	1	1	7
III.....	1	1	2	1	1	6
IV.....						
V.....		1	1	1		3
VI.....	1	1		1		3
VII.....						
VIII.....				1		1
<i>sachsi</i>	1	2				3
<i>disper</i>			1			1
<i>Salmonella</i>						
<i>paratyphi</i>						
A.....	1		1			2
B.....			1	1		2
C.....						
<i>typhi</i>	3	1				4
Total <i>Shigella</i> & <i>Salmonella</i>	10	13	14	11	11	59
Per cent pos. for enteric pathogens*	23	13	22	12	18	17

* Percentages are given as the nearest whole number.

Source: Mount, R. A. and J. R. Baranski. 1953.

Regional distribution of Shigella and Salmonella types in the Yemen on the basis of a single stool culture

	LOCATION			
	Hodeida	Ta'izz	San'a	Totals
No. examined.....	159	160	39	358
No. positive for:				
<i>Shigella</i>	14	34	3	51
<i>flexneri</i>				
I.....	1	2	0	3
II.....	1	17	0	18
III.....	2	1	0	3
IV.....	1	5	1	7
V.....	2	2	2	6
VI.....	0	0	0	0
VII.....	1	5	0	6
VIII.....	2	1	0	3
IX.....	0	0	0	0
X.....	0	1	0	1
XI.....	3	0	0	3
XII.....	1	0	0	1
<i>Shigella</i>	5	1	2	8
<i>paratyphi</i>				
A.....	1	0	1	2
B.....	0	1	1	2
C.....	0	0	0	0
<i>typhi</i>	4	0	0	4
Total <i>Shigella</i> & <i>Salmonella</i>	19	35	5	59
Per cent found positive*	12	22	13	

* Percentages are given as the nearest whole number.

Source: Mount, R. A. and J. R. Baranski. 1953.

4.6 Effects of Labor Migration ^{25/}

In the sense that many of the YAR's environmental problems are aggravated by migration, it must be considered. Labor shortage in rural areas has led to abandonment of marginal agricultural land, a trend reinforced by the high rate of remittances which make it less necessary for survival to keep the land productive. Terraces are deteriorating and erosion results. The shift to qat, which is much less labor intensive than most other crops, is reinforced. Some remittances are invested in irrigation, which can be a mixed blessing, both improving production and reducing water resources. Some are invested in land, reinforcing the sharecropping patterns which are less likely to attend to environmental problems.

²⁵ Source: Checchi and Company. 1978.
 Socknat, J. A. and C. A. Sinclair. 1973
 Birks, S. and C. A. Sinclair. 1979.
 Halliday, F. 1977.

Yemeni migration abroad is overwhelmingly in unskilled and semi-skilled categories. However, in a country as short of highly trained personnel as the YAR is even the loss of a few of these people can impede implementation of development projects. Concern over a Yemeni "brain drain" may not seem justified in terms of the small numbers involved, and Yemen is certainly not similar to Jordan or Egypt in sending large numbers of educated or skilled personnel abroad. Still, the YAR is hurt by the loss of even a few of these people at this stage of its development.

5.0 Economic Development 26/

The Yemen Arab Republic's initial Five-Year Development Plan (1976/77-1980/81) is the first attempt at comprehensive planning. Previous development was simply a collection of individual projects. The basic economic objectives of the plan, as summarized by the World Bank, are as follows:

- (a) Mobilize human resources and improve their skills through education and vocational training;
- (b) Expand the physical infrastructure, i.e., the transport network, telecommunications, and electricity, thus integrating the various regions of the country and breaking present bottlenecks in the supply of vital goods and services;
- (c) Develop the productive sectors, i.e., agriculture and industry. Increase domestic food production; develop agricultural supplies for export and local industry; establish viable manufacturing industries catering to domestic and foreign markets; and expand the capacity of the construction sector so that it can cope with the fast-rising investment volume; and
- (d) Increase the level of national savings and mobilize financial resources through taxation and other means, to cover the expenditures of the public sector.

Besides these economic objectives the Plan also pursues social goals aimed at satisfying the basic needs of the population for food, drinking water, health care, elementary education, housing and other community services.

Source: The World Bank. 1979.

5.1 Agricultural Development

Agricultural development is the sector most likely to have direct immediate impact on the environment. In agriculture, the principal objectives as summarized by the World Bank are as follows:

- (a) Work towards self-sufficiency in food production within economic limits;
- (b) Provide raw materials for agro-industries already existing and those to be established during the Plan period;
- (c) Reduce the widening trade deficit in agricultural commodities;
- (d) Improve the quality of agricultural products;
- (e) Provide special support to small farmers and create equitable and stable land tenure relations; and
- (f) Limit the growing of opat.

These objectives are to be achieved through the following means:

- (a) Continue the institution building and training of agricultural staff;
- (b) Carry out a comprehensive survey of soil and water resources;
- (c) Expand credit services to all main agricultural areas of the country;
- (d) Establish farmer cooperatives suitable for Yemeni conditions;
- (e) Provide storage capacities for agricultural products and extend the network of rural roads;
- (f) Conduct an agricultural census to obtain reliable data for the sector; and
- (g) Carry out studies on marketing, prices and taxation with a view of arriving at policies that would best promote agricultural development.

In addition, a great number of investment projects are to be carried out under the Plan with emphasis given to irrigation schemes, farm mechanization, seed preparation, plant protection, livestock and poultry production, afforestation and integrated rural development.

Five Year Plan: Investment by Sector

(YR mn; 1975/76 constant prices)

	<u>1976/77</u>	<u>1977/78</u>	<u>1978/79</u>	<u>1979/80</u>	<u>1980/81</u>	<u>Total</u>	<u>% of total</u>
Transport & communications	317	615	912	1,282	1,769	4,925	30.8
Industry	270	545	657	850	1,223	3,545	22.2
manufacturing	170	312	371	176	639	1,998	12.5
electricity & water	81	182	254	325	528	1,373	8.6
mining & quarrying	16	21	32	19	56	171	1.1
Agriculture	154	321	423	536	812	2,276	14.3
Housing	305	307	387	509	582	2,090	13.1
Services	90	194	361	561	751	1,963	12.3
Trade	50	95	116	168	199	628	3.9
Construction	32	73	83	116	147	451	2.8
Banking & finance	11	19	17	20	23	93	0.6
Total	<u>1,262</u>	<u>2,169</u>	<u>2,959</u>	<u>4,045</u>	<u>5,636</u>	<u>15,971</u>	<u>100.0</u>

Source: Quarterly Economic Review of Bahrain, Qatar, Oman, the Yemens. Annual Supplement. 1979.

Studies are to be made for the possible use of sewage water for irrigation. Also, investigations are planned for the location of dam sites in mountainous areas for the possible storage of surface flow for irrigation. The program of works envisages some construction of small dams for flood retardation and soil erosion prevention as well as water conservation. Other projects depend on groundwater. No legal protection is provided as yet against over-exploitation, although the plan does give recognition to the need for some government regulation of groundwater development.

In other aspects of environment, there is also a lack of means to deal with problems, and usually a lack of awareness. Even in the areas where the government recognizes the need, such as with afforestation, projects are only beginning to enter the implementation phase.

Development of the industrial sector is not likely to bring about any additional immediate environmental problems.

