PN-AAJ-625

DRAFT ENVIRONMENTAL PROFILE
ON
SYRIA

PREPARED BY THE SCIENCE AND TECHNOLOGY
DIVISION, LIBRARY OF CONGRESS
WASHINGTON, D. C.

AID/DS/AT CONTRACT NO. SA/TOA 1 7
WITH U.S. MAN AND THE BIOSPHERE SECRETARIAT
DEPARTMENT OF STATE
WASHINGTON, D. C.

JUNE 1981

THE UNITED STATES NATIONAL COMMITTEE FOR MAN AND THE BIOSPHERE
Department of State, IO/UCS
WASHINGTON D.C. 20520

USMAB

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.

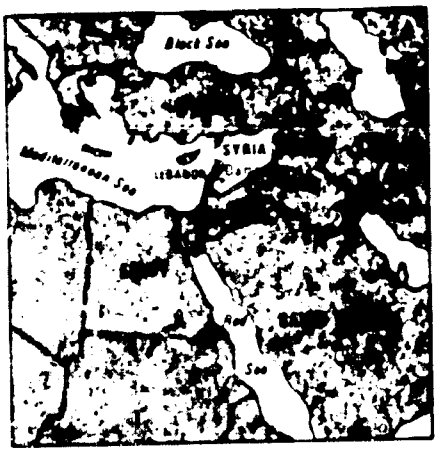
This report is the first step in a process to develop better information for the A.I.D. Mission, for host country officials, and others on the environmental situation in specific countries and begins to identify the most critical areas of concern. A more comprehensive study may be undertaken in each 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.

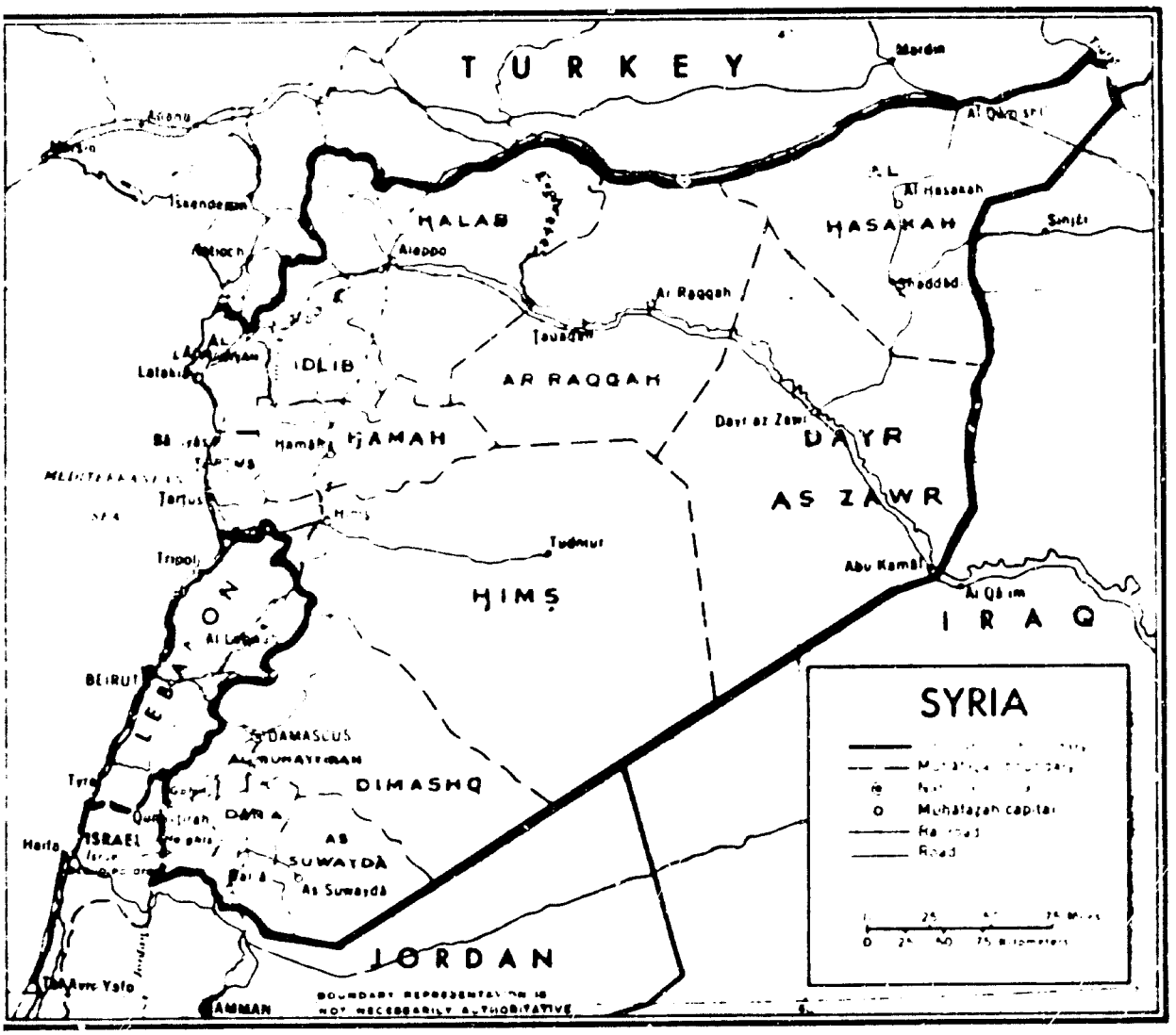
Comments on the attached draft report would be welcomed by USMAB and DS/ST and should be addressed to either:

Jim Corson
AID/MAB Project
Department of State
Room 410, SA-5
Washington, D.C. 20520

OR

Molly Kux
Office of Forestry & Natural Resources
U.S. A.I.D.
Washington, D.C. 20523





Base 502877 1-76

DRAFT ENVIRONMENTAL REPORT ON SYRIA

Table of Contents

0.0 ENVIRONMENT AND NATURAL RESOURCES IN SYRIA: Introduction and summary

Situated at the eastern end of the Mediterranean Sea, the Syrian Arab Republic, with an area of some 185,000 square kilometers, is just slightly larger than the state of North Dakota.

Although there has been a long history of human activity in the area now occupied by Syria, the modern state of Syria was not established until 1946 with the withdrawal of the French, who had occupied Syrian territory since the end of World War I and had exerted considerable influence over the area since the mid-19th century. Since achieving its independence Syrian has undergone internal revolution and has been embroiled in external struggles, most notably the 1967 and 1973 wars with Israel, and more recently problems relating to the internal conflict in Lebanon. Syria today is officially a republic under the leadership of President Hafiz al-Assad, who has been in power since 1970.

The population of Syria is overwhelmingly Arab, but there is nevertheless a significant religious and racial diversity underlying this surface uniformity. Present population is variously estimated to be as high as 8.8 million people, with a growth rate of some 3.2% per year. Overall population density is about 48 persons per square kilometer. Density per square kilometer of cultivated land was 160 persons in 1977. About 50% of the population is urban, while nearly 50% of the work force was employed in agriculture or related pursuits as of 1977.

Geographically and climatically Syria falls into several distinct zones. There is the narrow coastal plain along the Mediterranean, backed by a mountainous region which extends along the entire length of the country in the west. To the east of the mountains lies a series of plains where Syria's major crops are grown and where most of its cities are located. To the east and south of this area likes the Syrian desert, which occupies the bulk of the country. Rainfall in Syria generally decreases as one moves from west to east, being highest in the coastal plains and mountains and lowest in the desert area of the east.

water resources

Syria's water resources are unevenly distributed, reflecting the uneven distribution of rainfall in the country. With the major exception of the Euphrates River, which actually derives most of its flow from rainfall and snowmelt in the mountains of Turkey, both surface water and groundwater resources are most plentiful in the western region immediately adjacent to the humid mountain area. By far the most prominent use of Syria's water resources (about 94%) is for irrigated agriculture.

The major problem associated with Syria's water resources is pollution. Concentrated chiefly in the more populated western region of the country, water pollution is attributable to lack of sanitary sewage disposal systems and industrial waste from petroleum processing, textile mills, tanneries,

and fertilizer production in the country's more important basins, particularly the Oronte and the Barada Rivers, the latter of which flows through the capital city of Damascus. Pollution problems also extend to groundwater, while overpumping of groundwater reservoirs has resulted in depletion of reserves as well as to intrusion of salt water, particularly along the Mediterranean coast.

Although domestic water supplies are generally adequate throughout Syria, population growth has led to shortages in urban areas and seasonal shortages occur in drier parts of the country.

soil resources

The soils in most areas of Syria receive low levels of rainfall and support vegetation suitable chiefly for grazing. According to land use figures, about 31% of the land area is cultivable, 46% is steppe or pastureland, 19.8% is uncultivable, and 2.4% is covered by forests. The more productive soils of the western region of the country have been heavily worked for centuries; they are used for the production of wheat and other cereals, cotton, and fruit. Through the use of irrigation water from the Euphrates River, Syria is now bringing more of the soils of the arid eastern region of the country into agricultural production; however, salinity and water-logging present a major obstacle to agricultural development in this region. Problems also occur in the development of the calcareous soils which are present both the Euphrates Valley and other parts of the country. Soil erosion resulting from continuous cultivation and overgrazing is also a problem.

vegetation and forest resources

The natural vegetation of Syria can be classified into three broad groups corresponding to climatic and soil conditions (Mediterranean, Iranian-Turanian. and Saharo-Sindian), with a decrease in size and abundance of vegetation as one moves from the moist areas of the western mountains to the desert of the southeast. However, virtually all of the natural vegetation of Syria has been radically altered and degraded by human activity, including cultivation of land, grazing of animals, and removal of trees for firewood, charcoal production, and construction. Deforestation has been the most striking form of vegetation loss. Although thick forests once covered western Syria, there are today only a few areas of concentrated forest growth in that area, while forests now account for only 2.4% of total Syrian territory. A concomitant problem is that of desertification, as soil erosion and sand encroachment as a result of continuous cultivation and overgrazing lead to further loss of vegetal cover.

wildlife resources

Syrian wildlife resources appear to be scanty. Although the wolf, the Anatolian leopard, the Syrian wild ass, and the Saudi Arabian dorcas gazelle are listed as endangered species for Syria by the International Union for the Conservation of Nature, little information on the actual occurrence of these or any other species in Syria could be found.

coastal resources and fisheries

Syria has 93 kilometers of coastline along the Mediterranean Sea, with three major ports. The location of oil terminals along the Mediterranean has resulted in problems with coastal oil pollution; however, problems with pollution from industrial and domestic wastes appear to be minor. Although Syria's Mediterranean waters are not rich in fish life, they serve as a source of species such as sardine, mullet, and mackerel, while also providing grounds for sponge fishing. As a result of government development programs yields from Syria's inland waters increased during the 1970's, finally topping catches from the country's Mediterranean waters at the end of that decade. Total catch in 1977 was 1,915 metric tons. Problems for fisheries include water pollution and fishing by illegal means such as dynamiting.

mineral resources

Although not particularly rich in mineral resources, Syria has recently successfully exploited both phosphate and oil deposits; oil is now Syrian's largest export item.

air quality

Air quality problems occur in Syria's major population areas. Air pollution in the industrial center of Homs can be attributed to a refinery, sugar factories, and fertilizer factories, while pollution in the capital city of Damascus comes chiefly from automobiles, heat generating facilities, and factories.

1.0 POPULATION CHARACTERISTICS

1.1 General population situation

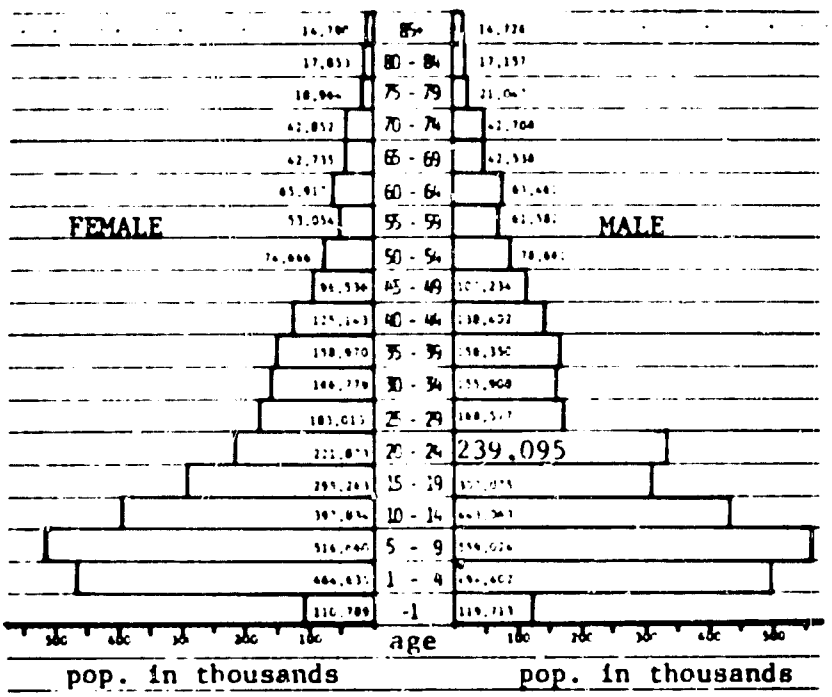
The population of Syria has grown at a rapid rate in the past two decades, increasing from 4.3 million in 1960 to 6.3 million in 1970; 1980 estimates place the population at 8.6 million. As in many third world countries, a large percentage of the population (nearly 50%) is under 15 years of age, a circumstance which places a heavy burden on the economically active portion of the population to support and provide education and other service for this large number of dependents (Weissman 1977:3).

1.2 General population statistics (WPDS 1980)

Population estimate (mid-1980): 8,400,000
Population at date of last census (1970): 6,304,685
Birth rate: 45 per 1,000; Death rate: 13 per 1,000
Rate of natural increase: 3.2%
Number of years to double population: 21 years
Population in the year 2000: 16,200,000
Infant mortality rate: 114 per 1,000 live births
Population under 15 years old: 49%; Population over 64 years old: 4%
Life expectancy: 57
Urban population: 49%
PQLI (an index of the quality of life based on infant mortality, life expectancy at age one, and literacy) 52

POPULATION PROFILE (Weissmann 1977)

1 9 7 0



1.3 Distribution of population

Population density: 46 persons per square kilometer
(based on 1980 population estimate of 8,600,000)

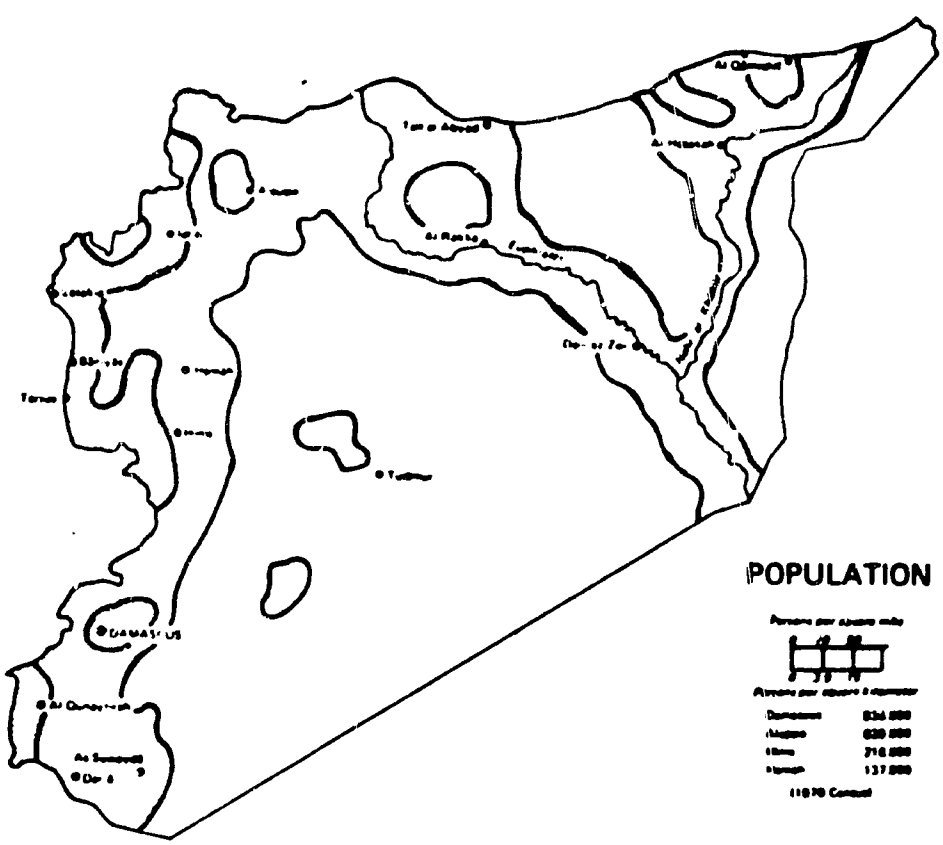
Rural-urban distribution

1970: urban:43%	1980: urban:49%
rural:57%	rural:52%

POPULATION OF MAJOR SYRIAN URBAN AREAS: 1960, 1970, 1978
(1960 and 1970 figures from Syrian Arab Republic, Central Bureau of Statistics, 1978; 1978 estimate from U.N. Demographic Yearbook 1978)

City	1960	1970	1978
Damascus	529,963	836,668	1,142,000
Aleppo	425,467	639,428	878,000
Homs	137,217	213,423	306,000
Latakia	67,604	125,716	204,000
Hama	97,930	137,421	180,000

Syrian Arab Republic



1.4 Ethnic and religious characteristics of the population

Although Syria is primarily an Arab nation, several major ethnic groups comprise the society. In 1964, Arabs were by far the largest single group (87.8%), while Kurds accounted for some 4.6% of the population, Armenians for 3.0%, Turks for 1.1%, Circassians for 0.9% , and remaining groups for 2.6% (German Statistical Office 1978:14). By one recent estimate, Arabs now make up 90.3% of the population, while the remaining 9.7% is made up of Kurds, Armenians, and other groups (National Basic Intelligence...1979). Estimates of the sizes of the different ethnic groups vary considerably. Nyrop 1979, for example, estimates the size of the Kurdish population at 9%. A particularly interesting minority groups is formed by the Druzes, some 300,000 of whom live in southern Syrian on the Jordanian border. Of obscure origin, the Druzes, many of whom are tall, fair, and blue-eyed, are a fiercely independent group who practice a religion with virtually secret tenets (La Fay 1978:339).

Despite the relatively unified picture presented by the above figures, there are considerable diversities in language, religion, and race within Syria; loyality may, in fact, be more to the family, clan, tribe or sect than to the more overriding national unit (Kurian 1978:1364).

ETHNIC GROUPS OF SYRIA

Group	est. %age of pop.*	language	religion	area
Arabs	90+%	Syrian Arabic	Muslim: 85% Sunni 13% Alawite 2% Ismaili/ Shiite	throughout country
Druze	3+%	Syrian Arabic	Druze	southern Syria
Kurds	as high as 9%	Kurdish/Arabic	Sunni Muslim	foothills of the Taurus Mts. in the Jazirah, Jarabulus, Damascus
Armenians	2+%	Armenian	Catholic Christian	Aleppo, Damascus
Turkomans	less than 1%	Turkic	Sunni Muslim	Northern border area
Circassians	less than 1%	Syrian Arabic/ Circassian	Sunni Muslim	--
Assyrians	less than 1%	Aramaic dialect	Nestorian Christians	near the Khabur River, Hasakah, Aleppo
Jewish	less than 1%	Syrian Arabic	Jewish	Aleppo

*Estimates of population percentages are derived from Nyrop 1979:55-61 and Kurian 1978:1364-1365; recent Syrian censuses have not included detailed breakdowns for ethnic groups

Not included in the above table are the large numbers of Palestinian refugees, who are not considered to be Syrians but rather a separate and stateless people. Concentrated particularly in the area around Damascus, Palestinian refugees numbered (according to official Syrian government figures) 220,345 in 1977 (Syrian Arab Republic, Central Statistical Office, 1978). A more recent figure, however, places that number somewhat lower --208,539 in 1979 (Palestinian Statistical Abstract 1980*). Nyrop (1979:51), on the other hand, estimates the Palestinian population at a much higher 250,000 as of 1978.

One further group deserves some mention--the beduin tribal population included as part of the Arab population in the table on page 3. Although the nomadic population of Syria was at one time quite substantial, nomadic groups comprised less than 7% of the total Syrian population in the mid-1970's. Furthermore, the number of actual nomads has been steadily decreasing, to a large extent because of government settlement policy, which aims at the eventual settlement of all beduin tribes, but also because of factors such as the advent of the motor vehicle, which has helped to undermine their economic base. There now remain only eight wholly nomadic tribes; these are found chiefly in the eastern desert regions of the country (Nyrop 1979:68-69).

1.5 Educational characteristics of the population

Adult literacy rate: 53% (as compared with 30% in 1960)

SCHOOL ENROLLMENT (World Bank, WDR: 1979:170)

numbers enrolled as % of age group

	total		male		female	
	1960	1976	1960	1976	1960	1976
Primary	65	103	89	121	39	85
Secondary	16	50				
High Ed. (ages 20-24)	4	12				

There is a striking difference between urban and rural literacy rates. Whereas some 63% of Damascenes are literate, only 15% of the inhabitants of Al Raqqah province are literate. There is also a dramatic disparity between male and female literacy rates, illiteracy being as high as from 82 to 90% among women but only about 47% among men (Kurian 1978:1373).

Schooling is universal, compulsory and free up to the age of 14, and textbooks are supplied free of charge in primary schools. Primary school lasts three years, followed by three years of intermediate school and three years of secondary school. Intermediate and secondary schools have both general and vocational curricula; however, because of cultural biases against manual labor, only about 4% of the secondary students are in the vocational stream,

*This information was supplied by Frank Hobbs of the International Population section of the U.S. Bureau of the Census (May 28, 1981).

a factor which, along with the departure of many workers for employment in other Arab countries, helps to account for Syria's persistent shortage of technical personnel and skilled workers (Kurian 1978:1374).

Studies in fields such as science and agriculture are introduced at the intermediate level, while secondary students may chose between a humanities or a science curriculum. Classrooms are crowded, and qualified teachers are in short supply; the teacher pupil ratio in 1973 was 1 to 37 (Kurian 1978:1374).

The administration of the educational system is centered in the Ministry of Education and the Ministry of Higher Education, and both curricula and teaching methods are supervised by a central inspectorate.

In 1975 the educational budget for Syria was some 4.09% of the Gross National Product and 7.5% of the yearly national budget. Per capita educational expenditure was $27 (Kurian 1975:1374).

1.6 Health characteristics of the population

Crude birth rate: 47.5 per 1,000 population

Crude death rate (Weissman 1977): 16 per 1,000 population

Infant mortality rate
per 1,000 live births
(Weissman 1977): 105.8 (female)
119 (male)

Child death rate (ages 1 to 4): 29 per thousand in 1960
(World Bank,WDR 1979:166) 14 per thousand in 1977

Life expectancy: 54 (Weissman 1977)
57 (WPDS 1979)

Percentage of population with access to safe water(1976): 75% (WB,WDR 1979)

Daily per capita calorie supply (1974): 2,597 (104% of daily requirement) (WB,WDR1979)

1.6.1 Health problems

Important health problems in rural areas are those to which these populations have been subjected for centuries: trachoma (of highest occurrence where dust storms are most frequent), schistosomiasis, tuberculosis and undernutrition, the last of which occurs in accordance with variations in food production and distribution (Weissman 1977:1).

Poor sanitary conditions in both rural and urban areas account for the high incidence of both infectious intestinal and upper respiratory diseases.

A high rate of infant mortality persists and has been attributed, among other things, to low incomes, the poor educational and nutritional status of women, and generally unfavorable environmental conditions (Weissman 1977: 1).

1.6.2 Health Care

Both medical personnel and hospital facilities are concentrated in the urban areas in the western part of Syria.

The thrust of Syrian medical policy has tended to be on the training of doctors and the construction of hospitals. This has resulted in high cost health care system that concentrates on curative care, while at the same time suffering from a shortage of preventive care facilities and paraprofessional medical personnel (Weissman 1977:2).

MEDICAL CARE (GSO:1978)

	1967	1976
Hospitals (1976):	83	107
government:	27	31
Hospital beds	5,418	6,837
government	4,078	5,282
Doctors(1976):	1,403	2,824
inhabitants per doctor:	4,115	2,735
Nursing persons	483	1,521
inhabitants per n.persor:	n.a.	5,037

1.6.3 Water supply and sanitation

WATER SUPPLY (source: World Health Statistics Report, vol. 29, no. 10, 1976; only 1970 figures reported)
1970

	numbers	%age
Urban population served		
House connections	2,455,000	89%
Public standposts	244,000	9%
Total urban	2,699,000	98%
Rural population		
Reasonable access	1,746,000	50%
TOTAL POPULATION *	4,445,000	71%

* According to the AID Alldata Report of 1/25/80, 75% of the population was served as of 1975.

SANITATION (1970) (Source: AID Alldata Report: 1/25/80: 17).

%age of dwellings with access to toilet

	1962	1970
Rural	36.6%	18.0%
Urban	97.6%	93.7%
Total	58.4%	49.2%

Most areas of Syria have water supplies sufficient to meet the needs of the population. In eastern Syria the Euphrates River, which contains some 80% of the country's water supply, is the major resource. The Oronte River in western Syria supplies water for the cities of Homs and Hama, while the Barada River and the Figeh Spring have provided the water supply for Damascus for several thousand years. In the arid plateau area, wadis (seasonal streams), other smaller rivers and underground streams create oases and provide water for domestic purposes as well as for irrigation and livestock watering. Along the Mediterranean coast water is supplied by streams flowing from the coastal mountains to the sea. Water shortages occur in southeastern Syria throughout the year; here wadis, wells and boreholds are the chief sources of water (Weissman 1977:24).

Despite the generally favorable water supply situation, problems with potable water supplies occur. Problems of development and distribution are found throughout the country, while pollution from human, animal, and industrial wastes create health problems. Although the figures presented above indicate that large numbers of the population have access to safe potable water, the situation is less positive that the figures would seem to indicate. One problem arises from contamination of water supply in its transmission to the users. In urban areas, for example, old distribution systems permit leakage as well as contamination from sewerage systems and highly corrosive organic soils. In rural areas human and animal contamination of groundwater sources is a problem. Water held in storage containers in homes without taps also frequently becomes contaminated. The health of the population is thus seriously compromised by a lack of good potable water. The high incidence of water-borne diseases including cholera, diarrhea and enteritis, hepatitis, and typhoid fever can be directly attributed to the wide use of contaminated water supplies (Weissman 1977:25).

Waste disposal

Syria's larger cities have fairly comprehensive sewerage systems, but these have not been expanded as the population has grown, so that the total population served by sewerage systems in cities such as Damascus, Aleppo, Homs, Hama, Latakia, Deir ez Zor and Dar'a is actually only a small percentage of the total population. None of the cities has a sewage treatment plant; untreated sewage is emptied into rivers and streams, causing serious problems for those who must use water sources further downstream (Weissman 1977:25).

Regular garbage collection is provided in both Damascus and Aleppo, and this garbage is buried or used as land fill. In rural areas both sewage and garbage are deposited in shallow pits or left exposed to the air to rot, thus attracting flies, other insects, and rodents and creating health problems. The use of untreated night-soil fertilizers contaminates food supplies and promotes the spread of fecal-borne diseases among agricultural workers (Weissman 1977:35).

1.7 Birth control and family planning

Syria's present birth rate is a rather high 45 per thousand population, which in concert with a continuously decreasing mortality rate, has created a situation in which the country's population is expected to double within 21 years. Regionally, the rate is uneven in its distribution, with the eastern governates (muhafazat) having significantly higher rates.

Attempts to contend with the problem of burgeoning population numbers were not begun until 1976, with the development of a Maternal and Child Health and Family Planning Program assisted by the United Nations Fund for Population Activities.

There are, however, major stumbling blocks to the success of this program. For one thing, the number of women of reproductive age has been increasing at a rate faster than that of the rest of the population. Also, the present lack of educational opportunities for women appears to be another important factor. It has been ascertained at least for Damascus, that the birth rate for educated women is lower than that for non-educated women. However, for a number of reasons, among which the role of women in Moslem societies appears to be of some significance, only about 20% of Syrian women (as contrasted with 60% of men) were literate in 1970, and the prospects of significant numbers of women attaining the educational level of men within the near future are poor(Weissman 1977:5-7).

2.0 RESOURCES

2.1 Geographical features

Syria occupies a land area of 185,181 square kilometers, of which mountains and uplands--concentrated mainly in a narrow north-south band in the western part of the country--account for some 28,840 square kilometers (about 16% of the total) and plains and lowlands for some 156,341 square kilometers (about 84% of the total) (Akhraf 1973:465). The country has a Mediterranean coastline of about 200 kilometers and shares borders with Lebanon, Israel, Jordan, Iraq, and Turkey.

Natural regions

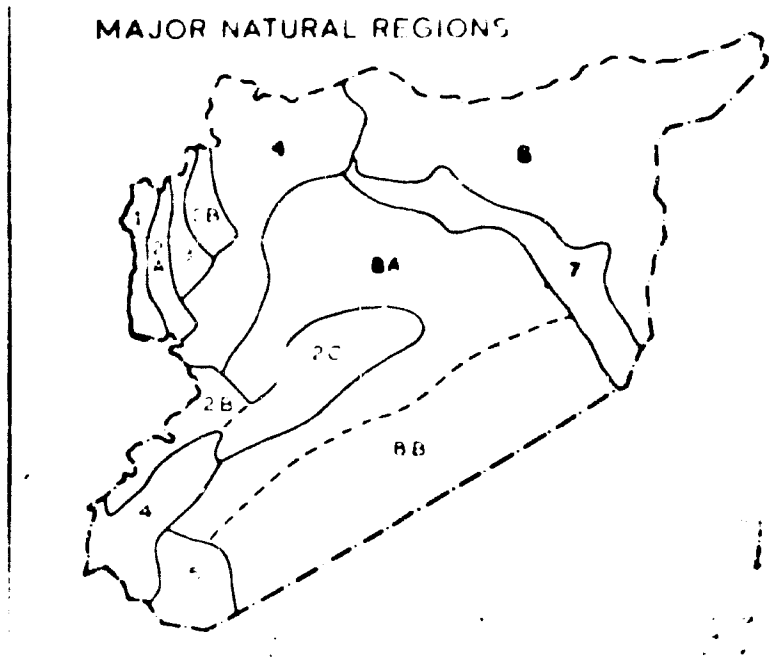
The major natural regions of Syria, defined by, among other things, climatic and topographical features, are indicated by the map on page 10. These eight regions, following Akhraf 1973, are:

1. The coastal zone. This zone consists of narrow discontinuous alluvial lowlands, the largest of which is that of Latakia. This lowland area is broken by hilly ridges running from the foothills of the western mountain ranges. The regions has a Mediterranean climate; precipitation is about 500 millimeters per year, but humidity is low. Streams from the Jabal al Nusayriah range cut through the area, and regulation of the largest of these, the Nahr el Kabir, which empties into the Mediterranean near Latakia, is necessary to prevent flooding.

2. The mountain regions (2 A,B,C on map) can be considered in three groups. The steep sided coastal ranges (2A), the Jabal al Nusayriyah or Alawite Mountains, form a high limestone barrier that prevents easy human access to the inland areas and also blocks the penetration inland of rain-bearing air currents. These are karstic uplands which now carry only thin scattered forests, with some flatter cultivable land in high valleys. The interior mountains (2B) are lower and more dissected but drier and not so rich in vegetation as the coastal ranges. The Jabal al Zawiyah in the north, which faces the coastal range across the depression of the Rift Valley, attains heights of 877 meters. The Antilebanon Mountains (Al Jabal ash Sharqi) to the south run along the border with Lebanon, reaching their highest point at Mount Hebron (Jabal al Shaykh). Running out from this range in a northeasterly direction is a third series of ranges (2C) known collectively as the Palymyra Range; these mountains, which include the Jabal al Ruwaq and the Jabal abu Ruymayh, terminate at Jabal Bishri (865 meters), just short of the Euphrates River.

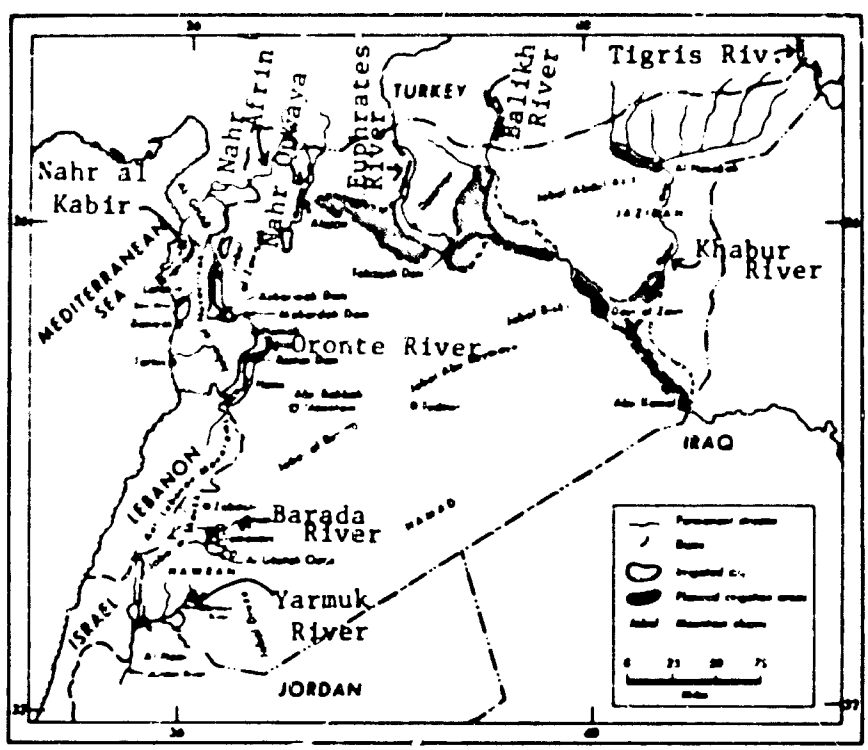
3. The Rift Valley (also called the Bekka Valley) lies between the Jabal al Nusayriyah and the Jabal al Zawiyah but shares the higher rainfall levels of the western coastal zone. In the northern part of the Rift Valley is the Ghab, the valley of the north-flowing Oronte River. This plain runs for some 60 kilometers , with a width of about 14 kilometers, roughly from Hama in the south to the Turkish border in the north. The Ghab is ill-drained and subject to extensive flooding but contains fertile soils; much reclamation work has been done in this area to permit irrigated crop farming.

MAJOR NATURAL REGIONS OF SYRIA (Akhraf 1973:477)



1 Coastal Zone
2 Mountain Regions
3 Rift Valley
4 Interior Steppes
5 Jabal Druze and El Leja
6 Jazirah
7 Euphrates River Valley
8 Desert Region

PRINCIPAL RIVERS AND MOUNTAIN RANGES (Nyrop 1971:11)



4. The interior steppes region is a relatively narrow zone lying between the climatically more favorable western areas and the desert and semi-arid steppes to the east. This region includes fertile piedmont plains and oases: the Horan in the southwest, the Ghutah and Merdj areas in western Damascus, the Homs plateau and the plateau of Hama and the Aleppo Plain in the north, which extends from the Jabal al Zawiya to the Euphrates River. These are all areas with long histories of occupation and cultivation, including irrigation.

5. The Jabal Druze and El Leja form an upland area between the Jordanian border to the south and the basalt desert to the east. The Jabal Druze is an extinct volcano with fertile soils and a major settlement at As Suwayda The lava plateau of the El Leja is an area of stony soils.

6. The Jazirah lies between the Tigris and Euphrates Rivers. Its northern part, which receives relatively high levels of rainfall (about 500 mm per year) is a rich steppeland with fertile soils. NOrthern Jazirah is also the site of Syria's oil and natural gas finds.

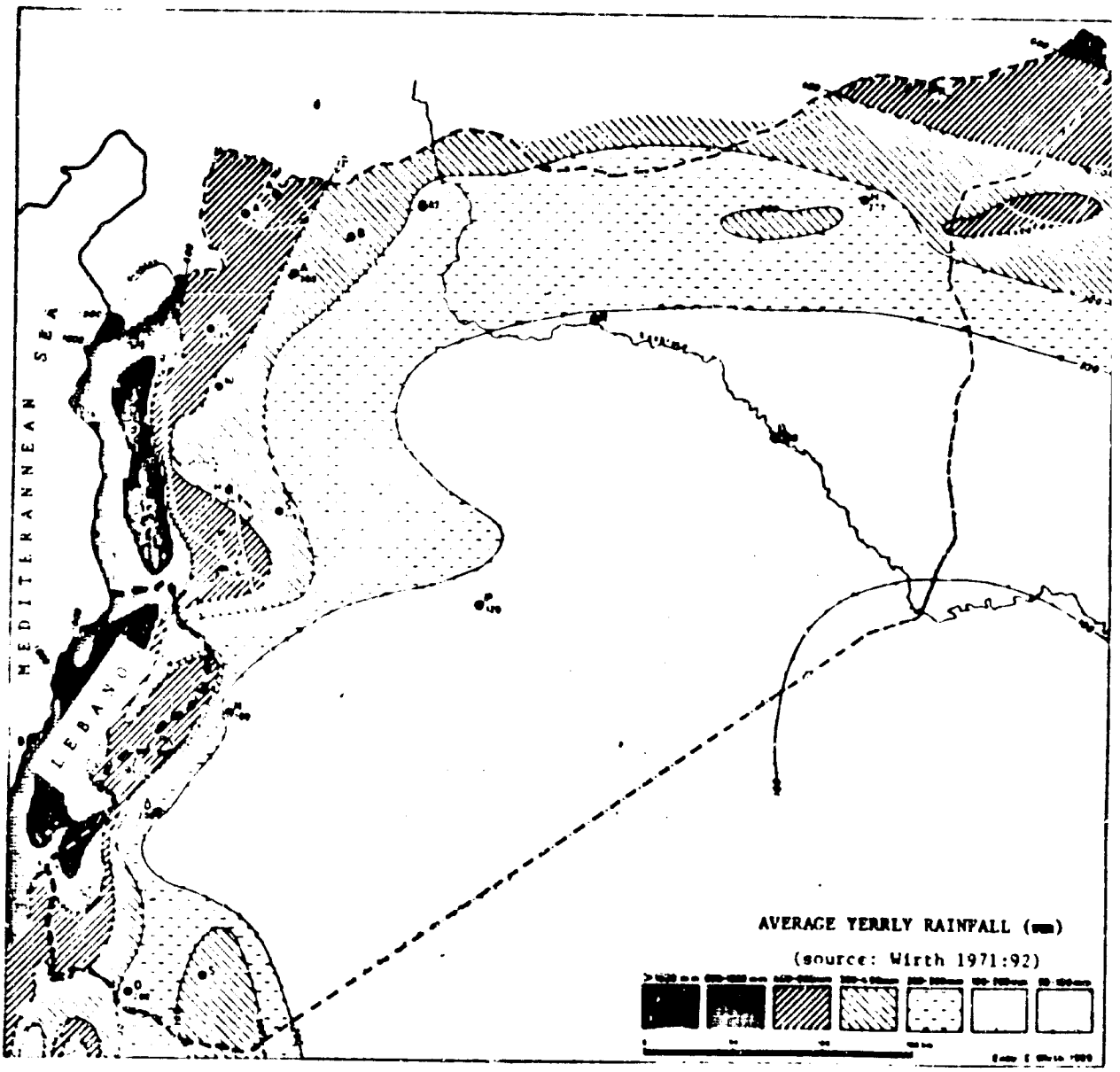
7. The Euphrates River Valley. Essentially part of the steppelands, this region is characterized by the presence of Syria's largest river and the alluvial plains bordering it.

8. The desert region. Occupying by far the largest area of Syria, the desert regions of Syria become increasingly more arid and less fertile towards the southeastern border. They can be subdivided by the amount of rainfall received and type of vegetation into semi-arid desert (8A) in the west and the desert proper (8B), which, however, carries some vegetation in the less arid winter season.

2.2 Climate

The climate of Syria is generally described as Mediterranean. The country experiences two distinct seasons, winter and summer, with brief transitional spring and autumn periods. The winter season, characterized by cool temperatures and rainfall, generally lasts about four months, with coolest temperatures and highest rainfall levels occurring in January and February. The Summer season, which reaches its high point in July and August, is characterized by high temperatures and almost a complete lack of rainfall.