5.2 Status of Environmental Problems

In general, there is in the Yemen Arab Republic very little action on environmental problems, either by the government or by private interests. The World Bank has made general recommendations concerning the environmental problems discussed in this report. It is likely to be some time before most of these are acted upon. The start of a few projects designed to cope with environmental deterioration show that the YAR is willing to recognize and deal with the problem once it is brought to attention. However, most development is still in the first stages.

There is little hard data on problems and even less on how development may affect them. The YAR is suffering from a lack of qualified personnel to implement projects. These and a host of other factors make it unlikely that in the near future the government will be able to devote very much attention to the environment except in those cases where problems directly and immediately affect the welfare of the population or the production of various sectors of the economy.

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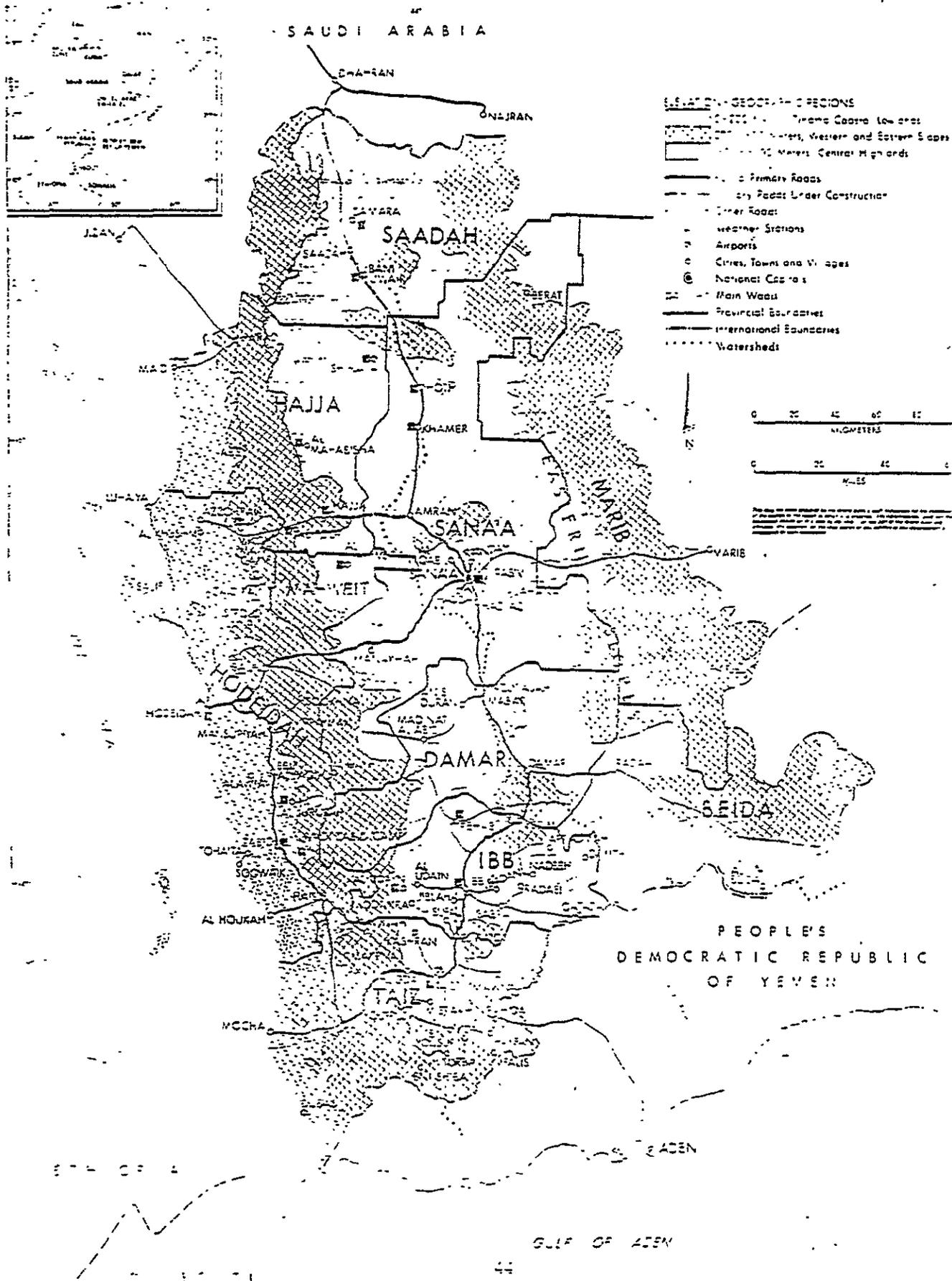
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APPENDIX I

GEOGRAPHY AND CLIMATE

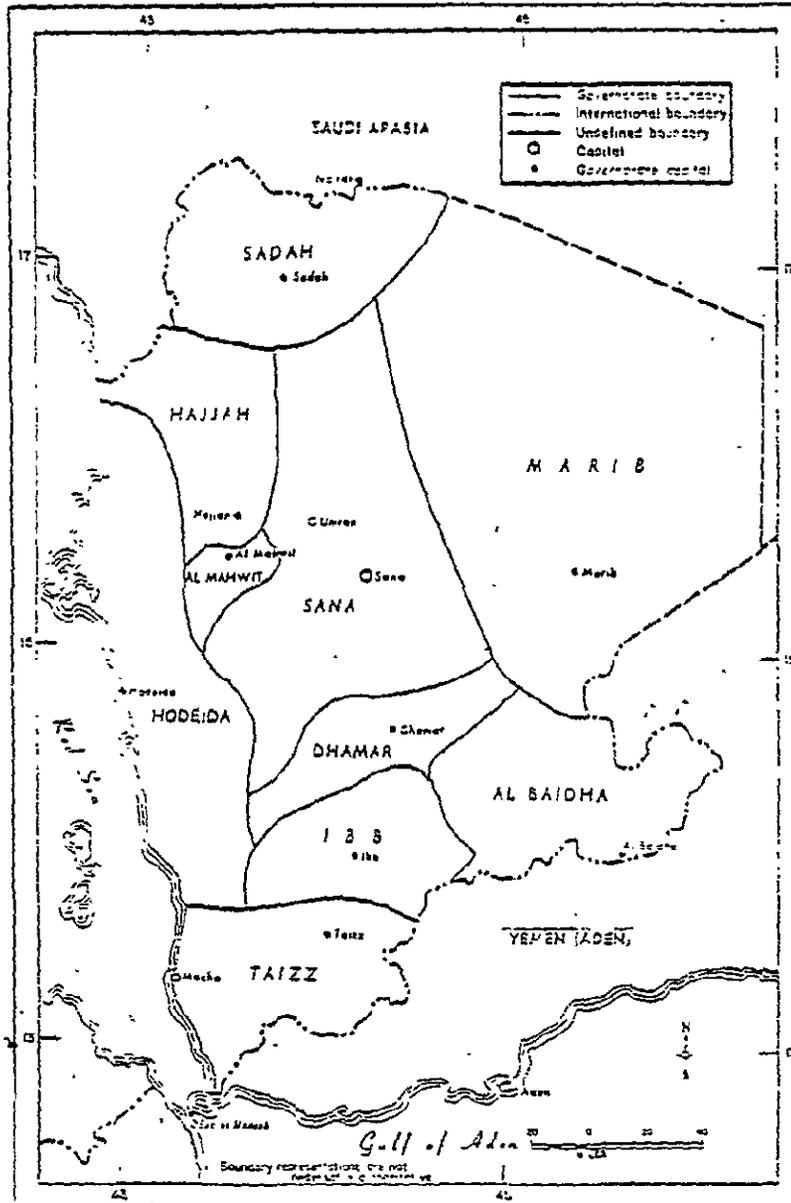
1. Physical Regions and Hydrography
2. Governorates
3. Mean, Maximum, and Minimum Monthly Rainfall at Selected Stations
4. Ecological Zones, Principal Crops, and Religious Divisions

1. Physical Regions and Hydrography



Source: The World Bank, 1971.

2. Governorates



Source: Nyrop, R.P. et al. 1977.

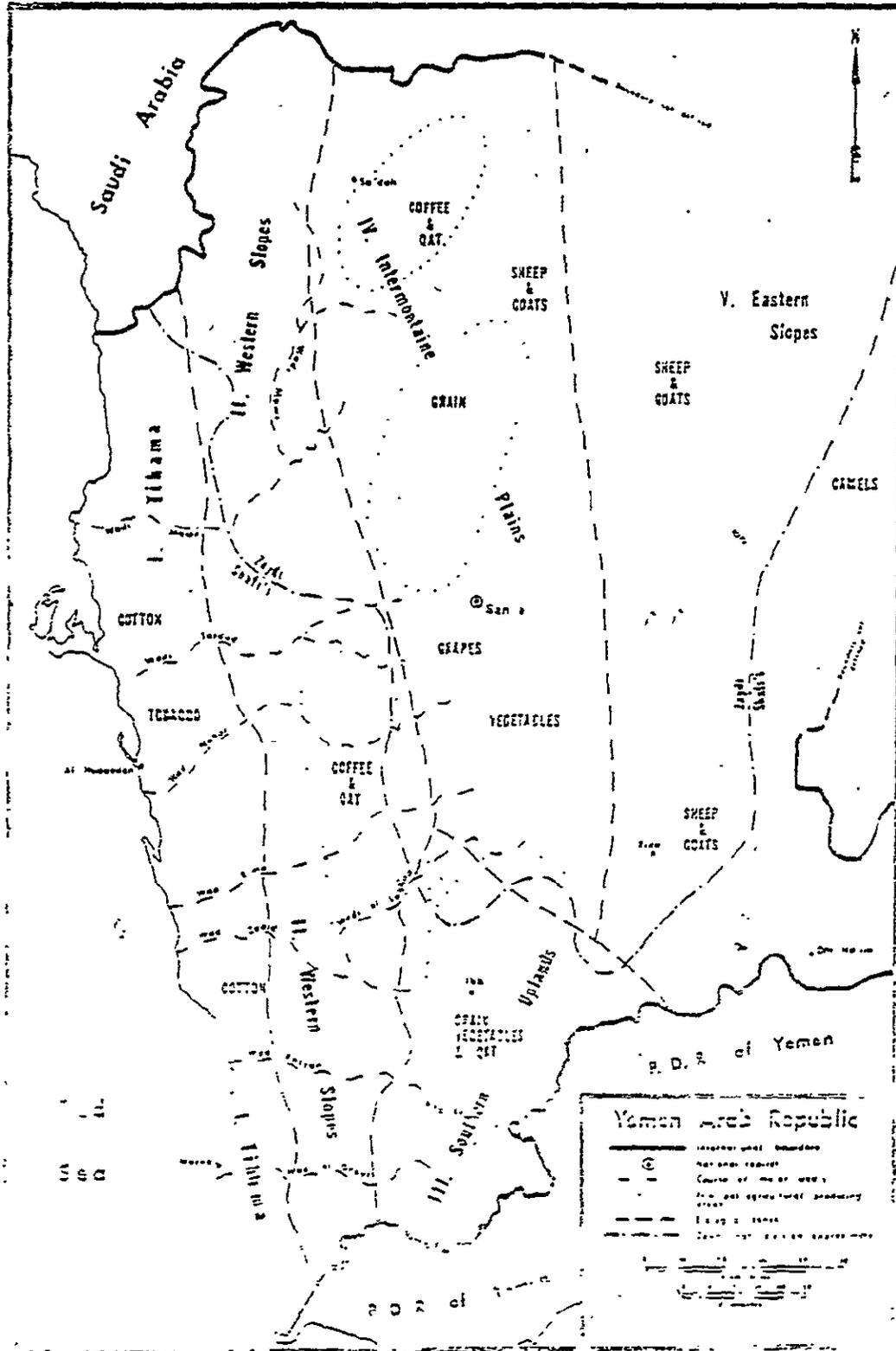
3. MEAN, MAXIMUM AND MINIMUM MONTHLY RAINFALL AT SELECTED STATIONS

(mm)

Station/Year Record	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Tbilisi (24-yrn record)													
Mean	1.3	11.8	15.9	73.6	97.6	83.9	60.9	66.8	83.7	60.9	14.3	9.7	580.4
Maximum	15.2	84.6	60.9	138.6	213.4	149.8	134.7	141.7	137.1	130.0	53.9	36.5	831.4 (1966)
Minimum	0.0	0.0	0.0	0.0	30.4	22.8	10.2	25.4	25.4	5.6	0.0	0.0	308.9 (1976)
Zabid Group (7 yrs 1970-76)													
Mean	5.0	0.7	5.4	21.9	29.1	4.4	35.7	80.7	128.4	36.9	2.4	1.6	352.2
Maximum	22.0	3.0	17.0	80.0	51.0	15.0	102.0	206.0	281.0	124.0	10.0	11.0	546.0 (1974)
Minimum	0.0	0.0	0.0	0.0	0.0	2.0	12.0	68.0	0.0	0.0	0.0	0.0	226.0 (1972)
Samsat (7 yrs 1970-76)													
Mean	4.1	0.9	19.1	42.5	21.1	0.9	22.6	57.9	4.5	0.0	6.8	0.9	181.3
Maximum	23.9	3.0	35.8	109.4	89.3	3.0	84.5	102.0	13.8	0.0	31.5	3.0	350.6 (1975)
Minimum	0.0	0.0	0.5	5.6	0.2	0.0	0.0	3.7	0.0	0.0	0.0	0.0	111.3 (1972)
Yarim (7 yrs 1970-76)													
Mean	2.0	16.3	51.3	66.0	64.0	45.2	65.5	132.9	35.1	4.9	9.7	3.8	497.6
Maximum	9.1	37.2	104.6	202.1	178.3	109.5	114.5	242.3	65.2	23.4	48.0	14.5	687.0
Minimum	0.0	0.0	2.4	10.6	2.4	4.3	4.3	69.7	5.3	0.0	0.0	0.0	365.8
Ili (7 yrs 1970-76)													
Mean	10.1	17.1	46.3	124.7	229.2	246.2	246.7	250.0	193.5	68.9	35.8	0.0	1,468.4
Maximum	43.4	42.9	76.6	291.0	402.0	377.0	414.3	426.3	335.9	174.8	120.5	0.0	2,228.6 (1970)
Minimum	0.0	0.0	0.0	44.6	77.5	185.5	174.2	199.2	109.8	15.5	0.0	0.0	1,050.1 (1971)

Source: The World Bank, 1979.

4. Ecological Zones, Principal Crops, and Religious Divisions



Source: Tumbler, R.N. et al. 1978.