Syria can be divided into several climatic regions on the basis of rainfall levels. The FAO-UNESCO Soil Map of the World, for example, distinguishes the following regions: subtropical and tropical Mediterranean regions in the west, a subtropical semiarid Mediterranean region covering the bulk of the northern part of the country and some areas to the south and west, and a large hot subtropical region covering the southeast (FAO-UNESCO 1977: Map 1). As indicated by the map on page 12, rainfall levels decrease from north to south and, with the exception of the extreme northeast, from west to east. The chief influence on rainfall levels is exerted by the western mountains, which catch the moisture moving off the Mediterranean Sea. These mountainous regions receive the highest levels of rainfall, followed by the



Mean Monthly Rainfall and Temperature for Selected Stations in Syria
(rainfall in mm; temperature in degrees centigrade) Source: German Stat. Off.:1978

LOCATION	January (winter) rainfall (in mm)	January (winter) temp (cent)	July (summer) rainfall (in mm)	July (summer) temp (cent)	Year total rainfall (in mm)	Year total no. of days
Latakia	156	10.5	3	25.8	785	65
Tartus	158	12.1	0	25.0	809	66
Aleppo	97	6.3	0	28.3	396	49
Homs	55	7.0	0	26.1	374	59
Damascus	38	7.2	0	26.7	165	37
Dayr az Zawr	41	7.1	0	32.7	167	33
Tadmur (Palmyra)	26	2.5	0	29.5	108	30

coastal region. The great bulk of the country, however, is semi-arid to arid in climate, with rainfall levels under 300 mm per year. The most arid section--the southeast--receives less than 100 mm of rain per year in some sections.

Rainfall levels vary from year to year, and droughts leading to decreases in agricultural production are not uncommon. In the drought years 1958, 1959, and 1960, for example, the great bulk of the country received less than 200 millimeters of rainfall, and precipitation in the normally rainy mountainous regions dropped below its usual level (Wirth 1971:92).

Temperature levels in Syria are highest in the summer season, usually reaching their peak in August. Daily temperature ranges during this season are also quite high--as much as 23 degrees centigrade in the interior areas and 13 degrees centigrade in the coastal region. The coldest months, Decembe and January, usually see sub-freezing temperatures and snowfall in the mountain ranges of the western part of the country.

Syria experiences moist winds from the Mediterranean, which, as mentioned above, are blocked in most places from reaching the interior by the barrier of the western mountain ranges, and dry winds from the desert regions. Vegetation-damaging sandstorms are common in the desert region, particularly in February and May (Nyrop 1971: 14-15).

According to a recent publication, evaporation varies from 1,000 to 3,000 millimeters per year (Khouri and Rasoul Agha 1977:3). More specificall evaporation values of 958 millimeters per year have been established for Aleppo in the Syrian steppe and of 1,356 millimeters per year for Dayr az Zawr on the Euphrates (Beaumont 1978: 40).

2.3 WATER RESOURCES

The water resources of Syria are unevenly distributed, reflecting to a large extent the uneven distribution of rainfall in the country. With the major exception of the Euphrates River, which actually derives most of its flow from rainfall and snow melt in the mountains of Turkey, water resources in Syria are most plentiful in the western areas immediately adjacent to the humid mountainous regions. According to estimates prepared for the 1976 United Nations Water Conference, annual water potential for Syria is 32,000 million cubic meters for surface water and 1,600 million cubic meters for groundwater (UNWC 1977:15).

2.3.1 Surface waters

2.3.1.1 Rivers

The longest and most important river of Syria is the Euphrates (Al Furat), which contains an estimated 80% of the country's water resources. Originating in the high mountains of northeastern Turkey, the Euphrates cuts a diagonal path some 675 kilometers across Syria's arid eastern plateau before entering Iraq. The major left-bank tributaries of the river --the Balikh and the Kabur--are major rivers which also originate in Turkey. The right-bank tributaries, however, are only small seasonal streams or wadis, which contain water during the winter season and dry up during the summer. The Euphrates is fed largely by precipitation in the uplands of Turkey, most of which occurs in the winter months in the form of snow. Maximum discharges, occurring in April and May, are produced by the melting of this snow. Minimum flow levels occur in August and September. It has been estimated that 88% of the mean annual content of the river is generated in Turkey, while virtually the whole of the remaining 12% is generated within Syria. Maximum and minimum annual flows for this and other Syrian Rivers are indicated by the table on page **15** (Beaumont 1979:36: Nyrop 1971:12).

Syria's second most important river, the Oronte (Orontes) drains the calcareous massifs of the Anti-Lebanon Mountains (roughly on the far northern border of Lebanon) and flows northwards into Turkey. Because the river is fed primarily from productive springs, its flows generally do not show such great variance as do those of the Euphrates. Maximum flows occur between February and June, minimum flows from August to September. The flow of the Oronte has been regulated since Roman times at the Lake of Homs near the Syria-Lebanon border, where a natural basalt sill provides the dam (Wirth 1971:111).

On the western slopes of the Jabal al Nusayriyah are several perennial coastal rivers, which are characterized by short courses and small catchment areas. The largest of these is the Nahr al Kabir, which enters the Mediterranean near Latakia. Like most of the coastal rivers the Nah al Kabir is dry in summer but subject to flash flooding in winter.

In the southeast of Syria, the Barada, the Aawaj and the Yarmouk rivers drain the eastern parts of the Anti-Lebanon Mountains, the Jabal es Sheikh

RIVERS IN SYRIA
(Khouri and Rasoul Agha 1977:7)

RIVER	discharge: m3/sec. Minimum	Max.	Average	Total length km.	Length in Syria km.	Catchment area: sq. km.
Euphrates	250	2,500	830	2,230	675	350,000 20,000 in Syria
Aafrine	2	450	[illegible]	149	83	2,780
Quoeik	-	60	2.5	124	100	2,214
Jagh-Jagh	1	8	3	124	100	-
Northern Kabir	0.8	150	3	80	56	1,040
Yarmouk	7	100	15	57	47	6,990
Sajour	-	25	3	108	48	2,372
Orontes	10	400	-	571	325	-
Khabour	35	300	52	460	-	31,800
Balikh	5	12	6	105	-	13,088
Es-Sinn	8.5	22	12	6	-	150
Barada	5	25	2.5	66	-	262
Aawaj	017					
Southern Kabir	-	-	-	90	-	992

and the Hauran volcanic plateau. The most important of these is the Barada, which is responsible for Syria's largest oasis, the Al Ghutah--the site of Damascus.

Rivers in the northwest region of Syria include the Qoueik, the Afrin, and the Sajour Rivers, which originate on the southern slopes of the Tauros mountain ranges and drain the major part of the Halab Plateau (Khouri and Rasoul Agha 1977:6).

The Syrian steppe, which covers some 60% of the country, is characterized by closed desert basins. Some of the large seasonal rivers (wadis) drain into the Euphrates. A few empty into swamps and small lakes; other drain into the desert, contributing to underground water supplies. Several ephemeral streams and major wadis are cut into the southern slopes of the Palmyran and Jabal el-Arab Mountains (Khouri and Rasouli Agha 1977:6).

In the extreme northeast, the Tigris marks a 44-kilometer length of border with Iraq.

2.3.1.2 Lakes and reservoirs

Although salt lakes, swampy areas and temporary lakes are not uncommon in Syria, particularly during the rainy winter season, the country has no natural lakes of any significance. However, according to Wirth (1971:113), as recently as 1850 lakes in the area of both Aleppo and Damascus served as important sources of fish; these lakes have dried up because of overuse of their waters for municipal water supply and irrigation.

The Syrian Statistical Abstract (1978) lists a total of 33 bodies of water formed by dams within Syria. By far the largest of these is Lake Assad, formed by a dam at Al-Tabqa on the Euphrates. When full this Lake, which is the focus of Syria's plans for agricultural expansion in the Euphrates River valley, is expected to have a surface area of 630 km^2, a maximum length of 80 kilometers, and a storage capacity estimated at from 11,900 to 30,000 million cubic meters of water. Other reservoirs have storage capacities ranging from 500,000 cubic meters to 225 million cubic meters (Raoul and Khouri 1977:52; Beaumont 1978:40; Syria: Central Bureau of Statistics 1978:68).

2.3.2 Groundwater

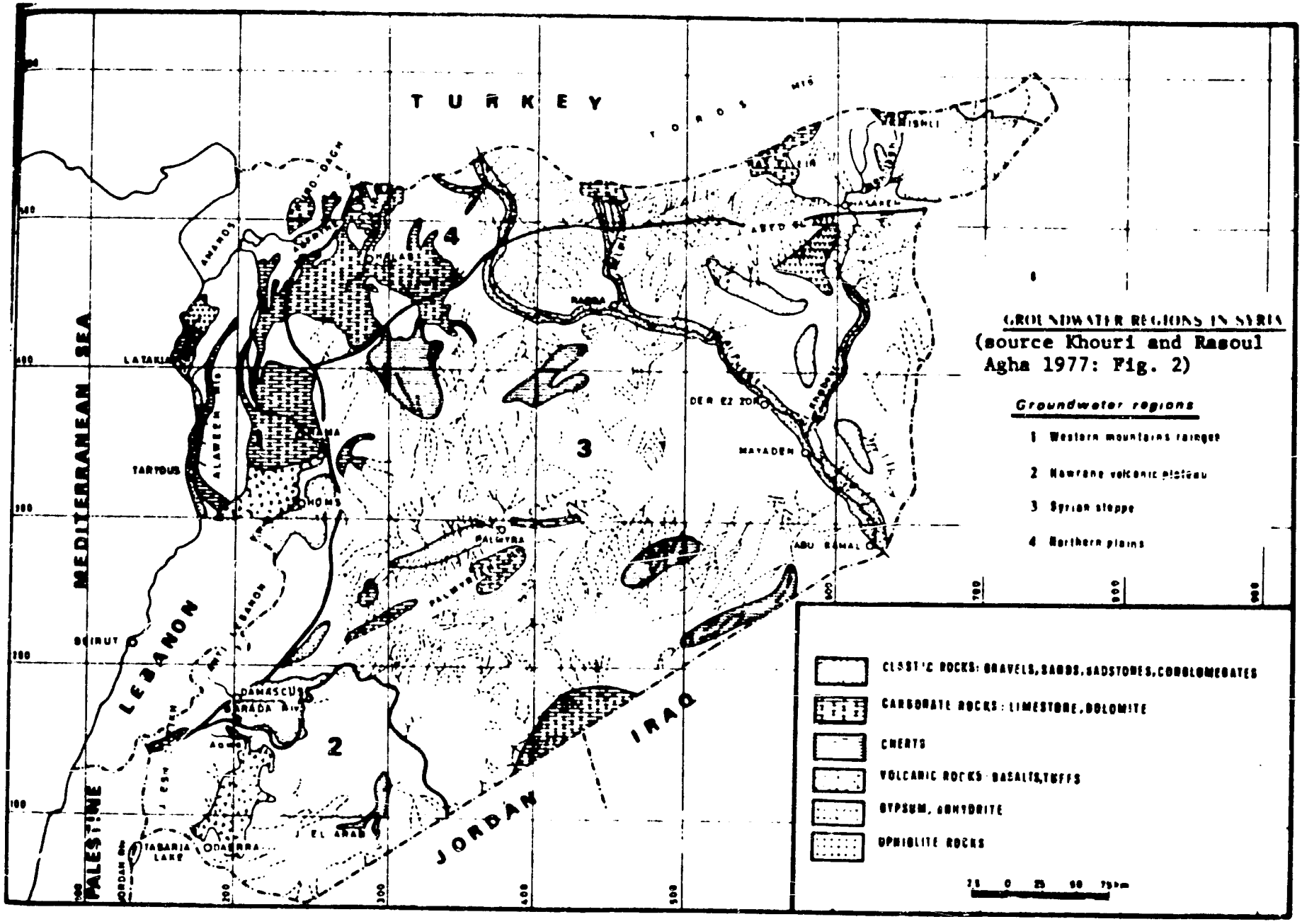
According to figures provided for the U.N. Water Conference, groundwater production in Syria comes to approximately 1,600 million cubic meters per year.

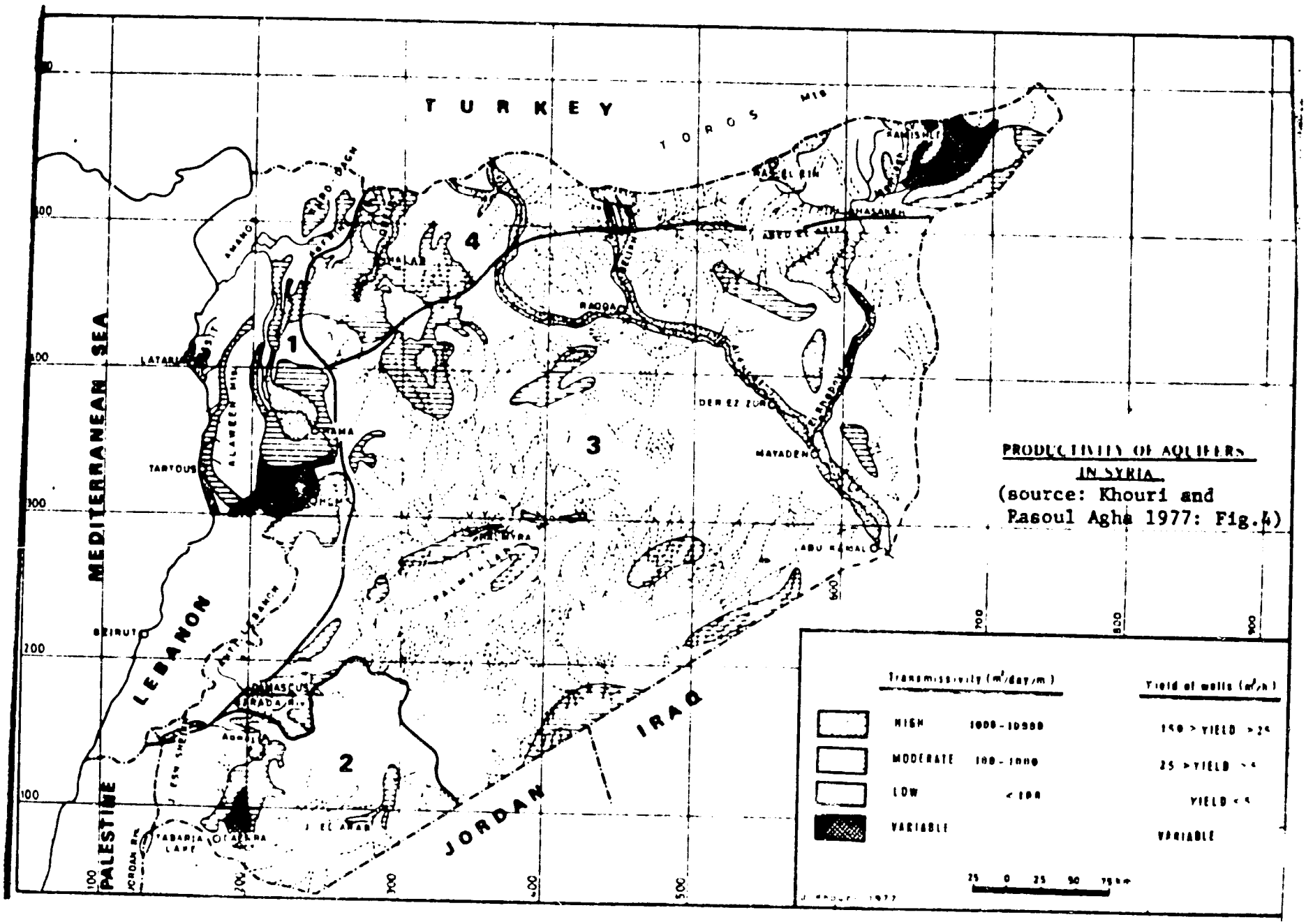
As indicated by the maps on the following pages, the western and northern areas of Syria and the areas immediately adjacent to the Euphrates River are most favorable for groundwater production. The west and northeast are characterized by limestone and basaltic aquifers whose capacity to store and transmit water is usually relatively high. Particularly favorable are the high-rainfall western mountain ranges, which are composed of karstic limestones and fissured basalts that make them excellent recharge areas for the highly productive aquifers in the coastal plain, the Homs-Hama regions, and the Hawrane and Damascus plains. The interior arid regions, on the other hand, are generally poor in underground water, although groundwater occurs in alluvial plains and valleys. Minor aquifers of only limted extent are also found in cherts and siliceous limestones in these regions (Khouri and Rasoul Agha 1977:17-18).

Syria has been divided into four basic groundwater regions: 1) the Western mountain ranges; 2) the Hawrane volcanic plateau; 3) the Syrian Steppe; and 4) the northern plains. The map on page 18 shows these regions and indicates pertinent geological characteristics. The map on page 19 shows the productivity of aquifers in the various regions.

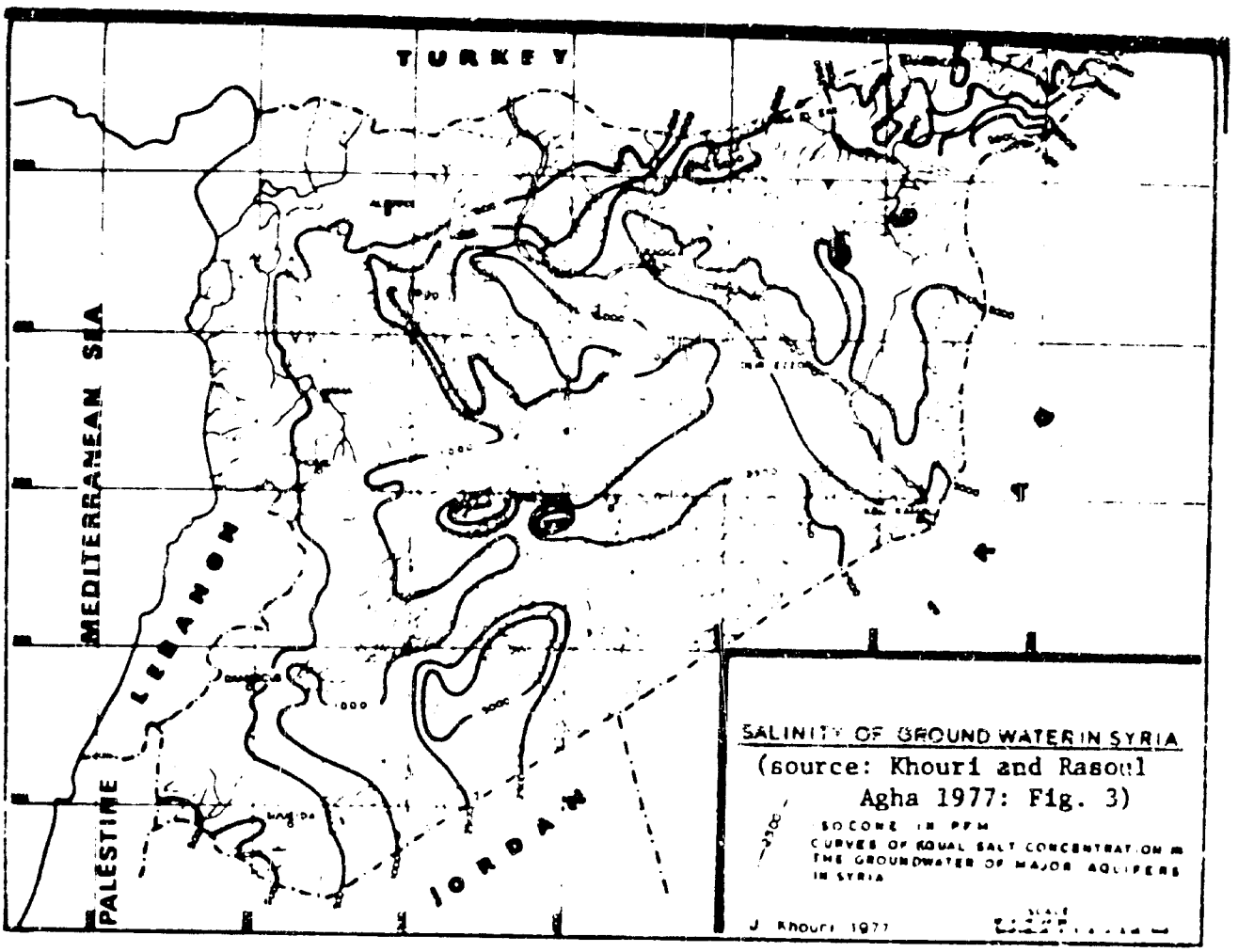
Springs issuing from underground water sources are of great importance in Syria. Of particular significance are the karstic springs issuing from the Western mountain ranges and from the hills forming the northeastern border with Turkey. The Kabur spring in the area of Ras-el-Ein on the Turkish Border is one of the most productive karstic springs in the world, with a flow of 4,000 liters per second, while the spring of Nahr Sene on the western slope of Jabal al Nusayriyah and the Oronte spring both have flows of from 1,200 to 1,500 liters per second. Dozens of springs produce flows of more than 200 liters per second each. These springs are used not only for domestic water but also for irrigation and livestock watering. In the Damascus area karstic springs used for centuries have formed the basis for the development of the city (Wirth 1971:109; Syria. Central Bureau of Statistics:65-67).

The overall quality of Syrian groundwater, as reported for the 1976 U.N. Water Conference, is good to fair (ECWA 1976:20). The highest quality groundwater, as judged by salinity levels, is found in the northeast and in the western areas of the country, the lowest in the arid steppes. The map on page 20 indicates salinity levels in aquifers in various parts of the country. A detailed account of Syrian groundwater quality can be found in Khouri and Agha 1977. Problems with groundwater arising from pollution and overpumping will be considered below.


TURKEY
MEDITERRANEAN SEA
LEBANON
JORDAN
IRAQ
PALESTINE
LATAKIA
TARTOUS
HOMS
PALMYRA
DEIR EZ ZOR
MAYADEN
ABU KAMAL
BEIRUT
DAMASCUS
EL ARAB
TABARIA LAKE
ODAERRA
1
2
3
4
GROUNDWATER REGIONS IN SYRIA
(source Khouri and Rasoul Agha 1977: Fig. 2)
Groundwater regions
1 Western mountains ranges
2 Hauranne volcanic plateau
3 Syrian steppe
4 Northern plains
CLASTIC ROCKS: GRAVELS, SANDS, SANDSTONES, CONGLOMERATES
CARBONATE ROCKS: LIMESTONE, DOLOMITE
CHERTS
VOLCANIC ROCKS: BASALTS, TUFFS
GYPSUM, ANHYDRITE
OPHIOLITE ROCKS



PRODUCTIVITY OF AQUIFERS IN SYRIA
(source: Khouri and Pasoul Agha 1977: Fig.4)


TURKEY
MEDITERRANEAN SEA
LEBANON
PALESTINE
JORDAN
SALINITY OF GROUND WATER IN SYRIA
(source: Khouri and Rasoul Agha 1977: Fig. 3)
SCONE IN PPM
CURVES OF EQUAL SALT CONCENTRATION IN THE GROUNDWATER OF MAJOR AQUIFERS IN SYRIA
J. Khouri 1977

2.3.3 Desalinated water

According to recent reports, no activities involving desalination of seawater are presently being undertaken in Syria, nor is it likely that desalting plants will be used as a source of freshwater in the near future. However, brackish water desalination is considered an important source of domestic water supply for small communities in the Syrian steppe (Khouri and Rasoul Agha 1977:43).

2.3.4 Water utilization

Agriculture is the principal user of water in Syria today. According to estimates made by Khouri and Rasoul Agha in 1977, agriculture accounted for about 94% of all water uses in the mid-1970's (see table below) and would account for a projected 92% of water uses in 1985. In addition to the estimates in the table, Khouri and Rasoul Agha project water consumption by tourism to grow to about 24 million cubic meters per year by 1985 (Khouri and Rasoul Agha 1977:43).

Water use figures generated for the U.N. 1977 Water Conference contrast with those in the table below in indicating present water-use levels closely resemble Khouri and Rasoul Agha's projections for 1985: 6,400 million cubic meters per year--6,000 for agricultural purposes and 400 for domestic purposes; no figures for industrial uses were supplied. Furthermore, the U.N. figures project water use for 1990 at 19,500 million cubic meters--18,000 for agricultural and 1,500 for domestic purposes (ECWA 1977).

PRESENT WATER USE (WITHDRAWALS) AND PROJECTED DEMANDS FOR 1985
("approximations" from Khouri and Rasoul Agha 1977:44)

	Areas	Present water use (1977): millions of cubic meters					Project needs for 1985: millions of cubic meters		
		Irrigation		Municipal and Industrial			Irrigation	Municipal& Industrial	
		Surface Water	Ground Water	Surface Water	Ground Water	TOTAL	Surface& Groundwater	Surface& Groundwater	TOTAL
1.	Damascus	260	250		80.0	590.0	795	140.0	935.0
2.	Oronte	580	105		26.0	711.0	1,015	118.0	1,133.0
3.	Coastal	81	71	4.0	12.2	168.2	487	49.6	536.6
4.	Aleb	50	200	33.0	7.8	290.8	450	110.7	560.7
5.	Jezira	1,340	240	21.0	4.0	1,605.0	3,580	68.9	2,648.9
6.	Hauran	-	60	0	13.3	73.3	110	38.0	148.0
	TOTALS	2,311	926	58.0	143.3	3,438.3	6,437	525.2	6,962.2

2.3.4.1 Irrigation

As mentioned above, irrigation currently accounts for about 94% of water use in Syria: 98% of surface water usage and about 97% of groundwater usage. According to recent estimates (1977), the total irrigated area is 530,800 hectares: about 39% of this area is irrigated by groundwater, the remaining 61% by surface water. Although water usage for both irrigation and domestic purposes is expected to grow over the next several year, the percentage of

water used for irrigation is projected to remain at about the same level in 1985 (Khouri and Kasoul Agha 1977:43; Syria. Bureau of Statistics 1978: 192).

Irrigated hectarage varies from year to year; in recent years it has ranged from a low of 476,000 hectares in 1971 to a high of 619,000 hectares in 1973; average irrigated hectarage for the years 1971-1977 was 556,000 hectares--on the average about 16% of the land under crops during that period of time (see table below).

LAND AREA ACCORDING TO METHOD OF IRRIGATION 1973-1977 (in 1,000's of hectares)
(Source: Syria. Bureau of Statistics 1978:192)

YEAR	TOTAL IRRIG.	non-pump irrigation			pump irrigation		
		total	from rivers by water wheels	rivers, * and floods irrigation	total	from wells	from rivers
1973	619.0	156.7	0.6	156.1	462.3	208.9	253.4
1974	578.3	111.7	0.8	110.9	466.6	226.8	239.8
1975	516.1	103.7	0.7	103.0	412.4	203.8	208.6
1976	546.7	115.0	0.3	114.7	431.7	226.6	205.1
1977	530.8	103.5	0.5	103.0	426.3	216.2	211.1

*includes springs

major irrigation projects

Syria's most ambitious irrigation project and the "cornerstone of Syria's agricultural development" is the Euphrates Dam, which was started in 1966 and completed in 1978. When full, Lake Assad, the body of water formed by the dam, is projected to provide irrigation for 640,000 hectares of land as well as water supply for Aleppo, profitable fishing grounds, and the nation's entire supply of electricity. Although electrification plans related to the dam have been proceeding well, as of mid-1979 irrigation and land reclamation work had started on less than 100,000 hectares of the projected total, and there were strong indications that technical considerations such as the necessity of lining canals with concrete and problems with waterlogging and salinity might force the government to revise the figure for total irrigated hectarage (already considerably lower than an earlier projection of 850,000 hectares) downward. In any case, Syrian officials reportedly concede that the goal may take as long as 30 years to attain (MEED, 13.April 1979:3; Beaumont 1978:40)**.

Another major project in the steppe area is a water management for the Khabur River, a tributary of the Euphrates, which is expected to permit the development of another 400,000 hectares for irrigated agriculture (Beaumont 1978:40).

**According to a report in the Quarterly Economic Review of Syria, Jordan, 4th Quarter 1979 (Economist Intelligence Unit) several foreign-sponsored projects for land reclamation in the Euphrates basin have failed, and Syrian officials are now advocating the diversion of some of the waters of Lake Assad to agricultural lands in the Aleppo area instead of using them to reclaim saline lands in the Euphrates basin.

Further to the west, in the important basin of the Oronte River, the much smaller Ghab Irrigation Project covers an area of some 72,000 hectares, 25,000 hectares of which was previously reed-covered swamp. A combined irrigation and drainage project and Syria's first effort of this sort, the Ghab Project has encountered several difficulties: the annual flooding of large areas because the principal drainage canals are unable to handle the heavy volume of winter flood water; silting up of drainage canals and the rapid growth of water weeds; water logging caused by rising groundwater; and alterations in the physical and chemical characteristics resulting in detrimental effects on the productivity of beet and cotton crops. Furthermore, the reclamation of the Ghab area has resulted in biological changes affecting the environment and health (UNESCO/MAB 1978:68-69).

2.3.4.2 Domestic water supply (see 1.5.3)

2.3.4.3 Hydroelectric power

The only hydroelectric production in Syria appears to be from the multi-purpose Euphrates Dam, which has been generating electricity since 1974 and now has a capacity of over 800 megawatts from eight turbines. As of 1978 the dam was producing some 70% of the nation's electric power and, according to one report, was supplying about 90% of the country's power needs as of mid-1979 and also producing electricity for export to Turkey, Lebanon, and Jordan (Le Fay 1978:354; MEED, April 13, 1979:3). The dam has also been responsible for the continuing extension of electricity to rural areas. Whereas only 24 villages had electricity in 1970, that number had jumped to 1,170 by 1978. It is hoped that by 1988 all villages with 100 inhabitants or more--some 5,400 villages--will have electricity (Economist Intelligence Unit. Quarterly Economic Review of Syria, Jordan. 4th Quarter 1979: 9).

2.3.5 Problems with water resources

2.3.5.1 Water pollution

In its review of the Syrian environmental situation for the 1972 U.N. Conference on the Human Environment, Syria named water pollution as one of its most serious environmental problems. Causes of this pollution were said to be lack of sanitary sewerage disposal systems on a country-wide basis and industrial wastes, including wastes from petroleum processing, textile mills, tanneries and fertilizer production in the country's more important basins: the Euphrates, the Oronte, and--above all--the Barada (Human Environment...1972).

The water pollution problem appears to have persisted through the 1970's. In 1975, for example, the Director of the General Directorate for Combating Water Pollution within the Ministry of Public Works and Water Resources reported that in Damascus the Barada River had become more of a means for carrying sewer waters and liquid wastes than a conveyor of natural waters, especially during the dry season; organic sedimentation was reportedly being decomposed anaerobically, producing toxic and harmful gases. It was also stated that the groundwater in the area--the chief source of water supply--would be in danger of pollution if dumping of untreated wastes were to continue (JPRS 6431. March 18, 1975). In April 1976, moreover, an official of the Ministry of Public Works and Water Resources reported at the First Scientific Conference for the Protection of Damascus and Its Environs that Al-Ghutah, the oasis which encircles the city of Damascus, was threatened with complete destruction from the wastes pouring into the rivers and streams of the Barada Basin at an estimated rate of 4 to 5 cubic meters per second (JPRS 67103, April 7, 1976:14-15).

Although studies have been undertaken to assess the pollution problem in Damascus and its environs and although efforts have been made to force industrial plants to treat their wastes before dumping them into canals and rivers, a recent discussion of the problem by the Chief of the Syrian Geological Society would indicate that little progress has been made in this area. This official also mentions the problem of inadequate drainage systems becoming blocked during heavy downpours in the rainy season; furthermore, during the dry summer season sewers become blocked because there is inadequate water to flush out the system. Again, the problem of groundwater pollution, a problem aggravated by the high water table in the Damascus area, is mentioned as well as the circumstance that polluted water is frequently used for irrigation purposes (JPRS 75526: 18 April 1980:20; Khouri and Rasoul Agha 1977:27).

Water pollution problems also extend to the Oronte and Euphrates Rivers. Furthermore, in southern Aleppo and Latakia, there have been difficulties with soil pollution arising from the use of polluted sewage water for irrigation (JPRS 71583: July 31,1978:22).

2.3.5.2 Problems with groundwater and its exploitation

The development and exploitation of groundwater in Syria have gained momentum in recent years, bringing problems in their wake. Some problems have occurred because of overpumping, while salt water intrusion following upon overpumping has become a serious threat in the Syrian coastal plains and in some arid regions (Ramadan and Beida) in which saline aquifers occur. Deterioration of water quality is also found in areas irrigated by brackish waters and in multi-layered aquifers such as those found in the Lower Radd area, where freshwater is underlain or overlain by saline groundwater (Khouri and Rasoul Agha 1977:49).

In the semi-arid regions of Syria several groundwater reservoirs have been overdeveloped during the past decade. In these areas, overpumping followed by drought conditions has caused storage depletion because withdrawals have exceeded recharge. These aquifers include the Qalamoun, Salamyeh, Mouselmyeh, El Bab, Menbej, and Jeiroud aquifers, all of which are characterized by limited thickness, high water table, and medium to high transmissivity. Most of the areas are those with good agricultural potential. Measures taken to alleviate the situation have included reduction of pumping from production wells, prohibition of further development, and artificial groundwater replenishment from surface runoff. In some areas small dams have been constructed and integrated use of surface and groundwater has been practiced to good advantage. In other areas, however, water must be imported (Khouri and Rasoul Agha 1977:49).

costs of groundwater development

Costs of groundwater development vary throughout the country, and for some parts of the country recent increases in labor costs make the development of groundwater prohibitively expensive unless modern irrigation methods and improved agricultural practices are used (Khouri and Rasoul Agha 1977:53). The costs of production of groundwater from major Syrian aquifers has been estimated at from between 0.34 to 3.41 sent per cubic meter, while the cost of production of groundwater from highly productive zones such as Hama, Al Gutah, and Jezira ranges from 0.34 to 0.61 sent. The cost is high when the yield of a well is less than 5 liters per second or the total head exceeds 75 meters (Khouri and Kasoul Agha 1977:53).

2.4 SOILS OF SYRIA

Studies of the soils of Syria have been conducted by various scholars, but the most extensive single study appears to have been performed by W.J. van Liere, an FAO (United Nations Food and Agriculture Organization) specialist whose map (scale of 1:500,000), published in 1963, forms the basis for the Syrian sector of the FAO-Unesco Soil Map of the World (FAO-Unesco 1977). This breakdown, along with a map indicating the broad soil areas, is contained in Appendix A.

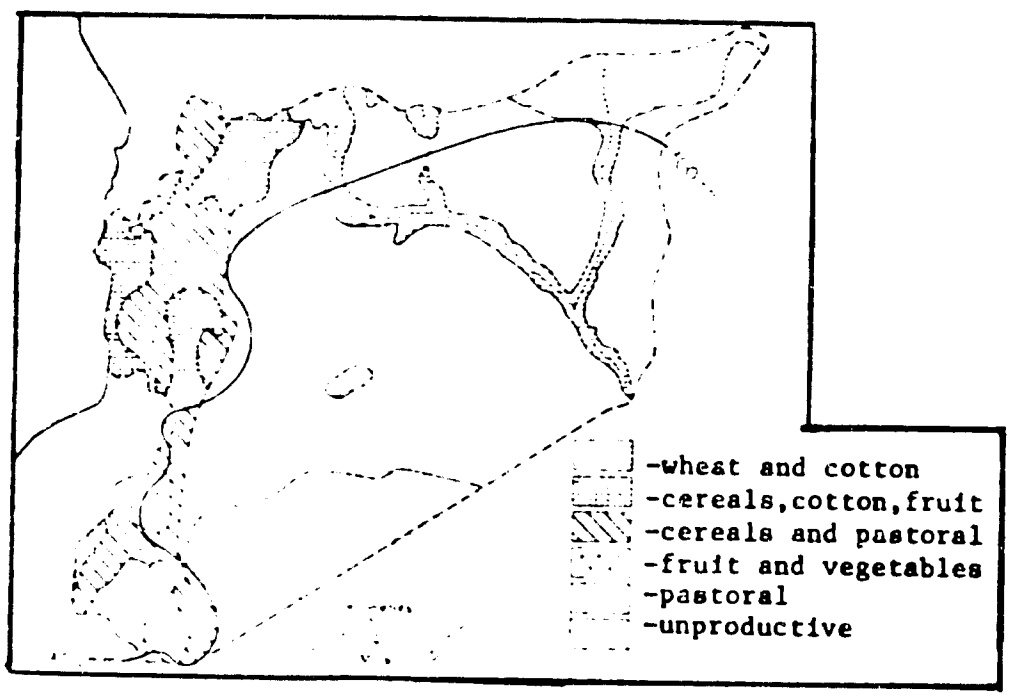
Broader regional classifications of soils, such as those presented in Fisher 1978 and Akhrat 1973, identify terra rossas and rendzinas in the western mountain region, brown and chestnut soils in the areas roughly corresponding to regions 4 and 6 on the map on page 10 of this report, and lithosols in areas 7,8, and 2c on the same map. Fisher's map also identifies red brown chernozems in the extreme northeast portion of the country (Fisher 1978:86).

The soil map and soil information presented on the following two pages are from the Syrian Statistical Abstract (Syrian Arab Republic, Central Bureau of Statistics, 1977:53-54).

2.4.1 Soil areas (see map on page 27 and explanatory table on page 28).

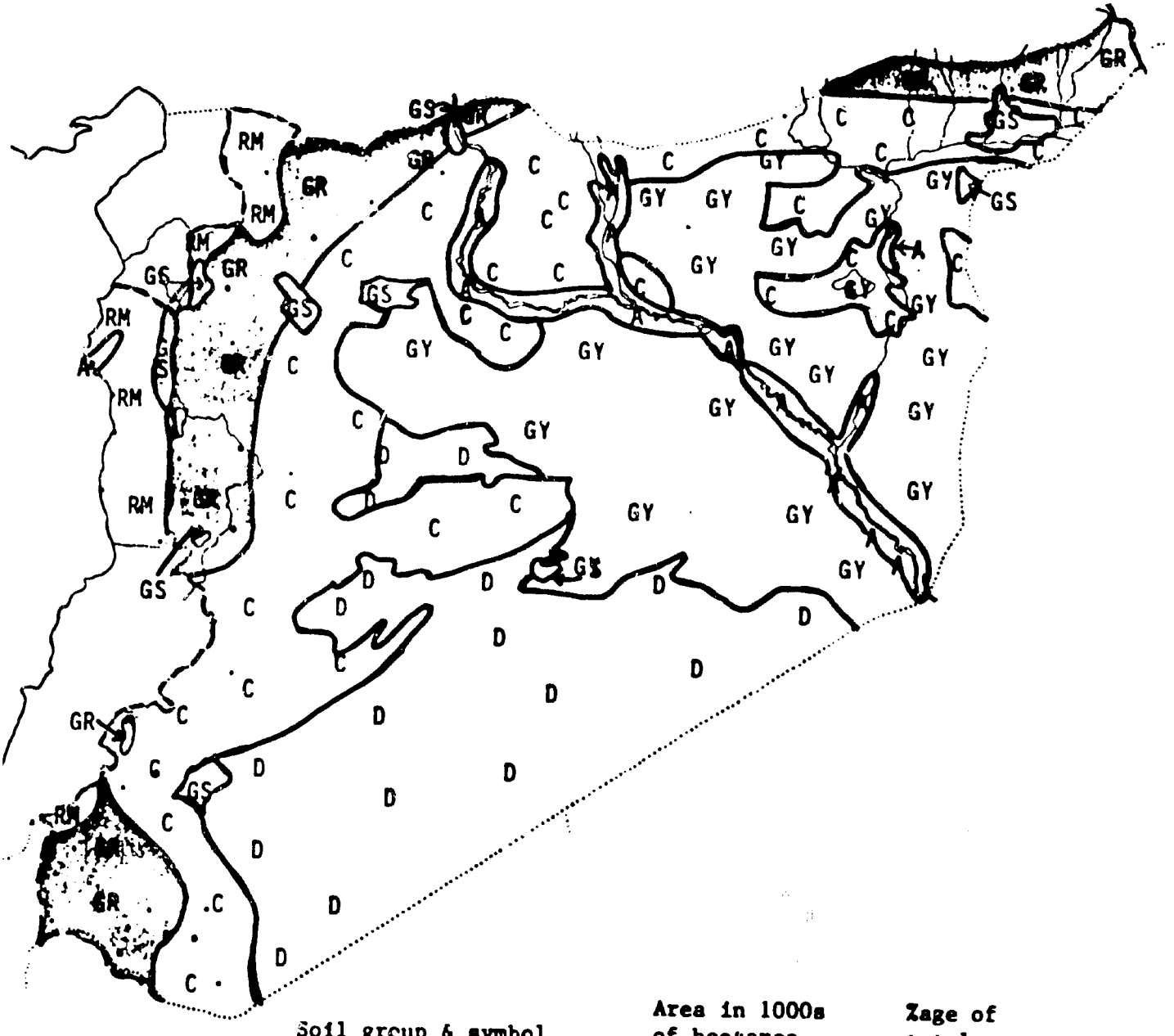
2.4.2 Soil suitability and land use (see table on page 28)

LAND USE IN SYRIA (Fisher 1978:422)



SOILS OF SYRIA

(Soil Classification and map from Syrian Arab Republic, Central Bureau of Statistics. 1978.)