APPENDIX II

DEMOGRAPHIC CHARACTERISTICS

1. Population
2. Illustrative Population Projections
3. Vital Statistics
4. Vital Statistics Relevant to Period 1970-1975
5. Enumerated Resident Population by Age Group and Sex
6. Population Pyramid
7. Enumerated Resident Population by Sex and Governorate
8. Population Map
9. Public Health Indicators
10. Distribution of Resident Labor Force by Educational Status and Sex
11. Age Structure and Share Abroad of Labor Force Age Male Cohorts - 1975

1. POPULATION (in million)

Year	Population Est.	Source
1979	7.0 (+1.5 working out of country)	1
1978	5.804	2
end 1976	5.5	3
1974	6.365	4

-
1. Quarterly Economic Review of Bahrain, Qatar, Oman, the Yemens
 2. AID All Data on the Yemen
 3. World Bank
 4. Council of Arab Economic Unity

2. ILLUSTRATIVE POPULATION PROJECTIONS
(in 1,000)

	<u>1975</u>	<u>1995</u>	<u>2010</u>
Total Population	5,300	8,000	10,600
of which:			
Residents	4,720	n.a.	n.a.
Migrants	580	n.a.	n.a.

Source: The World Bank. 1979.

3. VITAL STATISTICS

Population Density Per Sq. Km	28
Population Density Per Square m of Arable Land	> 100
% of Population in Urban Areas (defined as over 2000)	11%
Population Per Practicing Physician (1973)	20,440
Average Daily Caloric Consumption (1973)	2,017
% Literate (over 10 years of age)	13%
Per Capita Share of GNP (1978)	~ 320 US\$

Sources: Quarterly Economic Review of Bahrain, Qatar, Oman, the Yemens

AID All Data on the Yemen

World Bank

Council of Arab Economic Unity

4. VITAL STATISTICS RELEVANT TO PERIOD 1970-1975

Crude birth rate	47.3
General fertility rate	217
Sex ratio at birth	104.3 (M/100 F)
Crude death rate	28.7
Life expectancy at birth	
Males	35.7 years
Females	38.3 years
Infant mortality rate	
Males	176
Females	143
Total	159
Net annual population increase	18.6 (per thousand)

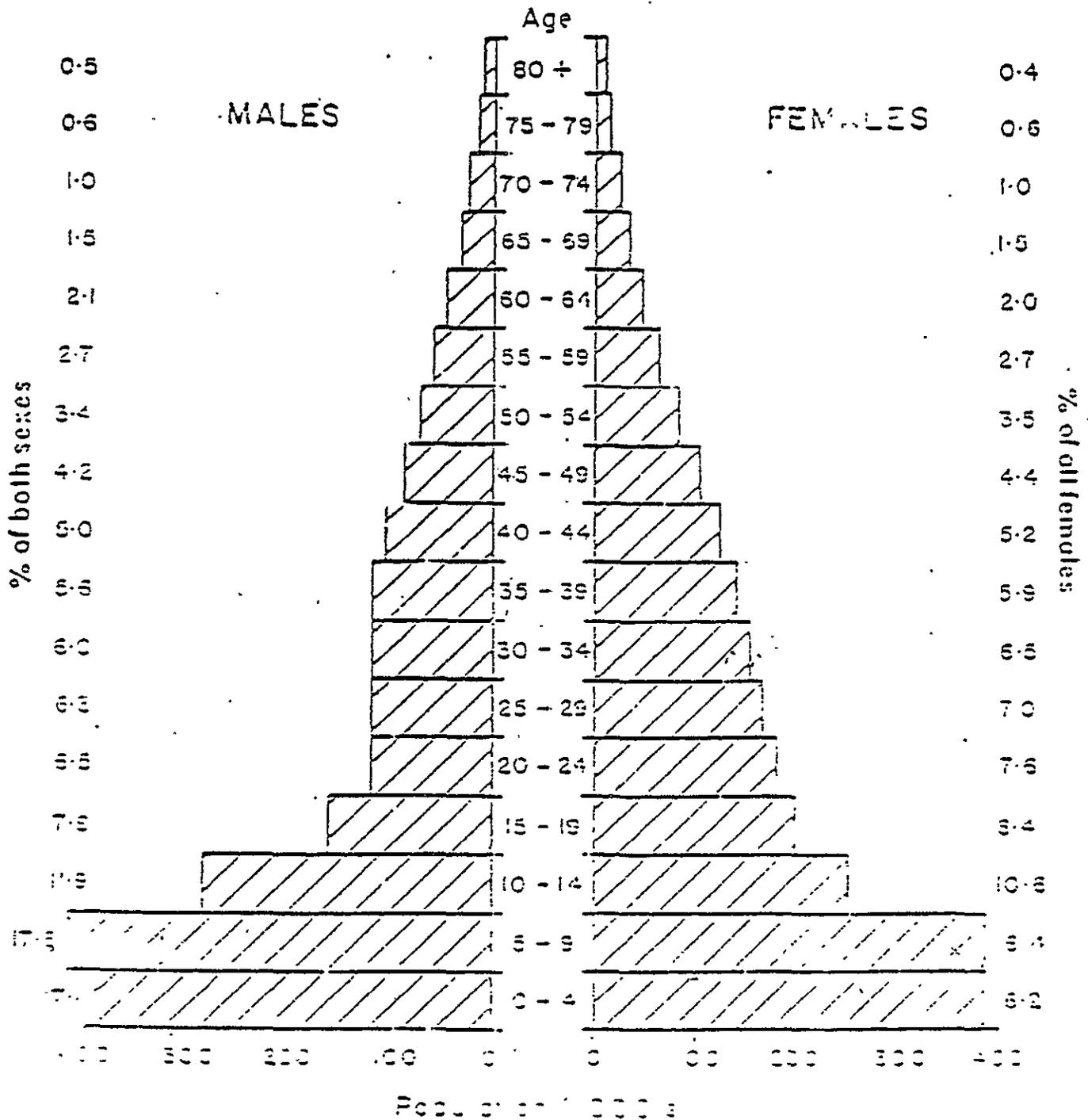
Source: Socknet, J.A. & C.A. Sinclair. 1978.

5. ENUMERATED RESIDENT POPULATION BY AGE GROUP AND SEX
(Preliminary Results of February 1975 Census;
in Thousands)

<u>Age Group</u>	<u>Males</u>	<u>Females</u>	<u>Total</u>
0 - 4	387	385	772
5 - 9	418	389	807
10 - 14	286	252	538
15 - 19	158	200	358
20 - 24	116	180	296
25 - 29	116	167	283
30 - 34	116	154	270
35 - 39	115	140	255
40 - 44	104	123	227
45 - 49	86	104	190
50 - 54	70	84	154
55 - 59	57	65	122
60 - 64	45	48	93
65 - 69	33	35	68
70 - 74	23	23	46
75 - 79	14	13	27
80 +	11	10	21
TOTAL	2,155	2,371	4,526

Source: The World Bank. 1978.