Soil group & symbol	Area in 1000s of hectares	%age of total area
Red Mediterranean (RM)	850	4.6%
Grumusol (GR)	2,218	12.0%
Cinnamonic (C)	4,781	25.8%
Desert (D)	4,244	22.9%
Gypsiferous (GY)	5,528	29.9%
Alluvial (A)	531	2.8%
Groundwater soils (GS)	366	2.0%

SOIL GROUPS (see map on previous page)
(Source: Syrian Arab Republic. Central Bureau of Statistics. 1978: 51-52)

RED MEDITERRANEAN (RM)
Rainfall levels: 600 mm per year
Characteristics: red color; clay loam and loam montmorillonitic; pH 7-8; little horozonation; some clay movement
Area: western hills of Syria
Utilization: exhaustive use of arable and marginal land after clearing of stones and terracing; population density in area high.

GRUMUSOL (G)
Rainfall levels: 300 - 600 mm per year
Characteristics: dark red, brown, dark brown and black; clay; montmorillonite; pH 8-8.5; no horizonation
Area: plains of western and northern Syria
Utilization: wheat growing; ideal for cotton under irrigation.

CINNAMONIC (C)
Rainfall levels: 150-300 mm per year
Characteristics: dominant color reddish-yellowish brown; montmorillonite-attapulgite loam and clay loam; highly calcareous; pH 8-8.5; little horizonation; calcium concretions and sometimes calcium horizons; unstable structure
Area: interior plains of Syria
Utilization: barley growing.

DESERT (D)
Rainfall levels: less than 150 mm per year
Characteristics: dominant color brown-gray and gray; loam; highly calcareous
Utilization: grazing land.

GYPSIFEROUS (GY)
Characteristics: dominant yellowish-orange brown color; powdery and easily subject to wind erosion; pH 7; often gypsiferous crusts
Utilization: permanent agriculture possible only with irrigation; otherwise natural grazing land of low capacity.

ALLUVIAL (A)
Characteristics: gray sand loam to clay; pH 8
Area: found mainly in the low valleys of the Euphrates River and its tributaries
Utilization: irrigated cotton; but suitable for other types of crops as well.

GROUNDWATER SOILS (GS)
Inclusions: bog organic, diatomeceous earth, gray and brown calcareous and saline groundwater soils
Area: plains of the Ghab, Roughe, Radd and the inland lakes of Syria.

2.4.3 Soil problems

2.4.3.1 Salinity and waterlogging

In Syria about 30% of the irrigated land in the Euphrates Valley is seriously affected by salinity and waterlogging, annual losses to the main crops coming to about 300 million dollars (Elgabaly 1976:36).

It is feared that in Syria the limited amount of surface water during certain months of the year, and the spreading of these scarce water resources over a greater land area, may lead to soil salinization as a result of insufficient leaching. The problem is said to develop very quickly when the quality of irrigation water is poor as is often the case in Syria (Elgabaly 1976:37).

Waterlogging may also occur because of seepage from irrigation canals during conveyance and during other parts of the irrigation operation; such losses are said to account for over 70% of the water used in the Near East region as a whole. These losses raise the groundwater table gradually until a critical point is reached after which waterlogging and salinization result through water and salts raised through capillary action to the plant root zone (Elgabaly 1976:37).

In order to relieve this problem large horizontal drainage programs are presently being planned in Syria, as well as in other Near Eastern countries (Elgabaly 1976: 38).

Improved water management practices through which these problems can be avoided are seen as essential to successful irrigation projects. They have been judged more important in efforts to increase food supplies than any other agricultural practices (Elgabaly 1976).

2.4.3.2 Calcareous soils

In Syria, as also in Lebanon, Jordan, and Iraq, calcareous soils constitute a large part of land resources. These soils have several disadvantages: low water-holding capacity; deterioration of structure under irrigation; and formation of surfaces crust when irrigated. Irrigation efficiency on these soils is low, and irrigation creates problems of waterlogging and secondary salinization. Gypsum, present in the newly developed soils of the Euphrates region of Syria, also leads to difficulties because it dissolves when put under irrigation, causing the failure of both irrigation and drainage structures (Elgabaly 1976:37).

2.4.3.3 Sandy soils

Sandy soils, present in large quantities in Syria have very low water-holding capacity; efficiency of water use on these soils are traditional methods is very low, and these soils are very expensive to develop. Furthermore, the development of sandy soils on high lying lands may create problems of waterlogging in low-lying areas (Elgabaly 1976:37).

2.5 Vegetation Resources

2.5.1 Natural vegetation zones

The natural vegetation of Syria is generally classified into three broad groupings corresponding to climatic conditions, with a decrease in size and abundance of vegetation as one moves from the moister areas of the western mountain regions to the desert areas of the southeast. The western part of the country (the coastal zone and the mountain regions) falls into the Mediterrean vegetation zone; it is typified by dense growth of evergreen oaks, myrtle, and broom, with thick undergrowth of thorn bushes and shrubs. In addition to this maquis vegetation the natural vegetation of this zone also includes forests of pines, cedars, and firs. To the immediate east of the Mediterrean zone lies the vegetation zone of the interior steppes, often designated as Irano-Turanian. This less vegetated zone is typified by thornbushes and by grasses and herbs which flourish under drier conditions. Typical species are Euphorbia spec., Astragalus spec., Centaurea spec., Poa bulbosa, and Hordeum bulbosum. To the east and south of the interior steppes lies the extensive arid area classed as falling into the Saharo-Sindian vegetation zone. Typical of this sparsely vegetated area are shrubs and grasses such as Artemesia herba-alba, Haloxylon articulatum, and species of Astragalus, Stipa, Poa, and Carex (Wirth 1971:121-123; Fisher 1978:90-94. A somewhat different breakdown of vegetation zones is found in FAO/Unesco 1977:18-23).

2.5.2 Present vegetation

It must be stressed that virtually all the natural vegetation of Syria has been radically altered and degraded by human activity, including cultivation of land, grazing of animals, and removal of trees for firewood, charcoal production, and construction. Furthermore, climatic conditions have also conspired to make vegetation more vulnerable to human encroachments.

The problem of deforestation, probably the most striking form of vegetation loss in Syria, will be dealt with below. However, the grass and shrub vegetation of the interior steppes and the arid desert-like areas of eastern and eastern and southern Syria has also undergone extensive changes, principally because of overgrazing by animals, particularly goats, maintained by nomadic herdsmen. This problem has been aggravated by the establishment within the arid zone of wells that have permitted areas to be grazed for longer periods of time. It is believed that as recently as 2500 years ago the now desert-like areas typical of so much of Syria were for the most part covered by a relatively dense vegetation consisting not only of grasses, herbacious plants, and small bushes but also, where ecological conditions were favorable, of woody plants and trees. Today these original plant communities have been virtually eradicated and replaced by those species which have survived largely because they have been of little interest to either humans or animals (Wirth 171:121).

According to one analysis of the succession of vegetation in the Syrian desert zone, the vegetation has undergone a transformation from scattered forest with an undergrowth of steppe grasses through a stage in which dwarf and thorn bushes such as Artemsia herba-alba dominated to the present dominance of Poa sinaica, Artemsia herba-alba and Carex stenophylla. In recent years Carex stenophylla, a grass not favored as feed by animals, has gradually become the chief plant in many areas, while in others degradation has finally brought about erosion and desertification as land has become increasingly incapable of supporting vegetation (Wirth 1971:130-133).

As indicated by the land use chart on page 48, Syrian government figures show that 46% of the country consists of steppe and pasture, 31% of cultivable lands, 19.8% of uncultivable lands, and only 2.4% of forests.

2.5.3 Forests and tree growth

Forest areas, found almost exclusively in the mountainous country of western Syria, occupy only some 2.4% of the total territory.* The map on page 32 indicates the locations of these forests as well as the species which dominate in them.

In addition to these forests, areas planted with tree crops such as olives, occupy some 425,600 hectares or about 2.3% of Syrian territory (SAR. Central Bureau of Statistics 1978:191).

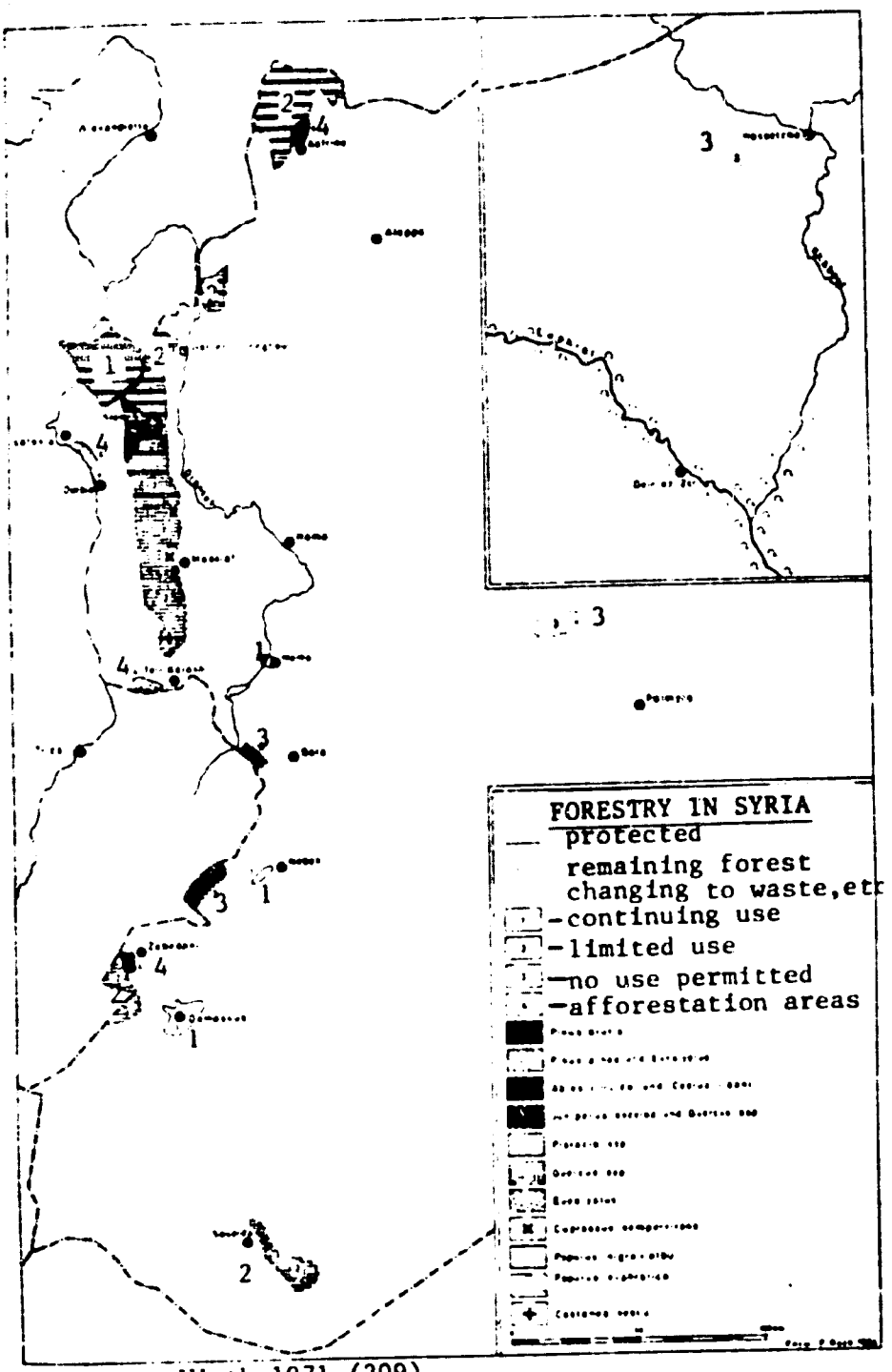
Few forest areas of Syria resemble the dense forests of Western Europe and the United States. The most prominent example is the forest of Baer Bassit on the Mediterranean Coast north of Latakia. This is a large heavily forested area with only occasional pockets of cultivation. The dominant species is Pinus brutia, which resembles the Aleppo pine. In cooler, damper locations this is mixed with the oak Quercus pseudocerris, in drier places with kermes oak Quercus coccifera. There are also isolated occurrences of such European species as hornbeam, red beech, and hazel. The undergrowth, which has been altered by human activity, consists of myrtle, broom, pistachio, and strawberry tree.

In the northeast corner of Syria, to the west of Afrin, is the forest area of Kourd Dagh, which, because of human encroachment, is much less dense than that of Baer Bassit. The major species in this area are Pinus brutia, yew (Taxus baccata), and species of oak, above all Quercus ilex, holm/evergreen oak.

The last major forest area of Syria is found on the Jabal al Nusayriyah. The density of forest in the area varies considerably depending on altitude and accessibility to human encroachment. Major species are oaks (Quercus sessiliflora, lusitanica, ilex, coccifera). These are often intermixed with hornbeam (Carpinus orientalis), maple (Acer syriaca), hazel, yew, elm, and, rarely, red beech. Coniferous trees dominate only in areas over 1200 meters; these include most prominently fir (Abies cilicica) and cedar (Cedrus libani). Forest growth in this area is heaviest in protected zones such as the reserve near

*452,000 hectares

FOREST AREAS AND USE CATEGORIES



Source: Wirth 1971 (209)

Slennte; in many areas, however, particularly at altitudes of from 800 to 1200 meters, the forest has been degraded to shrubs and heath vegetation (Wirth 1971:126-129).

Minor areas of natural forest are found in the Jabal Druz in southern Syria (Quercus coccifera mixed with Acer microphylla, etc.), and there are scattered occurrences of oak on Mt. Hermon (Wirth 1971:128). Afforested areas of poplar now play an important role in supplying wood (Wirth 1971:210).

2.5.4 Utilization of forest resource

By one recent estimate only some 60,000 hectares of Syria's over 400,000 hectares of forest land are productive (Turian 1978:1371). As indicated by the table on page 34, Syria's limited forest resources produced some 86,000 cubic meters of roundwood in 1976, nearly 60% of which was used for fuelwood and for charcoal production. Roundwood production subsequently dropped to 73,000 cubic meters in 1977 and 66,000 cubic meters in 1978 (FAO Yearbook of Forest Production 1967-78).

Fuelwood is used not only for cooking but also for heating in those areas which experience colder winter temperatures; it has also been employed for industrial purposes such as tobacco drying (Wirth 1971: 210).

Wood products manufactures in Syria include wood based panels, plywood, and compressed wood. It must be assumed that these enterprises rely heavily on wood imports for their raw materials. The value of imported wood products, including paper products, rose from $28,926,000 in 1976 to $79,309,000 in 1977 and to $91,800,000 in 1978; exports, only a fraction of this amount were valued at $2,117,000 in 1978 (FAO Yearbook of Forest Production 1967-78).

2.5.5 Deforestation

Ancient texts, including the Bible, would seem to indicate that Western Syria was once covered by a thick impenetrable forest which thinned out toward the direction of the eastern steppes. It was in this more accessible forest area that deforestation began some 3,000 years ago. It is believed, for example, that the forests of the Jabal Al Zawiyah to the east of the Rift Valley were already almost completely decimated some 2,500 years ago, while other forest losses, such as the destruction of most of the forest area of the Kourd Dagh in northwestern Syria by Kurdish settlers, did not occur until the 19th century (Wirth 1971:120).

Syria's forests have fallen for a multiplicity of reasons. They supplied construction materials for both buildings and ships; wood for native crafts; fuel for cooking, heating and industrial purposes such as smelting and limestone production as well as the material for charcoal production; and tanning materials. Forest foliage has been used for cattle feed, and shepherds have cleared wooded areas in order to better control their herds and to eliminate thorny plants which become entangled in sheep's wool. Conversion of forest land into agricultural fields, a practice that has penetrated to almost all areas of western Syria where soils and slopes permit cultivation, has also accounted for heavy forest losses. The goat

FOREST CUTTING AND FOREST PRODUCTS (1965-1976)
Source: FAO Yearbook of Forest Products 1976 *

c=coniferous; nc=nonconiferous

	1961-65	1970	1976
ROUNDWOOD PRODUCTION			
total	80	112	86
exports	3	2	4
imports	28	24	40
Roundwood (c)	2	2e	7
Roundwood (nc)	78	110	79
Fuelwood (all nc)	50	50	50F
imports	7	0	0
exports	1	2	3
charcoal			
exports	-	-	1*
industrial roundwood	30	62	36
(c)	2	2e	7
(nc)	28	60	29
exports	2	-	1
imports	22	24	40
sawlogs and veneer logs	10	10e	11
nc	8	8e	4F
c	2	2e	7
imports	19	24	40
c	5	23	17
nc	14	9	23
exports	2	-	1
c			
nc	2	-	1
other industrial roundwood	20	52	25
c			
nc	20	52	25
imports	3	1	
exports			
sawnwood and sleepers	5	9	11
imports	96	155	128
exports			9
sawnwood total			
c	3	8	9
nc	2	1	2
imports (c)	84	153	119
(nc)	12	2	7
exports (c)		6	9
(nc)	-	-	---
sleepers (no production)			
imports	-	1	3

*All quantities in 1,000s of cubic meters, with the exception of charcoal, woodpulp, paper and paperboard, etc., which are in 1,000s of metric tons.

F=FAO estimate

1000s of metric tons

FOREST PRODUCTS

wood-based panels			
production	11	18	19
import	3		1
veneer sheets			
production	0	0	0
imports(no figures for these yeears)			
plywood			
production	11	11	11
imports	-	-	1
exports (no figures for these years)			
particle board			
production			
import	-	7	e
export	2	-	-
fiberboard			
production (none)			
import	1	-	-
fiberboard(compressed)			
production	-		
import	1	-	-
woodpulp			
no pro			
no import			
paper and paperboard			
no pro			
imports	15	24	24
newsprint			
import	1	2	1
printing&writing paper			
import	3	7	1
other paper&paperboard			
production		1	
import	12	16	23
exports(not for these years)			

total wood and wood products (value in dollars)

import	12,207,000	17,371,000	$ 28,926,000
export	167,000	379,000	1,701,000

(fuelwood and charcoal imports of 94,000 dollars in 1961-65, dropped 6,000 by 1969, and has completely stopped since; almost all of this was charcoal)
(roundwood imports of $1,245,000 in 1961-65, increased to 4,007,000 by 1970 and rose to $7,023,000 by 1976)
(roundwood exports: $

(industrial roundwood imports: $1,151,000 dollars in 1961-65, $1,183,000 by 1970; $7,023,000 by 1976)
no pitprops; no production of pulpwood and particles; no recorded import of pulpwood and particles;

population has had a particularly devastating effect on forests as well as on other vegetation. The practice of herding goats in forests during the summer season has inhibited forest regeneration because goats consume new tree growth (Wirth 1971:124).

Loss of forest in Syria was probably at its most intense during the late 19th and the first half of the 20th century. This acceleration destruction was brought about by increases in both human and animal populations, improved human access to forests in the wake of new road construction, and the importation of technologies which placed greater demands on forests as a source of fuel. Furthermore, with the reimposition of Turkish rule in the second half of the 19th century, Syrian forests came under the control of the Turkish forest administration, which issued permits enabling entrepreneurs to cut and transport wood. Thus forests which were once used for the supply of local villages began to supply large quantities of fuelwood and industrial wood for export to Turkey. Especially intense losses were experienced during World War I, when valuable forests were felled to supply fuel for the Turkish railroad system which cut through the Middle East (Wirth 1971:124-125).

2.5.6. Forest management and reforestation

Efforts at effective forest management and protection in Syria date from 1935, when the French mandate government issued a forest law providing for the protection of surviving forest areas, and these efforts have been intensified since 1958. Protection measures were concentrated to begin with on the forest areas which were still relatively intact, particularly the forest of Baer Bassit and forest areas in the vicinity of Slennfe on the western slope of Jabal al Nusayriyah (Wirth 1971:209).

A necessary condition for regeneration of Syrian forests was a solution of the problem of the large number of goats, whose feeding habits involve the consumption of new tree growth. An instrument for dealing with this problem was provided by the Decree of August 23, 1958, which limits to one the number of goats that may be held by any one family in the mountain zone of western Syria and puts all goats of individual villages under the supervision of a goatherd accountable for the numbers of goats in his herd. This decree and other forest legislation are to be implemented by a forest police force empowered to seize goats in excess of prescribed numbers and entitled to keep the proceeds from the sale of such animals (Wirth 1971:210).

Government forest programs, carried out under the Ministry of Agriculture and Agrarian Reform, have resulted in a significant renewal of protected forest areas. In addition to goat control, these programs have concentrated on checks on erosion, uncontrolled cutting, and other practices that have caused damage in the past. Reafforestation has also been undertaken by the government. As of late 1978, afforestation plans covered some 60,000 hectares, 12,000 hectares of which were scheduled for planting within that year (S&MA October 1975:50)

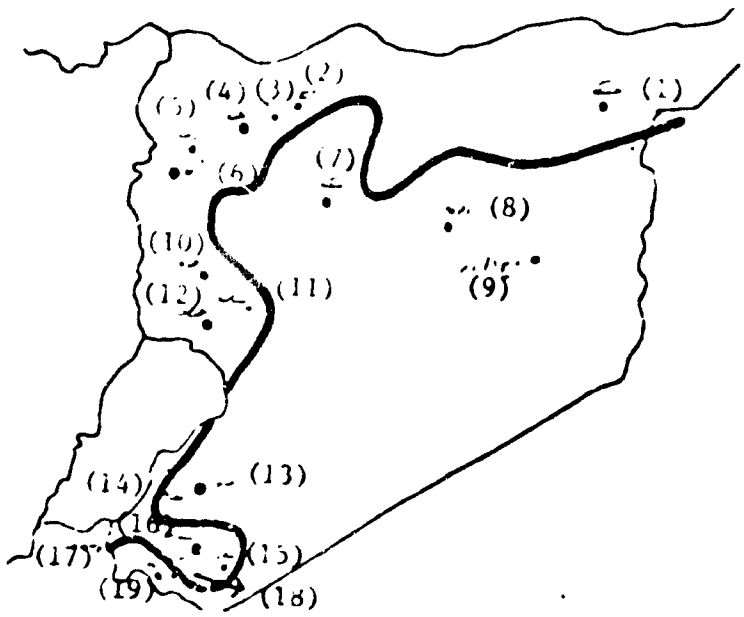
Of particular significance has been the planting of poplars, which have come to play a more important role in providing wood supplies than natural forest areas. Poplars have been planted in all areas where water supply

is sufficient but most particularly in irrigated areas, where they are found along roads and canals. As of the early 1960's, wood from poplars accounted for about 45,000 tons of the some 70,000 tons of wood produced in Syria (10,000 tons were from natural forests and an additional 25,000 tons from branches pruned from fruit trees). Although poplars have the distinct advantage of a growth rate far superior to that of Syrian forest trees (20-25 cubic meters per hectare per year as compared with a growth rate of 2-3.5 cubic meters per year for natural forests), they are not without disadvantages, including a high water demand and a vulnerability to pest damage (Wirth 1971:210-211).

green belt project

A significant effort at afforestation was scheduled to be initiated by the Directorate of Forests and Afforestation of the Ministry of Agriculture and Agrarian Reform in late 1978 with the launching of a program to create a green belt to extend some 1,100 kilometers from the Jordanian border in the south to the Iraqi border in the northeast. Intended to separate the semi-desert region from populated areas and to prevent the encroachment of the desert on these areas, the plan calls for the planting chiefly of fruit trees (olive, pistachio, fig, almond) but also of grazing shrubbery in areas of heavy livestock concentration, and of forest trees in other areas and along roadsides. In addition to halting creeping desertification, the program also aims at improving the climate of the area immediately adjacent to the belt, increasing employment in green belt areas and thus slowing down migration from rural areas, and securing refuge and feed for wild as well as domesticated animals. The initial (and somewhat experimental) stage of the plan--a 10 kilometer long and 2 kilometer wide green island in the al-Qasir area of Homs governate--was scheduled for completion in 1980-81 (JPRS 71956, 29 September 1978, p. 17).

Green Belt Area



Key:

1. Al-Hasakah
2. (Nabaj)
3. Al-Bab
4. Aleppo
5. Idlib
6. Ariha
7. (Maskanah)
8. Al-Raqqah
9. Dayr al-Zawr
10. Hamah
11. (Silmiyah)
12. Homs
13. Damascus
14. Qatanah
15. Salkhad
16. Al-Suwayda'
17. Tall Shihab
18. (Busrat Hisham)
19. Dar'a

2.6 Wildlife

2.6.1 The resource

Wild mammals found in many areas of Syria include varieties of deer, wildcats, porcupines, squirrels, hares, rats, and mice, while antelopes and gazelles have been common in the desert east of Hama, and occasional wolves are found in the Anti-Lebanon Mountains and the Jabal al Nusariyah in the west.

Reptiles common to the desert areas are lizards, chameleons, and vipers.

Birdlife includes waterfowl, particulary pelicans and flamingoes, in the marshes, and eagles, owls, vultures, and partridges in many areas of the country.

Common insects are mosquitoes, sandflies, and grasshoppers; locusts occasionally threaten crops (Nyrop 1971:16)*.

2.6.2 Endangered species

The IUCN Red Data Book lists four endangered species of mammals for Syria:

Wolf *Canis lupis*
Anatolian leopard *Panthera pardus tulliana*
Syrian wild ass *Equus hemionus hemippus*
Saudi Arabian dorcas gazelle *Gazella dorcas saudiya*

The list of Endangered Species and Plants issued by the U.S. Fish and Wildlife Service lists no animals as endangered specifically in Syria.

2.6.3 Wildlife protection

Legislation (see 5.4) protects wildlife in Syria and regulates hunting; moreover, as of mid-1979, hunting has been completely prohibited for a period of five years (see 5.4).

Hunting councils were provided for in the 1970 Hunting Law (see 5.4) but no information on the actual activities of these organizations was found. According to IUCN records Syria has no national parks or reserves for wildlife, nor do World Wildlife Fund publications indicate activities regarding wildlife within the past decade.

*More recent information on wildlife in Syria could not be located.

2.7 Coasts and Beaches

2.7.1 The Resource

Syria has 93 kilometers of coastline along the Mediterranean Sea, with major ports located at Latakia, Baniyas, and Tartus. Latakia, the oldest and most prominent of these seaports, experienced major improvement in its facilities during the 1960's. Baniyas is used principally to ship oil piped across Syria from Iraq, while Tartus serves as the main export point for Syrian crude oil (Nyrop 1971:19).

Fishery activities along the Syrian Mediterranean coast are discussed in section 2.8 below. There is no significant tourism activity along the coast (Tangi 1977:337).

2.7.2 Coastal pollution problems

The Syrian coast is reported to have more oil pollution problems than other countries in its region because of the location of three oil terminals directly on the coast: the Latakia terminal with limited activity, the Baniyas terminal with high annual activity, and the Tartus terminal with medium activity (JPRS 70011, Oct.21, 1977:19-22). Problems also arise because the prevailing west and south-west sea currents carry to the Syrian coast oil flushed by both Syrian and other tankers into the waters of the Mediterranean (JPRS 70011, Oct. 21, 1977: 19).

Because there are few population or industrial centers along the Syrian coast, pollution from both domestic and industrial wastes is smaller than along the more heavily populated and industrialized coasts of Lebanon Israel. The following table, based on data gathered in 1972, summarizes the domestic sewage situation for the coasts of Syria, Lebanon, and Israel.

Organic load of domestic sewage discharged into the Mediterranean directly or through rivers, given in tons per year (Osterberg and Keckes 1977:325)

	BOD_5	Phosporus content (P)	BOD_5 per km coastline	P per km coastline
Syria	6,500	260	36	1.4
Lebanon	31,250	1,250	149	6.0
Israel	32,000	1,400	145	6.5

2.7.3 Measures against coastal pollution

In its 1972 report to the U.N. conference on the environment, Syria listed coastal pollution, in particular oil pollution resulting from tanker traffic carrying Libyan and Algerian oil, as one of its chief environmental concerns.

At that time it proposed the construction of special oil discharge basins on shore for the use of which concerned governments would demand service fees from oil shippers and handlers (Human Environment...1972).

In a move to protect its coastal waters, Syria in the mid-1970's issued a regulation creating two important pollution control committees. The first committee, composed of specialists and technicians, is charged with investigating pollution incidents, specifying responsibilities, and assessing violators for damages. It is the task of the second committee to review the first committee's decisions in the event that they are disputed. The committees are authorized to impose fines, which are never lower than 5,000 Syrian pounds and which may range into the millions of pounds. One Swedish tankers, for example, was fined 32,000 pounds for violating anti-pollution regulations (JPRS 70011, 21 October 1977:19-22).

With regard to international oil pollution control measures, Syria has approved the 1964 agreement on pollution of the seas as amended in 1968 to include oil pollution. As of mid-1980, however, Syria had not yet signed the Protocol for the Protection of the Mediterranean Sea Against Pollution from Land Based Sources, which was approved by a large group of Mediterranean nations under the auspices of the United National Environmental Program in Athens on May 15, 1979; however, U.N. officials expressed confidence that Syria would sign ("Cleanup of Mediterranean Progresses." New York Times, August 26, 1980, C2).

2.8 Fisheries

Fishery statistics (FAO Yearbook of Fishery Statistics 1977)
(quantities in metric tons; F=FAO estimate)

Fisheries: (in metric tons)	FAO Yearbook of Fishery statistics 1970	1973	1976	1977
Total catch	1300	1300	1951F	1951F
Inland waters	300	600	1125F	1125F
Marine areas	1000	700	826F	826F
Breakdown by type of fish:				
Freshwater fishes (no specifics)		600	1125F	1125F
Marine				
allis shad and twaite shad (Alosa spp.			28F	28F
groupers (misc) Epinephelus spp.			107F	107F
red porgy Pagrus pagrus			107F	107F
sand steenbras Lithognatus mormyrus			10F	10F
surmullets Mullus spp.			123F	123F
mullets Mugilidae			71F	71F
Atlantic mackerel Scomber scombrus			70F	70F
Misc. marine fishes			310F	310F
MARINE CRUSTACEANS			00	00

Syria's potential fishing waters include the coastal waters of the Mediterranean Sea and some 288,620 hectares of inland waters: 7,400 hectares of lakes and reservoirs; 216,500 hectares of rivers; 720 hectares of water bodies formed by small dams; and 64,000 hectares of Lake Assad, the body of water formed by the Euphrates Dam (S&MA April 1979:5).

The waters of the Syrian Mediterranean are not rich in fish life, principally because of a lack of nutrients, a deficiency generally shared by the waters of the eastern Mediterranean with the exception of those benefitting from the nutrients carried by the Nile River. Despite this limiting factor, however, the Mediterranean is the source of several types of fish (see above table) including sardine, mullet, and mackerel. Another important product of the Syrian coastline is the sponge; its chief production area is the island of Ruad (Fisher 1978:240).

The fishing potential of Syrian waters, particularly its inland waters, had generally been neglected, and it was only at the end of the 1960's that the importance of fisheries began to gain recognition. An important step came in 1974 with the founding of the Public Fisheries Establishment. This move was accompanied by the introduction into development plans of fishery goals aimed at extending fishing to all possible locations and thereby increasing the supply of available protein and reducing the level of fish imports. The success of these efforts is reflected by the above table, which indicates increases in catches from Syrian inland waters between 1970 and 1977.

The fourth five-year development plan (1976-1980) contains several projections relating to fisheries, including the establishment of fish farms and a fishing project for the Mediterranean Sea. Calling for public investments of 57 million pounds over the plan period, the plan forsees an increase of fish catches to 14,000 tons by 1980. Fish farming, a prominent feature of the plan, was being carried out in some 277 hectares of water in 1979 (S&MA April 1979:6).

An important factor in the development of Syrian inland fisheries is the fisheries station set up on Lake Assad (the reservoir of the Euphrates Dam) by the Public Fisheries Establishment. The station, which boasts several laboratories, is carrying out studies aimed at analyzing the waters of the lake and studying life forms in the water. Twenty-one species of fish have been identified by the biological laboratory, which is developing plans to introduce new fish into the lake and to remove undesirable species (S&MA April 1979: 8).

One problem in the development of Syrian fisheries is that of educating the population to acquire a taste for fish, since Syrians on the whole are not accustomed to this type of protein, preferring the meat of sheep and chickens (S&MA 1979:5).

Among the problems facing Syria's fisheries resources are pollution of waters and fishing by illegal means. As recently as 1977 it was reported that illegal fishing by dynamite was practiced virtually unhindered along Syria's Mediterranean coast (JPRS 70011, October 21, 1977: 19-22).

2.9 Mineral resources

Syria has usually been said to be relatively poor in mineral wealth. Currently only phosphate deposits and oil are exploited. However, the country has recently shown renewed interest in investigating the mineral potential of its territory. The Ministry of Oil and Mineral Resources has appointed the British firm of Hunting Geology and Geophysics to act as a consultant on the development of mineral deposits including iron ore, phosphates, uranium, chromite, and salt and a wide range of industrial materials. The findings of this assessment will determine future developments in minerals (Economics Intelligence Unit 1979:9).

2.9.1 Oil production

Annual oil production in 1978 was projected to be 15 million tons, most of it tagged for export to Western Europe and the U.S.S.R. If no new discoveries are made, oil production is likely to stabilize at that level. Syria's major oil fields are located in the extreme northeast of the country, not far from the Tigris River, at Karachuk, Suweida and Rumailan; they are linked by pipeline to Homs and from there to Baniyas and Tartus on the Mediterranean coast. At the end of 1977, the country's proven oil reserves stood at 2,150 million barrels, far lower than those of major Middle East oil producers such as Saudi Arabia, Iran, and Kuwait. As sales abroad have grown, oil has become Syria's most important export commodity (A.I.D./B.N.E. 1979:115).

All oil activities are under the overall control of a General Petroleum Authority, which is responsible not only for oil field but also for the country's two refineries--at Homs (capacity of 100,000 barrels per day) and Baniyas (120,000 barrels per day) (Economist Intelligence Unit 1979: 9-10).

In addition to the pipeline running from Syria's oil fields to the Mediterranean ports, there are pipelines crossing the country from both Iraq and Saudi Arabia.

2.9.2 Phosphates

Syria's production of phosphate rock started from mines in the area of Palmyra (Tudmur) in the Syrian steppe in 1972, reaching 800,000 tons by 1977. Exports of phosphate totaled 700,000 tons in 1977, half of which was bought by Romania, the rest going to North Korea, Lebanon, Poland and Bulgaria. The North Koreans, however, may possibly become Syria's largest customer. The phosphate is of poor quality and sells at relatively low prices. With declines in world phosphate prices, Syrian revenues from this mineral have suffered accordingly. Nevertheless, current plans call for phosphate production to increase from 1.35 million tons to 4.5 million tons by 1980, of which 4 million are marked for export and the remainder for use in a triple super-phosphate fertilizer plant (A.I.D./B.N.E. 1979: 115).

2.10 Air and the Atmosphere

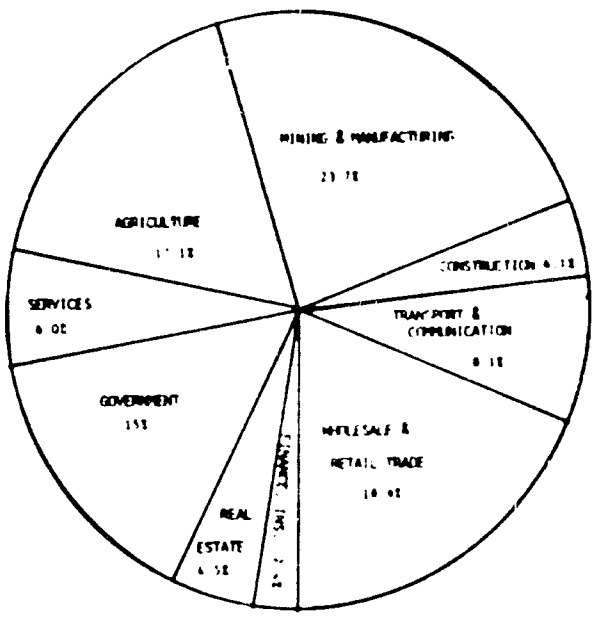
According to a recent interview with a Syrian official who had studied the air pollution problem in Syria "things are not that bad in our country" (JPRS 75526, April 18, 1980:26). The same official goes on to say, however, that the specter of pollution has begun hanging over the more populated areas such as Damascus, Aleppo and Homs, with the last being the more problematic area because of the presence of large polluting industrial projects such as a refinery, sugar factories, and fertilizer factories. Causes of air pollution in the capital city of Damascus are said to be automobiles, heat generation, and factories, all of which contribute to the smog cover hovering over the city (JPRS 75526, April 18, 1980:26). In Syria's 1972 report to the U.N. Conference on the Human Environment, sulfur pollution from the burning of high-sulfur Syrian Petroleum in electric power stations was mentioned as a particular problem; the availability of clean hydroelectric power from the Euphrates Dam should dramatically slash pollution from this source, however. (Human Environment...1972).

An object of some controversy in recent years has been the construction at Tartus on the Mediterranean coast of a cement factory with a production capacity of 6,000 tons per day. It has been estimated that in this olive-growing coastal area, emissions from the factory could lead to the gradual destruction of about 250,000 olive trees as well as of seasonal crops--a loss of some 50 million Syrian lira per year. This would be in addition to about 20,000 olive trees lost in clearing areas to obtain the calcic and basaltic rock used as raw materials for cement production. Other problems are the destruction of a beautiful stretch of coastal area, the forced relocation of some people, and adverse health effects for others. A meteorologist surveying the situation after the decision on the location had already been firmly taken judged the factory site to be incompatible with the climatic characteristics of the area, while a committee designated to assess the location has recommended that 150-meter smokestacks will be necessary for the factory rather than the 90-meter smokestacks called for in the original plans. It appears that the committee's recommendations have not been followed (JPRS 75526, April 18, 1980:23-31).