8. POPULATION PYRAMID (1975)



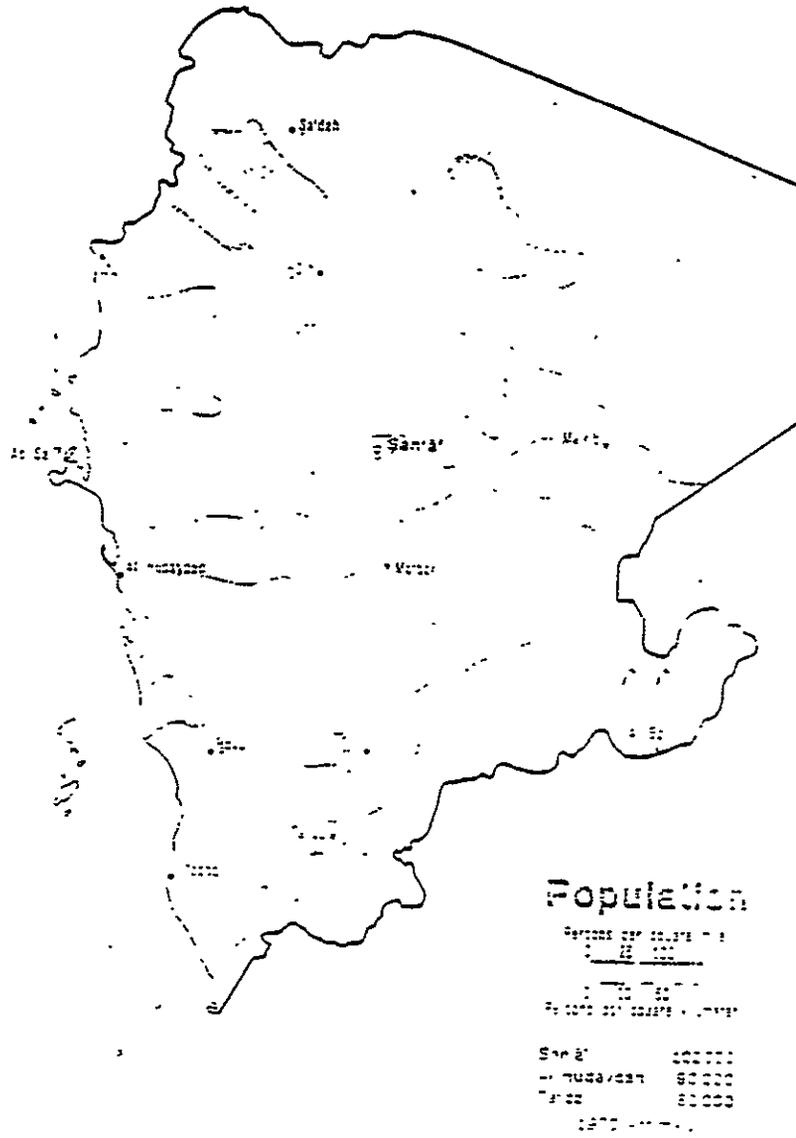
Source: Socknet, J.A. & C.A. Sinclair. 1978.

7. ENUMERATED RESIDENT POPULATION BY SEX AND GOVERNORATE
(Preliminary Results of February 1975 Census)

<u>Governorate</u>	<u>Governorate</u>			<u>Governorate Capital</u>	
	<u>Population</u> (000)	<u>Sex Ratio</u> (percent)	<u>Percent of</u> <u>Total Pop.</u>	<u>Population</u> (000)	<u>Sex Ratio 1/</u> (percent)
Sana'a	807,269	95.2	17.8	134,588	131.9
Damar	455,132	87.3	10.0	19,167	105.8
Ibb	789,518	88.4	17.4	19,066	116.1
Taiz	873,876	83.6	19.3	78,642	132.2
Hodeidah	676,693	102.2	15.0	80,314	145.0
Mahweet	174,639	85.7	3.9	2,421	109.2
Hajjah	396,578	95.8	8.7	5,813	107.3
Sa'adah	154,361	90.5	3.4	4,252	110.7
Marib	40,896	98.3	1.0	292	—
Sa'ida	157,764	81.5	3.5	5,975	82.6
<u>TOTAL</u>	<u>4,526,326</u>	<u>90.9</u>	<u>100.0</u>	<u>350,831</u>	<u>130.4</u>

Source: The World Bank, 1979.

8. Population Map



2-73 Yemen (Sana'a)

9. PUBLIC HEALTH INDICATORS

	<u>Total Number</u>		<u>Population per No.</u>	
	<u>1970</u>	<u>1976</u>	<u>1970</u>	<u>1975</u>
Physicians	184	234	26,630	23,256
of which				
Yemenis	(102)	(124)		
Foreigners	(82)	(110)		
Medical Assistants	643	796	7,620	6,837
of which				
Yemenis	(601)	(653)		
Foreigners	(42)	(143)		
Hospital Beds	3,317	2,637	1,477	2,064

Source: The World Bank. 1979.

10. DISTRIBUTION OF RESIDENT LABOR FORCE BY EDUCATIONAL STATUS AND SEX (February 1975)

	<u>Males</u>	<u>Females</u>	<u>Total</u>
Illiterate	778,678	134,394	913,072
Unable to read and write	667,473	132,727	800,200
Can read only	111,205	1,667	112,872
Literate	219,277	3,378	222,655
Can read and write	198,882	1,943	200,825
Finished primary	4,766	86	4,852
Finished preparatory	4,367	194	4,561
Finished secondary	5,046	399	5,645
Finished university	4,342	319	4,661
Not Stated	1,874	237	2,111
TOTAL	<u>997,955</u>	<u>137,772</u>	<u>1,135,727</u>

Source: The World Bank. 1979.

11. AGE STRUCTURE AND SHARE ABROAD OF LABOR FORCE AGE MALE COHORTS - 1975

Age Cohort	Male Inhabitants	Male/Female Ratio	Males Abroad Assuming Sex Ratio		Age Structure Males Abroad Assuming Sex Ratio		Males Abroad as share of Total Inhabitants plus Abroad Cohort	
			1.00	1.04	1.00	1.04	1.00	1.04
10-19	444,194	0.98	6,788	24,827	3%	8%	2%	5%
20-29	232,119	0.67	112,772	128,648	46%	41%	33%	36%
30-39	230,119	0.78	63,643	75,413	26%	24%	22%	25%
40-49	190,307	0.84	36,844	45,930	15%	15%	16%	19%
50-59	127,159	0.85	21,746	27,672	9%	9%	14%	18%
60-69	78,019	0.94	4,969	8,289	2%	3%	6%	10%
Total 10-69	1,302,408	0.84	246,762	310,779	100%	100%	16%	19%

Source: Socknet, J.A. & C.A. Sinclair. 1978.

APPENDIX III

ECONOMIC CHARACTERISTICS

1. Gross Domestic Product at Current Prices
2. Per Capita GNP and Remittances, 1970-1977
3. Estimated Employment by Sector, January 31, 1975
4. 1975 Structure of Manufacturing Industry (Page 1)
5. 1975 Structure of Manufacturing Industry (Page 2)
6. Value of Agriculture Production
7. Commodity Composition of Recorded Exports
8. Composition of Imports, By Value, To YAR 1970-1977

1. GROSS DOMESTIC PRODUCT AT CURRENT PRICES
(YR MILLION)

	<u>1969/70</u>	<u>1970/71</u>	<u>1971/72</u>	<u>1972/73</u>	<u>1973/74</u>	<u>1974/75</u>	<u>1975/76</u>
Commodity Sectors	<u>804</u>	<u>1,143</u>	<u>1,324</u>	<u>1,532</u>	<u>1,977</u>	<u>2,760</u>	<u>2,834</u>
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	<u>331</u>	<u>366</u>	<u>453</u>	<u>577</u>	<u>795</u>	<u>1,060</u>	<u>1,512</u>
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
Service Sectors	<u>184</u>	<u>237</u>	<u>314</u>	<u>405</u>	<u>488</u>	<u>654</u>	<u>835</u>
Government	91	127	185	252	291	401	509
Health	64	71	83	94	118	150	199
Education	29	37	46	59	79	103	127
Non-Financial Public	<u>1,399</u>	<u>1,746</u>	<u>2,091</u>	<u>2,514</u>	<u>3,260</u>	<u>4,474</u>	<u>5,181</u>
Financial Sectors	50	75	113	151	202	303	453
Construction Sectors	<u>1,169</u>	<u>1,671</u>	<u>1,978</u>	<u>2,363</u>	<u>3,058</u>	<u>4,111</u>	<u>4,728</u>

Source: The World Bank, 1979.