3.0 THE ECONOMY OF SYRIA

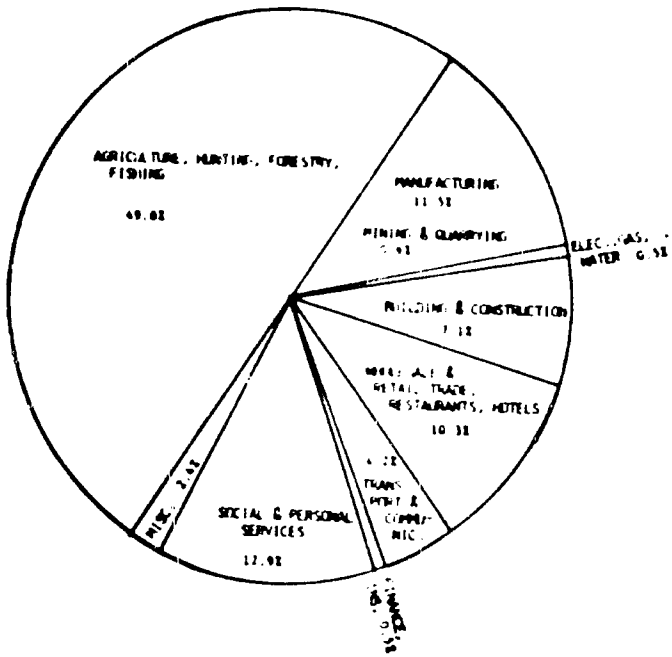
GDP: 7.8 billion (1978) (National Foreign Assessment Center, World Factbook: 198
Share of GDP per capita: U.S $960
Real GDP growth rate: 4.8% (1979)
Exchange rate: 3.95 Syrian pounds=U.S.$1

GROSS DOMESTIC PRODUCT BY SECTOR (1977)



(Source: Economist Intelligence Unit, Annual Supplement 1979)**

EMPLOYMENT BY SECTOR (1975)

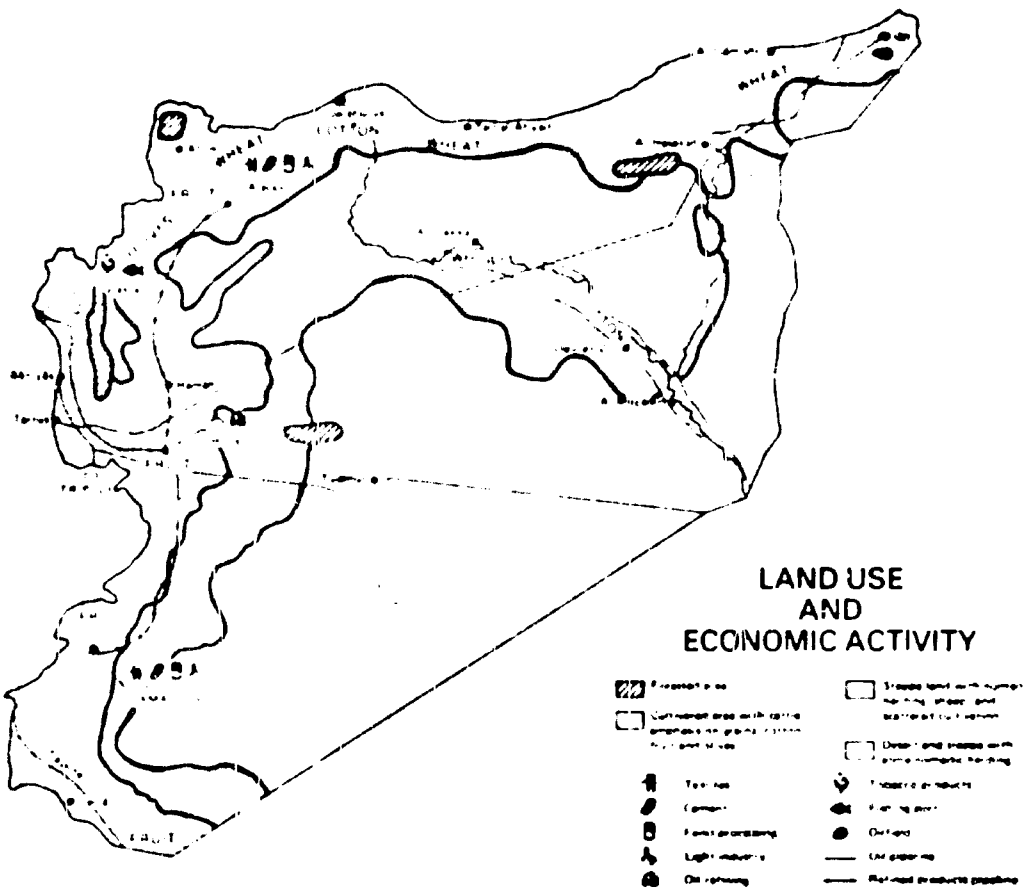


(Source: Economist Intelligence Unit, Annual Supplement 1977)*

*Labor force structure for 1977, as reported in Economist Intelligence Unit, Annual Supplement 197[illegible] differs somewhat: Agriculture, fore[illegible]ry,etc.: 37.8%; mining and quarrying: [illegible].3%; manufacturing: 13.3%; electricity, gas,water: 0.9% building and construction: 8.9%; wholesale and retail trade, restaurants and hotels: 10.2%; transport and communications: 6.0%; financing, insurance and real estate brokerage: 0.6%; social and personal services: 19.1%; miscellaneous 2.8%

**GDP for 1978, as reported in Economist Intelligence Unit 1980, was as follows: Agriculture: 18.1%; mining and manufacturing: 21.2%; construction: 4.4%; real estate: 4.5%; banking and finance: 2.4%; government: 24.2%; transport and communications: 8.3%; trade 19.5%; services: 7.3%.

Syrian Arab Republic



3.1 General economic situation

Syria is classified as a middle income country by the World Bank, ranking, in terms of 1977 GNP per capita, 67th on the World Bank's list of 125 countries (on which country no. 1 is the world's lowest income nation) (World Bank 1979).

Syria's economic growth rate has varied over the last few years. After experiencing an annual rate of 13% in real terms during 1974-76, Syria saw an annual economic growth rate of 7.6 in 1976, only 2.6 in 1977, and 4.9% in 1978, far short of the growth rate called for in the fourth five year plan (see below) (Economic Intelligence Unit 1980:17)

Wheat and cotton are Syria's chief economic crops and provide a substantial but increasingly less important percentage of its exports, petroleum, production of which began in 1968, having become Syria's leading export. Although the Syrian economy was virtually brought to a halt by the October 1973 war with Israel, the economy managed to recover rapidly following that wa to a large extent because of aid from other Arab nations. Economic difficultie related to the troubled international situation in the Mideast still remain, however; an influx of refugees from Lebanon, the cost of military intervention in the Lebanese Civil War, and the expense of maintaining its share of the 30,000-man Arab Deterrent Force in Lebanon have all put some strain on the Syrian economy (Europa Year Book 1980:1466).

Although steps were taken in the mid-1970's to revitalize private enterprise and encourage closer links with the Western European and U.S. economies, Syria continues to have a planned socialist economy dominated by the public sector (Economic Intelligence Unit 1980:4-5).

3.2 Development plan and its expenditures

Investment in the Fourth Five Year Plan, 1976-1980
(thousands of pounds)

	Public sector investment	Private, cooperative and mixed sector investment	Total
Euphrates dam	7,439,000		7,439,000
Irrigation, land reclamation, agri.	2,999,138	2,500,000	5,499,138
Industry & mining	9,889,416	1,400,000	11,289,416
Energy & fuels	7,985,500		7,985,500
Transport, communi	5,135,941	500,000	5,635,941
Commerce	944,336	200,000	1,144,336
Housing & utilities	3,996,601	4,088,479	8,085,080
Services	5,193,831	700,000	5,893,831
Municipalities	1,034,048		1,034,048
Popular work	159,710		159,710
TOTALS	44,777,521	9,388,479	54,166,000

Syria's first five-year plan dates back to the period 1960/61-1964/65, and the second went into effect in early 1965. Under the third five-year development plan (1970-74), the Syrian economy sustained a considerable expansion, principally because of large injections of capital and other forms of aid provided by Arab countries following the 1973 war with Israel. The fourth five-year plan (1976-1980), not actually announced until the autumn of 1977, aimed at GDP growth of 12% per year: industry and mining were to increase by 15%, construction by 15%, services by 11%, and agriculture by 8%. The plan size is 54 billion Syrian pounds, 44 billion to be provided by the public sector and the remainder by the private sector (Economist Intelligence Unit 1979:14-15).

As indicated, foreign aid and loans have played an important role in the implementation of Syria's development plans. Assistance from and cooperation with other Arab countries have been of particular significance (Economist Intelligence Unit 1980:16).

Syria's fifth five-year plan was due at the end of 1980. Broad guidelines for the plan emphasize: consideration of Arab economic integration; just distribution of the national income; liberalization of the public sector bureaucracy; encouragement of the private industrial and agricultural sectors; promotion of the agricultural sector; and the institution of fiscal reform (Economist Intelligence Unit 1980:17).

3.3 Agriculture

According to recent figures, agriculture employs about 38% of the Syrian labor force and contributes about 18% of the GDP (down from 21% in 1970). As indicated by the graph and table on page 48, about 29.7% of Syria's total land area was classified as cultivated land in 1977; however, only 20.9% of total land area was actually under crops.

Major crops are cotton, wheat, barley, maize, sugar beets, millet, various pulses, vegetables, oilseeds, olives, and fruit (see production tables on pages 49-50). Cotton is Syria's major export crop, but its relative importance in Syria's export picture has declined with the increase in petroleum exports; in 1978 cotton accounted for 12% of total export revenues, down from 43% in 1965, 33% in 1973, and 22% in 1974.

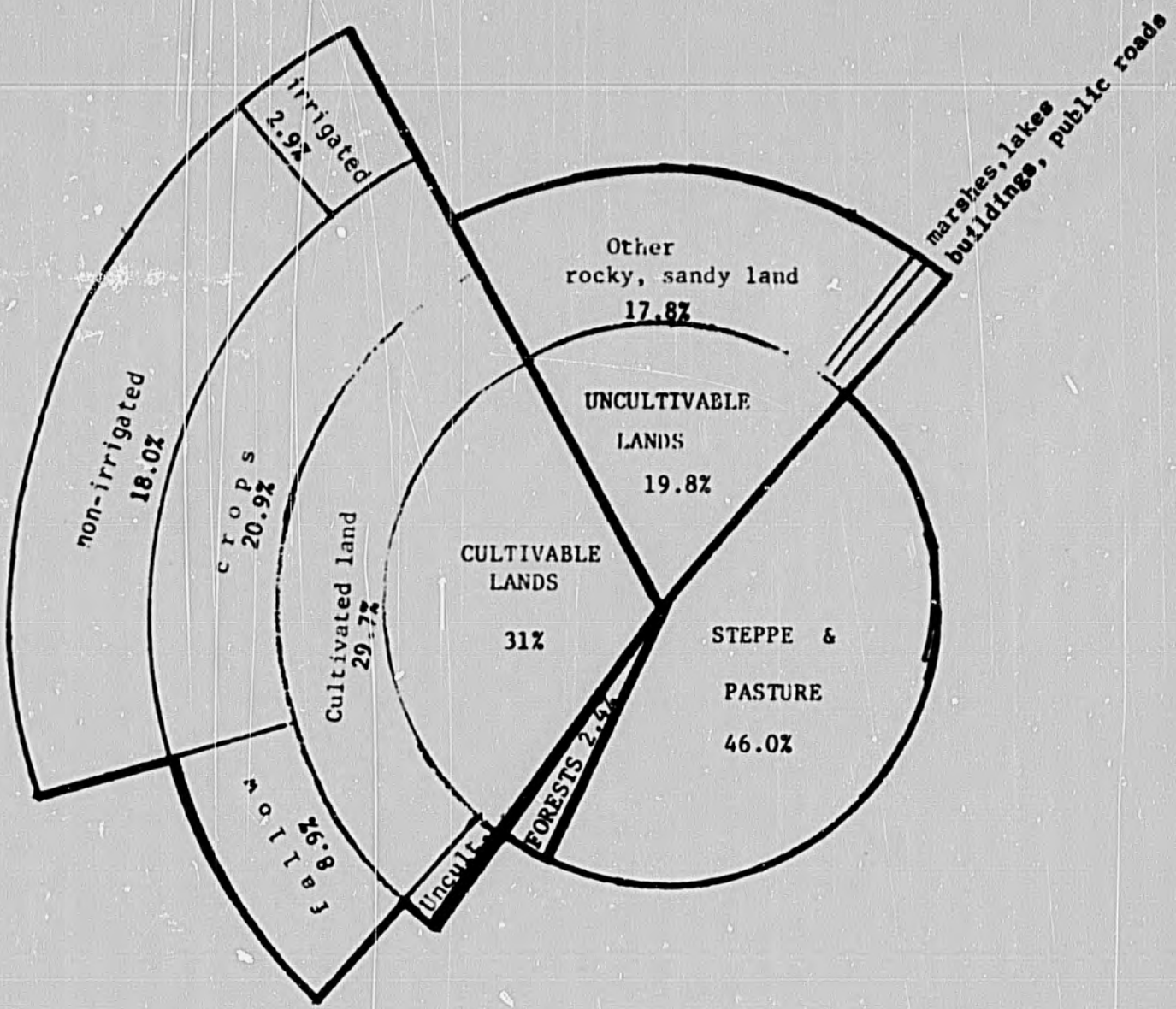
Agricultural performance has been directly dependent on rainfall levels, and years of drought have inevitably produced bad harvests. The development of new agricultural land using irrigation water from the Euphrates Dam is expected to change this situation, however, and make harvests more reliable (Economist Intelligence Unit 1980:7-8). (See also 2.3.4.)

Areas in which major crops are grown are indicated on the map on page 48 (see also map on page 26).*

The livestock situation in Syria is indicated by the table on page 51. Despite moves to modernize procedures, livestock rearing remains primarily pastoral. In 1978 livestock production accounted for about 26% of agricultural output (Economist Intelligence Unit 1980:9).

---

*For a more detailed breakdown for crops and production by administrative district, see Appendix B.



LAND USE IN SYRIA (1977)

(source of statistics: Central Bureau of Statistics 1978:191)
(Area in 1,000s of hectares)

1. FORESTS	452				
2. STEPPE AND PASTURE	8,531				
3. UNCULTIVABLE LANDS	3,671				
Other rocky, sandy areas		3,293			
Marshes and lakes		106			
Buildings, public roads		272			
4. CULTIVABLE LANDS	5,864				
Uncultivated		355			
Cultivated		5,509			
fallow			1,642		
cropped			3,867		
irrigated				531	
non-irrigated				3,336	

TOTAL LAND AREA 18,518

SYRIAN AGRICULTURAL PRODUCTION 1977 (Source: SAR. Central Bureau of Statistics. 1978).

Crop	Cultivated area (1000s of hectares)	%age of total cult.area	Production (1000s of tons)
CEREALS			
Total	2,602	67.2%	1,638
Wheat	1,528		1,217
Barley	1,021		337
Oats	1.8		1.6
Maize	26.2		58.7
Millet	24.9		23.7
Rice	0.1		1.2
DRY LEGUMES			
Total	138	8.2%	226
Lentils	178.3		117.3
Chick-peas	41.1		25.0
Dry broad bean	8.0		12.6
Dry haricot bean	6.1		10.7
Peas	0.8		0.7
Dry kidney	1.0		1.3
Rambling vetch	38.5		30.0
Flowering sern	16.6		12.7
Bitter vetch	27.4		15.7
VEGETABLES			
Total	249	6.4%	2,590
Dry onion	9.4		161.5
Dry garlic	1.4		11.8
Green pepper	2.8		30.2
Tomato	32.8		453.6
Potato	12.8		164.0
Egg plant	6.2		114.1
Broad beans	7.4		52.1
Green peas	1.0		5.2
Haricot beans	3.8		30.4
Cucumbers	18.7		177.5
Okra	8.2		22.8
Squash	7.2		99.7
Cabbages	3.3		65.2
Cauliflowers	3.1		58.3
Pumpkins	5.1		40.8
Watermelons	87.7		716.5
Other melons	25.9		201.2
Green onion	3.1		43.7
Green kidney bean	1.9		7.0
Leaf beet	1.0		15.6
Lettuce	1.6		39.0
Parsley-co	0.2		2.2
Other vegetables	4.5		77.9

Crop	Cultivated area(1000s of hectares	%age of total cultivated area	Production (1000s of tons)	
INDUSTRIAL CROPS				
Total	276	7.1%	729	
Cotton	186.5		394.8	
Sugar beet	12.1		273.3	
Tobacco	15.3		11.5	
Peanut	10.9		20.2	
Sesame	39.3		18.3	
Sunflower	5.0			
Aniseed	0.9		0.8	
Cumin	3.1		0.8	
Sumac	1.5		1.1	
Hemp	0.3		0.2	
Indian millet	1.1		1.0	
Castor mustard	0.1		0.0	
FRUIT TREES				No. of trees in 1000s (total/fruit bearing)
Total	426	11.1%	829	125,897/95,815
Grapes	94		353	72,775/59,983
Olives	228		175	28,846/18,268
Apricots	12		32	2,850/ 2,140
Peaches	3.3		18.6	1,152/ 822
Apples	19		61.2	5,873/ 3,081
Pears	2.6		7.9	789/ 478
Plums	3.2		12.0	1,082/ 710
Green plums	2.8		10.4	918/ 602
Almonds	7.5		15.5	2,419 1,393
Nuts	4.0		11.7	524/ 342
Quince	0.2		0.6	92/54 54
Fig	21		45	4,500/ 3,654
Pomegranates	4.9		24.0	2,361/ 1,641
Cherries	5.3		13.8	2,365/ 732
Pistachio	13.2		5.4	2,690/ 886
Bananas			0.1	9/ 10
Orange	2.5		24.5	828/ 502
Lemon	0.9		6.3	337/ 183
Other citrus	1.5		11.7	454/ 328
Loquat			0.1	17/ 18

SYRIA
LIVESTOCK NUMBERS AND PRODUCTION (from FAO Yearbook 1978)
[*indicates unofficial figures; F=FAO estimate]

ANIMAL	NUMBERS (in thousands of heads) 1969-71	1976	1978	PRODUCTS (slaughtered (sl):thousands of heads; carcass weight (car.wt.) and milk per cow in kilograms per animal; meat, wool, milk, and skins production in thousands of metric tons; eggs in metric tons)	1969-71	1976	1978
sheep	5,845	6,490	7,397F	mutton&lamb			
				sl.	2,200	2,800	2,892F
				car.wt	18	18	18
				meat pr.	40	50F	52F
				milk	218	285	240F
				skins	6,600	8,400F	8,675F
				wool(greasy)	14,300	13,000	14,400F
				(scoured)	7,136	6,560	7,200F
goats	742	756	1,039F	goat meat			
				sl.	308	450F	456F
				car.wt.	17	17	17
				meat pr.	5	7F	8F
				milk	57	72	73F
				skins	925	1,350F	1,375F
cattle	516	574	749F	beef&veal			
				sl.	95	125F	125F
				car.wt.	110	110	110
				meat pr.	10	14F	14F
				skins	1,615	2,125F	2,125F
milk cows	171	252	296F	milk per c.	1,156	1,195	1,154
				fresh milk	197	307	341F
				butter	9,305	10,263	9,155F
				cheese(all kds)	26,510	34,550	34,200F
camels	1	1	2F				
buffaloes	1	2	2F	milk	1	1	1F
pigs		1					
chickens	8,255	9,897	4,673	poultry meat	14	25	31F
				hens' eggs	15,550	35,000	33,900F
ducks	18	58	68				
				other eggs?			
turkeys	765	1,125	337F				
horses	46	54	55F				
mules	44	47	48F				
asses	240	274	242F				
OTHER PRODUCTS							
raw silk					54	47F	44F
honey					245	580	340F

Land reform was initiated in September 1959 by a decree limiting land holdings to 50 hectares of irrigated land or 300 hectares of rainfed land per person. Early in 1969 the government announced completion of the first stage of land reform with the redistribution of 708,000 hectares in 1,413 villages to 40,000 families. The second stage of the land reform program involves the development of agricultural cooperatives. By 1978, 23% of all cultivable and 23% of all cultivated land was managed by cooperatives (Economist Intelligence Unit 1980:9).

use of pesticides and fertilizers

No detailed data were available on use of pesticides in Syrian agriculture; however, Syrian import statistics indicate that imports of insecticides, although fluctuating somewhat from year to year, have generally risen over the past decade. In 1977 Syria imported 2,566 tons of insecticides at a value of 24,762,000 Syrian pounds (Syrian Arab Republic. Central Bureau of Statistics 1978:379). In its 1972 report to the U.N. Conference on the Human Environment, the Syrian government noted that a wide range of pesticides was in use in the country and expressed concern about potential soil pollution from this source (Human Environment...1972).

The use of chemical fertilizers of several types has been on the increase in Syria. Total chemical fertilizer use grew from 157,025 tons in 1971 to 259,380 tons in 1977. In 1977 nitrogen fertilizers accounted for 71% of fertilizers in use, phosphatic fertilizers for 25%, compound fertilizers for 2.1%, and potassium fertilizers for 1.3% (Syrian Arab Republic. Central Bureau of Statistics 1978:241).

3.4 Manufacturing industry

Syrian manufacturing industry, which experienced a period of slow growth following nationalization of the industrial sector in 1964 and 1965, picked up significantly in the 1970's; along with mining it accounted for 24% of Gross Domestic Product in 1977 (21% by preliminary figures for 1978) and occupied some 13.3% of the labor force (Economist Intelligence Unit 1980).