2. PER CAPITA GNP AND REMITTANCES, 1970-1977

Calendar Year	Per Capital GNP	Fiscal Year	Per Capita Remittances	Approximate Relation of Remittances to GNP
1970	\$69			
1971	\$96			
1972	\$111	1971/72	\$13*	17%
1973	\$147	1972/73	\$25	17%
1974	\$197	1973/74	\$26	16%
1975	\$225	1974/75	\$44	32%
1976	n.a.	1975/76	\$101	
1977	n.a.	1976/77	\$203	

*1971/72 remittance figure is net private transfers; for all other years figures are gross private transfers. All prices are current.

Source: Socknet, J.A. & C.A. Sinclair. 1978.

3. ESTIMATED EMPLOYMENT BY SECTOR, JANUARY 31, 1975
(in Thousands)

Sector	
Agriculture (incl. forestry, livestock & fishing)	785
Manufacturing (incl. mining, quarrying, power and water)	39
Construction & Building	47
Trade, Restaurants & Hotels	72
Transport, Storage & Communication	26
Finance, Insurance, Real Estate & Business Services	2
Community, Social & Personal Services	101
	<u>1,072</u>

Source: The World Bank. 1978.

4. 1975 STRUCTURE OF MANUFACTURING INDUSTRY

	<u>Countrywide industrial survey</u>			<u>Significant operations estab. by end-1975^a</u>			
	<u>No. of establishments</u>	<u>Labourforce</u>	<u>Turnover (YR million)</u>	<u>No. of Establishments</u>	<u>Labourforce</u>	<u>Turnover (YR million)</u>	<u>Capital Investment (YR million)</u>
Food processing:							
Flour-milling	6,104 ^b	8,255	102.0 ^{bc}	-	-	-	-
Bread	298	2,610	81.5	-	-	-	-
Biscuits and confectionery (2	444	22.7	9.9
Vegetable oils	403	528	7.9	-	-	-	-
Total (incl. others)	<u>6,808</u>	<u>11,440</u>	<u>192.7</u>	<u>4</u>	<u>461</u>	<u>23.7</u>	<u>11.9</u>
Soft drinks	6	207	12.7	4	160	10.0	7.4
Tobacco and cigarettes	70	462	18.9	1	214	11.7	5.0
Building materials:							
Cement	1	329	22.6	1	308	21.7	51.0
Bricks	32	123	3.0	-	-	-	-
Tiles and marble	13	122	4.4	-	-	-	-
Cement blocks	19	72	8.9	8	133	2.4	2.0
Total (incl. others)	<u>107^d</u>	<u>748^d</u>	<u>41.0^d</u>	<u>9</u>	<u>441</u>	<u>24.1</u>	<u>53.0</u>
Other related industries:							
Cotton spinning	1	550	28.9	1	138	34.5	2.0
Paper and allied	55	1,895	25.2	2	1,890	16.9	28.0
Textiles	2,543	3,606	...	4	63	1.3	0.4
Total (incl. others)	<u>2,601</u>	<u>6,070</u>	<u>65.3^e</u>	<u>7</u>	<u>2,091</u>	<u>52.7</u>	<u>30.4</u>
Other products:							
Food and drink shops	782	1,948	...	-	-	-	-
Chemical products	1	117	3.4	1	119	2.0	2.0
Clothing	368	502	10.4	-	-	-	-
Total (incl. others)	<u>1,151</u>	<u>2,567</u>	<u>67.9</u>	<u>9</u>	<u>238</u>	<u>3.3</u>	<u>8.5</u>

5. 1975 STRUCTURE OF MANUFACTURING INDUSTRY

<u>Sector</u>	<u>Countrywide industrial survey</u>			<u>Significant operations estab. by end-1975^a</u>			
	<u>No. of establishments</u>	<u>Labourforce</u>	<u>Turnover</u> (YR million)	<u>No. of Establishments</u>	<u>Labourforce</u>	<u>Turnover</u> (YR million)	<u>Capital Investment</u> (YR million)
Other manufacturing							
wood products	101	451	29.4	5	74	1.7	1.6
printing/publishing	42	246	1.1	8	204	2.5	3.7
pottery	170	283	4.5	-	-	-	-
plastics ^f	4	228	14.7	4	201	7.0	6.5
Total (incl. others)	337	1,331	72.4	22	528	14.1	12.8
^b GRAND TOTAL	10,587	23,076	466.9 ^c	56	4,135	139.5	129.0

a includes most firms with more than 10 workers, and some smaller ones

b including coffee roasting

c estimated

d excluding the 780 employed in 250 small stone quarries (turnover 24.3 million YR)

e including only some clothing

f including artificial limbs

Source: The World Bank, 1979.

6. VALUE OF AGRICULTURE PRODUCTION
 (YRLs million at 1971/72 constant prices)

	<u>1969/70</u>	<u>1970/71</u>	<u>1971/72</u>	<u>1972/73</u>	<u>1973/74</u>	<u>1974/75</u>	<u>1975/76</u>
Crops	676.6	871.2	821.1	1,024.9	931.8	1,186.2	1,090.5
Livestock	193.9	264.4	323.5	239.7	220.8	275.6	270.3
Fisheries	20.8	21.0	21.3	16.3	12.7	12.0	12.3
Forestry	<u>45.9</u>	<u>44.6</u>	<u>43.3</u>	<u>42.0</u>	<u>40.7</u>	<u>39.5</u>	<u>38.3</u>
Total	937.2	1,201.2	1,219.2	1,322.9	1,195.0	1,513.3	1,411.4

Source: The World Bank. 1979.

7. COMMODITY COMPOSITION OF RECORDED EXPORTS
(YR thousands)

Export Group ending June 30	71/72	72/73	73/74	74/75	75/76	76/77
<u>Agricultural</u>	<u>22,703</u>	<u>23,693</u>	<u>51,648</u>	<u>41,982</u>	<u>41,582</u>	<u>43,205</u>
<u>Ag Products</u>						
Cotton	10,799	12,821	37,053	30,954	24,583	24,953
Golden Fint	(9,912)	(10,785)	(35,180)	(20,188)	(24,221)	(24,593)
Golden Seeds	(887)	(2,036)	(1,873)	(2,766)	(362)	(-)
Coffee	5,534	5,469	6,461	4,972	7,580	10,223
Hides & Skins	3,271	3,325	6,242	4,404	8,010	6,129
Dried Fish	58	382	781	736	325	56
Live Animals	341	768	613	443	6	-
Lobsters	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
<u>Processed Agricultural Products</u>	<u>100</u>	<u>1,143</u>	<u>1,896</u>	<u>3,453</u>	<u>4,322</u>	<u>5,640</u>
Cotton Products	100	317	325	1,590	1,384	637
Fabrics	-	-	-	(1,193)	(775)	(165)
Seeds	(100)	(317)	(325)	(257)	(609)	(472)
Yarn	-	-	-	(140)	-	(-)
Miscellaneous	-	636	1,315	1,131	2,093	3,156
Confectionery	-	119	54	582	845	724
Petroleum Cokes	-	71	202	150	-	1,123
<u>Non-Agricultural Exports</u>	<u>1,898</u>	<u>433</u>	<u>1,838</u>	<u>7,531</u>	<u>4,159</u>	<u>1,689</u>
Salt	1,412	27	26	-	1	-
Dried Soap	247	102	356	9	343	-
Others	239	304	1,456	7,522	3,815	1,689
<u>TOTAL</u>	<u>24,701</u>	<u>25,769</u>	<u>55,382</u>	<u>52,966</u>	<u>50,063</u>	<u>50,534</u>

Source: The World Bank, 1979.

8. COMPOSITION OF IMPORTS, BY VALUE, TO YEAR 1970-1977

Item	1970	1971	1972	1973	1974	1975	1976	First Quarter 1977
Food Stuffs	65.2	44.2	50.1	51.3	49.8	45.3	41.1	30.6
Manufactured Products for Consumption	18.3	25.5	25.5	25.0	27.5	28.3	24.3	28.1
Fuel	3.5	6.3	4.8	5.0	3.8	5.0	3.4	1.6
Raw Materials	0.6	2.9	0.9	0.2	0.3	0.2	0.5	0.5
Chemicals	3.1	5.1	5.6	6.4	6.4	5.6	5.1	1.9
Machinery and Trans- portation Equipment	9.3	15.9	13.0	12.2	12.2	15.6	25.5	15.1
<u>Total</u>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Value of imports at current prices in M millions	178.4	124.8	378.2	364.3	368.1	1,341.4	1,882.1	379.4
Index of growth 1970 = 100.0; 1977 & First Quarter Data	100.0	103.6	210.8	216.2	466.5	751.7	1,064.7	2,135.4

source: Socknet, J.A. & C.A. Sinclair. 1976.

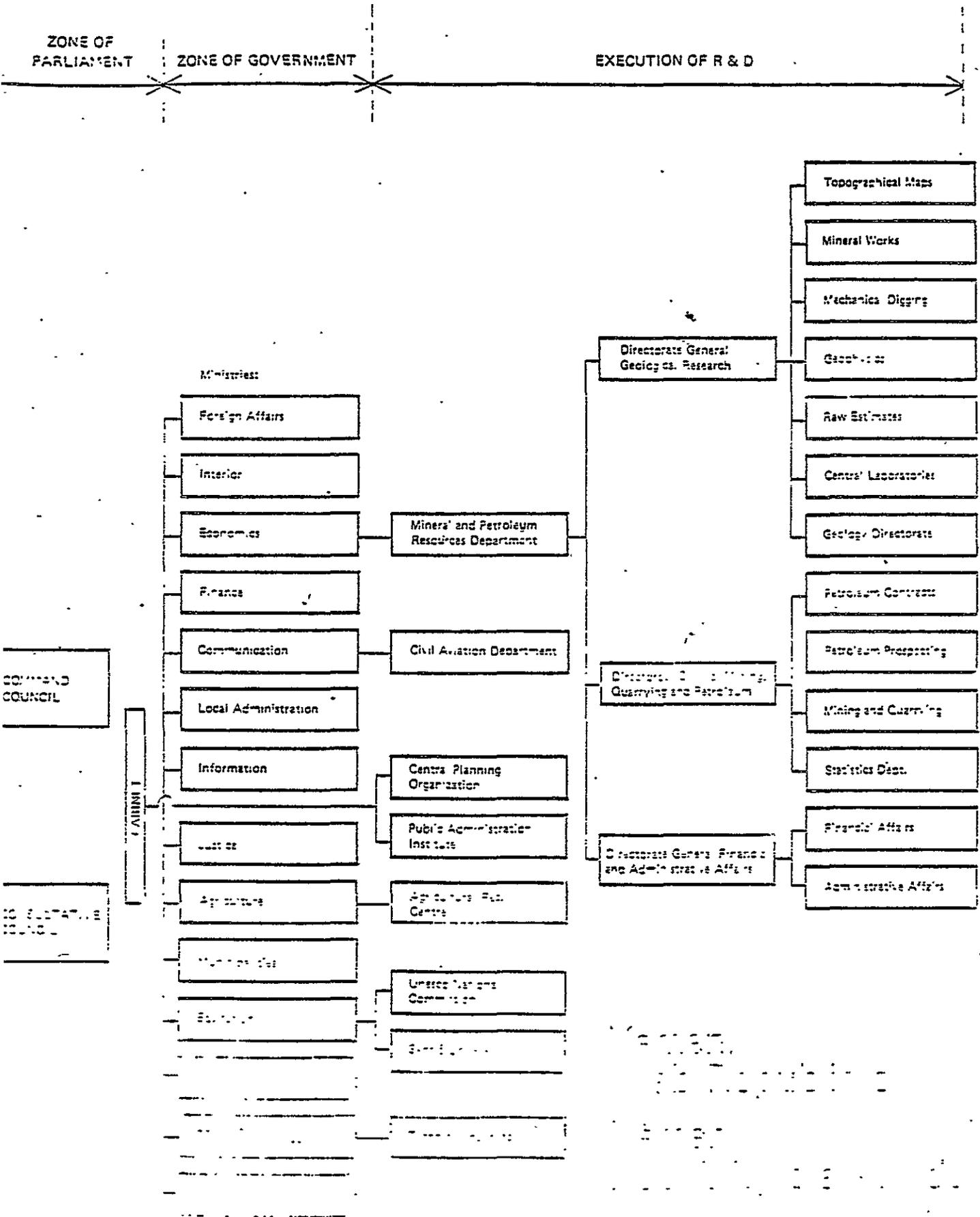
APPENDIX IV
ORGANIZATIONS

A. Governmental and Planning Structure

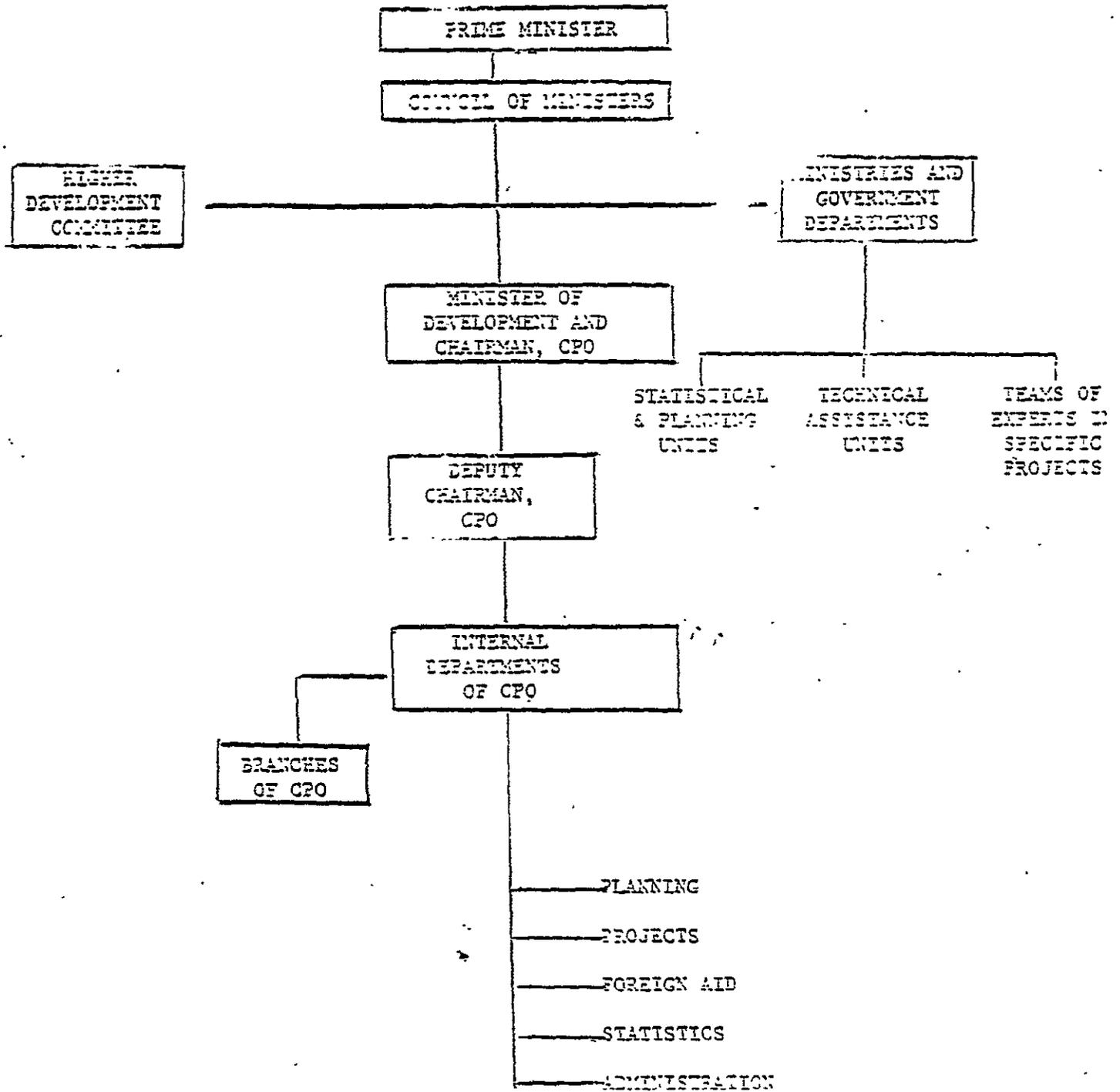
1. Governmental Structure
2. Planning Machinery
3. Functions of the Central Planning Organization
4. Current Ministers (Dec. 1979)

B. Other Organizations

1. Government Structure



2. THE PLANNING MACHINERY IN THE U.S.R.



* The CPO has two regional branches in the government.

Source: The World Bank. 1979.

3. FUNCTIONS PRESCRIBED BY THE CPO FOR ITS 5 DEPARTMENTS

Planning Department

Conduct economic studies for the preparation of the development plans.

Prepare plans to achieve the general goals of economic and social development, having regard to the available resources and potentialities of the country.

Prepare economic and social policies and procedures which will help to develop the country and contribute to the achievement of the plans.

Projects Department

Study projects submitted by ministries, departments and public corporations, and determine project priorities in terms of the general plan.

Follow up on project implementation, according to agreed timetables. Prepare reports on projects and their stage of implementation.

Determine the reasons for good project execution, or for shortfalls, and propose procedures for improved implementation.

Foreign Aid Department

Supervise the contracting of foreign loans and technical aid, and direct the utilization of loans according to the development plan. Formulate the necessary procedures for the proper utilization of loans, and provide for their repayment.

Coordinate, according to the provisions of the development plan, the applications for technical assistance submitted by the ministries, departments and public corporations.

Statistics Department

Conduct the census, partial and comprehensive surveys. Collect statistical data, analyze and publish them. This department is the formal source of all statistical data in the country.

Assist the ministries and government bodies in establishing their own statistical and planning units.

Coordinate the work of these statistical and planning units, so as to facilitate the supply of data for planning by the CPO.

Administration & Public Finance Department

Organize the internal regulations, finance and accounting procedures of the CPO. Prepare the CPO's yearly budget.

Preserve the CPO records and documentation.

Undertake the personnel functions for CPO staff.

4. GOVERNMENT OF THE YEMEN ARAB REPUBLIC

Head of state President Ali Abdullah Saleh
Cabinet reshuffled on 21 March 1979
Prime Minister Abdel-Aziz Abdel-Ghani
Deputy Premier for Financial & Economic Affairs Mohammad Ahmad al-Junaid
Deputy Premier for Internal Affairs Mujanid Abu-Shawarib
Deputy Premier, Foreign Affairs Hasan Makki
Finance Ahmad Abdel-Rahman al-Samawi
Awqaf (Religious Endowments) Ali Bin-Ali al-Samman
Supply & Trade Saleh al-Jamali
Health Mohammad Ahmad al-Asbahi
Education Mohammad Khadem al-Wajih
Agriculture Abde-Wahhab Mahmoud Abdel-Hamid
Transport & Communications Ahmad Mohammad al-Ansi
Information & Culture Yahya Hussain al-Arishi
Public Works Abdoullah al-Kurushmi
Municipalities Ahmad al-Mohanni
Justice Ismail al-Wazir
Interior, Chairman of National Security Organisation Mohammad Mahmoud Khanjis
Development, Chairman of Central Planning Organisation Ali Lutf al-Thour
Social Affairs, Labour & Youth Ahmad Saleh al-Ruani
Economy Mohammad Hizam al-Shohati
Minister of State for Oil & Mineral Wealth Ahmad Qaid Barakat
Ministers of state
Lutf al-Kalabi
Hussain Ali al-Hubaishi

Source: Middle East Economic Digest.
- 1979.

B. Other Organizations

British Council: P.O.B. 2157, Sinan Abu Lahum Building, Sana'a; f. 1974; library of 5,247 vols., 40 periodicals; Rep. R. W. H. CHARLTON; Regional Librarian (vacant) (based in Sudan).

Library of the Great Mosque of Sana'a: Sana'a; f. 1925; the collection of 10,000 MSS. and printed vols. is not at present accessible to the public; Librarian ZAID BIN ALI ENAN.

SANA'A UNIVERSITY

P.O.B. 1247, SANA'A

Telephone: 3443.

Founded 1970.

State control; financial support from Kuwait; Languages of instruction: Arabic and English; Academic year: October to June.

President: Dr. ABDUL KARIM EL-ERYANI.

Vice-President: Dr. MOHAMED MOTAHER.

Secretary-General: SALEM M. AL-SAQQA.

Librarian: FATRI AL-SHAPEL.

Number of teachers: 89.

Number of students: 3,139.

Publications: *University News* (monthly, Arabic), *Research Journal of the Department of English*.

DEANS:

Faculty of Arts: Dr. M. MANDOUR.

Faculty of Law and Sharia: Dr. H. AL-MARSAPAWI.

Faculty of Commerce and Economics: Dr. SAMAN BUTROSS.

Faculty of Science: Dr. A. MUHSIN AL-ABBADY.

Faculty of Education: Dr. M. ABDO GHANEM.

Kulliat Asshari'a Wa Alqanun (Faculty of Islamic Law): Sana'a; f. 1970.

There are also six vocational schools, a Military Academy, a College of Aviation, a College for Radio Telecommunications and an Agricultural School.

Source: Europa Publications Ltd. 1979.

APPENDIX V

Selected Bibliography

1. General (including bibliographies, maps)
2. Climate
3. Geology, Minerals, Soils
4. Flora and Fauna
5. Water Resources and Management
6. Land Use and Agriculture
7. Public Health and Nutrition
8. Social Aspects
9. Development

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