Output of selected industries (1000s of tons)

	1974	1975	1976	1977	1978
Cement	965	994	1,110	1,395	1,497
Sugar	148	117	126	104	105
Woolen fabrics (tons)	1,347	1,536	1,441	1,609	1,403
Vegetable/olive oil)	70	55	80	62	94
Cotton&silk textiles	35	37	37	42	40
Glass products	25	25	25	25	23
Manufactured tobacco	25	25	25	25	23
Index of industrial production (1975=100)		100	112	113	128

Source: Economist Intelligence Unit 1980:13

4.0 ORGANIZATIONS WITH INTEREST IN ENVIRONMENT AND NATURAL RESOURCES

4.1 CENTRAL GOVERNMENT STRUCTURE

Under the Syrian constitution, promulgated in 1973, the head of state is the president, who is also the commander-in-chief of the armed forces, the secretary general of the Baath Socialist Party, and the president of the National Socialist Front. Supreme power rests in the president who may, among other things: appoint or dismiss the vice president, the prime minister and other state officials; convene and dissolve the People's Council; issue laws and ordinances when the People's Council is not in session; and veto legislation, although such a veto may be overridden by the Council during a second review.

The president appoints both the prime minister and his cabinet and may dismiss them at any time. As of March 1981 there were 38 ministers, including the Prime Minister and his deputies, six of whom were entitled simply Minister of State. Those ministries whose work involves environment and resources are considered below.

4.1.1 Government ministries

4.1.1.1 Ministry of Public Works and Water Resources

The Ministry has responsibilities in the areas of agricultural uses of water, hydropower development, flood control, recreational water uses, and soil erosion control.

The Ministry of Public Works and Water Resources is responsible for overall water resources policy and planning; it therefore receives hydrological data and geological samples obtained by all establishments and administrative agencies performing exploration for underground water. The Ministry also fixes the ceiling on the quantity of water authorized to be used, the areas that can be irrigated, the restrictions to be imposed on underground water drilling and extraction methods, and the conditions for water conservation and utilization as calculated according to prevailing conditions in each region. The Ministry issues authorizations to install pumping equipment more powerful than 10 horsepower. It is responsible for undertaking studies and plans necessary for the construction of small dams and, in particular, of irrigation and drainage networks, for which it bears all corresponding costs. It also undertakes the implementation of dams and their appurtenances; in cases where implementation is put into the hands of a cooperative association or any other authorized organizations, the Ministry provides the organization free of charge with the experts and technical assistance necessary to perform the task. It is also charged with the general supervision of the construction and maintenance of dams and their appurtenances as well as of the policing and control thereof. The Ministry controls the activities of the Syrian Arab Waterworks Company, a state-owned enterprise having independent corporate legal status; it issues directives to the company on matters such as: approval of all the company's contracts resulting from bids before their execution; prior approval on the conclusion of negotiated contract

agreements or the implementation of works; and loans contracted by the company with banking institutions. The Minister of Public Works and Water Resources is also a member of the High Committee of the Euphrates Project (Caponera 1978:290-291).

The Ministry also has responsibilities in the area of water pollution control and has been active in the drafting of legislation for the control of water pollution in the rivers, lakes, ports, harbors, seashores, reservoirs, canals, and streams in the country (JPRS 64090, Feb 12, 1975: 26).

The General Directorate for Combating Water Pollution

The Directorate has completed surveys of the sources of water pollution in the Barada River and in the canals branching from it. It has also conducted a campaign to force industrial plants along the river and its canals to treat their wastes before dumping them into rivers and canals (JPRS 69407, June 12, 1977:15).

Department of Irrigation

The Surface Water Bureau of the Department is responsible for the measurement of the flow of streams, while the Groundwater Bureau bears the responsibility for groundwater investigations. Other Bureaus within the Department are in charge of surface water resources development and management.

4.1.1.2 The Ministry of Agriculture and Agrarian Reform

The Ministry represents the merger--effective as of 1967--of the Agrarian Reform Agency, which had previously been charged with operations relating to the expropriation, distribution and management of expropriated lands, and the Ministry of Agriculture.

The Ministry exercises control over the public agency in charge of the management, organization and utilization of the Ghab lands in the Rift Valley Region of the country and is in charge of managing and organizing irrigation and agricultural, economic and social matters on agricultural land according to government plans.

The Ministry exercises control over agricultural cooperative associations in all fields. It also issued directives to the Agricultural Cooperative Bank and appoints, by order, the representatives of the Cooperative Unions and of the Farmers' Union to membership on the bank's managing board, which also includes a representative of the Ministry.

Within the area of water pollution control, the Ministry is responsible for issuing authorizations for the construction of factories and laboratories and the installation of pipelines for petroleum and chemicals near public waters; these authorizations lay down measures designed to prevent water pollution by harmful wastes (Caponera 1978:289).

With regard to fishing, the Ministry fixes, by order, the number of permits to be issued to boats and to standing fishermen in each public water area.

The Ministry can also, on the decision of the High Council on Aquatic Life, prohibit fishing from boats on all or particular public waters.

The Minister of Agriculture and Agrarian Reform is also a member of the High Committee of the Euphrates Project.

Directorate of Forests

The Directorate is responsible, among other things, for reforestation projects involving the establishment of a green belt area to protect against desertification (Syria et Monde Arabe, no. 294, August 25, 1978:58-60).

Directorate of Statistics and Planning

The Directorate is responsible for the collection of annual data on the agricultural sector (both plants and livestock) from the village registers approved by the Central Bureau of Statistics and the General Farmers Union. The Directorate has a record of the area subject to expropriation under the Agrarian Reform Law and also has a record of state domain land.

Steppe Department

The Department works in the area of range improvement. It publishes reports of its activities. The Wadi Al Alazib Range and Sheep Experiment Station is affiliated with the Department (Johnson and Norvelle 1978:58).

Fisheries Office
Latakia

Agricultural Research Department

Syrian Cotton Bureau

4.1.1.3 The Ministry of Public Health

In addition to its other public health responsibilities, the Ministry is responsible for the surveillance of drinking waters from the standpoint of health. Within the central administration of the Ministry is a laboratory division, one of whose tasks is the chemical and biological analysis of drinking waters (Caponera 1978:291).

4.1.1.4 The Ministry of the Euphrates Dam

The Ministry is the administrative agency responsible for the important Euphrates Dam project and has special funds for the implementation of the dam (Caponera 1978:291).

4.1.1.5 Ministry of Oil and Natural Resources

Directorate of Geological Research and Mineral Resources
Fardos Street
Damascus

4.1.1.6 Ministry of Local Administration

Among other things, the Ministry exercises the functions and prerogatives devolving upon the Ministry of Health in the study, supervision, and implementation of projects for raising the health and sanitation level in villages, including the drainage and reclamation of swamps and ponds around inhabited areas (Caponera 1978: 289).

4.1.1.7 Ministry of Defense

General Directorate of Harbors

The General Directorate has responsibilities relating to the control of pollution of the sea by oil under Law No. 10 of March 26, 1972.

The General Directorate has established a laboratory to analyze sea water in order to ascertain on a regular basis the level of pollution. As reported in mid-1977, the Laboratory had produced good results and was working to expand its activities in cooperation with the Higher Sciences Council and the Ministry of Public Works and Water Resources (JPRS 70011, Oct 21, 1977: page 21).

The Army Geographical Service

This is the main cartographic agency in the Syrian government.

General Directorate of Meteorology

The General Directorate of Meteorology runs meteorological stations "fully equipped with various meteorological instruments (Syria: Central Bureau of Statistics 1978). The office has data since 1952 for the following six stations: Damascus, Hama, Aleppo, Kamishli, Deir-es-Zar, and Latakia). The General Directorate has also been engaged in the study of air pollution, particularly with regard to potential problems from the cement factory under construction at Tartus on the Mediterranean coast (JPRS 75526, April 18, 1980:22).

4.1.1.8 Ministry of the Interior

As reported in July 1978, the Prime Minister had issued a decree authorizing the Ministry of the Interior to deal with environmental problems with the aid of concerned ministries, the High Council of Sciences, and committees established to study subjects related to pollution. The Ministry was granted the right to take all necessary measures and to solicit help from anyone with knowledge and experience in this field in order to complete the task at hand (JPRS 71583: July 31, 1978:22).

4.1.1.9 Ministry of Housing and Utilities (MHU)

The Ministry is responsible for all water supply and sewerage in urban and rural areas in Syria, the exception being the eight major cities, which have semi-autonomous water authorities. Although its function is chiefly advisory in large municipalities, its responsibility in rural areas includes not only conceiving and designing water systems by also their construction and subsequent operation and maintenance (A.I.D./Syria/Near East. 1979. Provincial Water Supply Project no. 276-0024: 8-9).

Located in Damascus, the MHU consists of three directorates: the Directorate of Water Supply (DWS) is responsible for all aspects of water system design (mechanical, electrical, and water fountain placement), including source of supply, treatment plants, main distribution lines, and storage reservoirs. The DWS also provides some supervision of construction, especially for larger projects, and continual support on technical questions as they arise during construction. The Mechanical Directorate of the MHU is responsible for design of the mechnical and electrical components of the water distribution and treatment plant systems. The third directorate is responsible for sewerage.

The Ministry maintains a Directorate of Housing and Utilities (DHU) in each of the 13 administrative provinces or muhafazats into which the country is divided. Each of these has responsibility for construction and operation of the rural water system in its muhafazat.

With regard to sewerage, the MHU has drawn up a plan to organize the sewers of the residential areas in the important Barada Basin with the aim of protecting the waters of the Barada River from pollution resulting from human wastes. The Ministry has also studied a modern and independent sewerage network and treatment plant for the city of Damascus through a contract concluded with an independent consulting company. Within the framework of this contract, the Ministry is also conducting a study, slated for completion in early 1979, for the control of water pollution in the Barada River (JPRS 69407, July 12, 1977:14).

4.1.1.10 Ministry of Education

4.1.1.11 Ministry of Higher Education

Superior Council for the Sciences

The Council is responsible for science policy in other government ministries, in universities, and in the private sector (Frame and Sprague 1978:126).

4.1.1.12 Interministerial cooperation

As reported in mid-1977, it had been decided to set up a committee, composed of the Minister of Public Works and the Minister of Housing and Utilities, along with representatives of municipal councils, to study economic bids and to establish

a consulting office to study two water plants to deal with coastal pollution problems in Aleppo and Latakia, with emphasis on their beaches (JPRS 71583: July 31, 1978:22).

4.1.2 Other central government organizations

4.1.2.1 Central Bureau of Statistics

Located within the Prime Minister's Office, the Central Bureau of Statistics is responsible, in cooperation with other agencies, for the collection and interpretation of statistics covering a broad range of social and economic activities in Syria. Its annual Statistical Abstract presents statistics covering: agriculture; industry; building and construction; transport and communications; foreign trade; prices and internal trade; education, university and higher; health; justice; tourism, culture and information; cooperatives, unions, and popular organizations; finance; economic and social establishments; national accounts; and comparative Arab and international statistics. It also includes a brief survey of the physical features of the country.

In 1970 the Central Bureau of Statistics undertook the first agricultural census in the history of the country; basic data was gathered on the general structure of agricultural holdings, on their owners, and on various other aspects of agricultural activities. Data was collected in the field and processed with the help of computers (Syria, Central Bureau of Statistics 1978:179-180).

4.1.2.2 The High Council for Planning

Consisting of a number of Ministers, the High Council has as its mission the determination of the general framework of social and economic objectives for Syria, the discussion and adoption of draft plans for the long and medium terms as well of the annual plans for submission to the Council of Ministers, and the adoption of the measures necessary to ensure the coordination of the various parts of the plan and to ensure plan implementation and the realization of plan objectives with the guidance of competent authorities (Caponera 1978:292). The present five-year plan (the fourth) covers the years 1976-1980.

4.1.2.3 The High Committee of the Euphrates Dam Project

The High Committee consists of a number of ministers including, among others, the Minister of Public Works and Water Resources, the Minister of Agriculture and Agrarian Reform, and the Minister of Local Administration; its task is to direct and formulate the high policy on the Euphrates Dam Project. It adopts the general plan of the Project and relates it to the general framework of State policy national economic and social development plans, decides the stages of methods of plan implementation, and examines all related questions (Caponera 1978:292).

4.1.2.4 The High Council for Aquatic Life

Responsible for the planning of government policy on the protection and development of aquatic life, the council consists of the Ministry of

Agriculture and Agrarian Reform or his representative as Chairman, the Director General of Ports as Vice-Chairman, and six members representing various other ministries, including Public Works and Water Resources and Local Administration.

4.2 LOCAL GOVERNMENT

Administratively Syria is broken down into 13 provinces or muhafazat: Tartous, Daraa, Al Suwayda, Hims, Dayr al Zawr, Al Hasakah, Al Raqqah, Halab, Idlib, Al Ladhiqiyah, Hamah, Al Qunaytirah, and Dimashq (Damascus). Damascus is an independent municipality with the status of a province. Below the provinces are the mantika (districts), which are in turn divided into nawahi (localities). At the bottom of the local administrative structure are the villages. Provinces are headed by governors (muhaafez), mantika by district officers (mudir al nawahi), and villages by mukhtar. Popular government on the local level is provided by a Provincial Assembly (with three-quarters of membership elected and one-fourth appointed by the Department of the Interior and provincial governments) within each province, as well as by district and village councils with limited popular participation. Towns with an elected mayor have municipal councils. Nomadic tribes have their own governments, headed by a shaykh or chief who acts as the government's principal representative in legal and fiscal matters (Kurian 1978:1367-68).

With regard to water management, local government units are responsible for water resources at their own level without being subject to the control of the Ministry of Local Administration. The provincial (muhafazat) councils provide water supply, electricity and canal network services and organize cooperation with the people with the aim of adopting measures on cleanliness of rivers and protection against floods; they also propose dam construction and provide for the conservation of public domain waters. Furthermore, the muhaafez (governor) represents the central executive power in the province and acts on behalf of all the ministries (Caponera 1978:292). Thus it is the governor who issues the authorizations for the pumping of water when equipment power does not exceed 10 horsepower.

The City Council (population centers with more than 20,000 inhabitants) and the Town Council (centers ranging from 10,000 to 20,000 inhabitants) have control over all works dealing with city or town development. They act for the provincial council in matters concerning water resources, establishing water supply services and dealing with protection against both fire and floods (Caponera 1978:293).

The rural unit council or the village council have responsibilities such as the implementation of the agricultural plan for the muhafazat within the village framework and improving irrigation methods.

4.3 UNIVERSITIES, SCIENCE AND TECHNOLOGY, RESEARCH INSTITUTES

4.3.1 Universities and higher education

4.3.1.1 Basic statistics (Frame and Sprague 1978)

Students by type of institution (1974)

Institution	number of students
University	61,253
Teacher training	194
Other	2,747

Students in national institutions by field of study (1974)

Field of study	number of students
Natural sciences	8,291
Engineering	8,758
Medical sciences	6,219
Agricultural sciences	6,876
Social sciences/humanities	33,950
Students abroad	6,546
TOTAL	70,650

Degrees awarded (1974)

Field of degree	number of degrees
Natural sciences	616
Engineering	496
Medical sciences	597
Agricultural sciences	625
Social sciences/humanities	3,337

4.3.1.2 University of Damascus (World of Learning 1979-80)

Damascus

Founded: 1923
Under state control
Language of instruction: Arabic
Number of students: 39,241
Number of teachers: 745

Selected faculties:

Faculty of Agriculture
Specialists in: Agricultural Science, Field Products, Dairy Technology, Plant Physiology, Industrial Science, Food Chemistry, Agricultural Economics

Faculty of Commerce
Specialists in: Political Economy, Business Administration, Applied Statistics, Accounting, General Administration
Faculty of Education
Faculty of Engineering
Specialists in: Technological Engineering, Physics, Irrigation
Faculty of Dentistry
Faculty of Law
Faculty of Medicine
Faculty of Pharmacy
Faculty of Sciences
Specialists in: Zoology, Algebra and Statistics, Vertebrates, Botany, Morphology and Microbiology, Inorganic Chemistry, Nuclear Reaction, Electrical Engineering, Taxonomy of Angiosperms, Organic Chemistry, Physical Chemistry, Geology, Animal Physiology, Atomic Physics, Pure Mathematics, Light

The Department of Botany is engaged in a systematic study of the flora of Syria.

4.3.1.3 University of Aleppo
Aleppo

Founded: 1960

Under state control
Number of students: 19,122
Number of teachers: 417
Languages of Instruction: Arabic, French, English

Selected faculties:
Faculty of Engineering
Hydraulics Laboratory
Hydrodynamics Laboratory
Water Analysis Laboratory
Industrial Hydraulics Laboratory
Faculty of Agriculture
Faculty of Medicine
Faculty of Sciences
Faculty of Economic Sciences
Faculty of Veterinary Science

Affiliates: Agricultural Research Centre
Technical Institute for Agriculture
Technical Institute for Engineering
Intermediate School of Medicine

As reported in early 1978, a scientfic association for studies of solar energy had been established as the University of Aleppo, reflecting public and government interest in the use of alternative energy from the sun (Uniterra, February 1978: 7).

4.3.1.4 Tichreen University (World of Learning 1979-80)
Latakia

Founded: 1971
Number of students: 4,695
Number of teachers: 50
Language of instruction: Arabic

Faculties: Faculty of Sciences
Faculty of Agriculture
Faculty of Arts
Faculty of Engineering
Faculty of Medicine

4.3.2 Science and technology

4.3.2.1 Basic indicators (Frame and Sprague 1978)

Scientists and engineers (1972)

Field	numbers
Fundamental sciences	1,240
Agricultural sciences	1,031
Medical sciences	3,287
Engineers	3,155
TOTAL	8,713

Scientists and engineers by economic sectors (1972)

Sector	numbers
Productive	1,481
General services	5,780
Public administration	1,482
TOTAL	8,713

4.3.2.2 The state of science and technology

Science policy in Syria is organized under the Ministry of Higher Education. The Superior Council for the Sciences under this ministry is responsible for science policy in other government ministries, in universities, and in the private sector (Frame and Sprague 1978:126).

During the 3rd five-year plan (1972-75), the government had budgeted 29,163,000 pounds for the development of scientific research. An additional 13,600,000 pounds were budgeted to create centers for scientific researtch. In all, 1% of the total state budget was to be devoted to the development of scientific research (Frame and Sprague 1978).

Principal research centers in Syria are the various faculties of the Syrian universities as well as the Agricultural Research Department and

the Syrian Cotton Bureau, both under the Ministry of Agriculture and Agrarian Reform. Also located in Syria is the Arab Center for the Studies of Arid Zones and Dry Land (see below).

With regard to scientific publication, Syria, as of 1974, had only two scientific publications, the lowest number of any country in the Middle East (Frame and Sprague 1978:10).

4.3.3 Other research institutions (Paylore 1977:112-114)

Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD)
P.O. Box 2440
Damascus

ACSAD is a regional center controlled by a Board of Directors representing the member states.

Scope of interest: Undertaking regional studies and dissemination of information among Arab countries concerning a variety of fields, including: water resources, soil classification and soil-water relationships, field crops, pastures, sheep improvement, range management, crop rotation, and soil conservation.

Stations and facilities: ACSAD has hydrological field sites as Abou Galaa Representative Basin, along the Homs-Palmyra (Tudmur) Road, in the Dawwa Basin between the northern and southern Palmyran Mountains, and in the Hamad Basin. Experiment stations in Syria are located at Izraa and Hemo (field crop sites), at Deir el-Zor (soil-water), and at Hama and Salamia (sheep studies).

ACSAD has a soil and hydrological laboratory and a working library.

Research programs as of 1976 comprised: hydrological projects, including groundwater problems, surface water studies, and geothermal investigations, solar energy, wind power, remote sensing, and preparation of a water resources map of the Arab world at a Scale of 1.1 million; dryland framing; fruit tree studies; range management studies, soil water studies, and animal production.

Publications: Papers (in Arabic, with English summaries) are issued in various sub-series: hydrological, field crops, fruit trees, range management, soil and water, and animal production; Reports; Annual Technical (Progress) Reports (in Arabic). Some reports are published in English; see, for example, Khouri and Rasoul Agha 1977 (Ground Water in the Syrian Arab Republic), which was a valuable source for the preparation of the present profile.

4.3.4 SYRIAN NATIONAL COMMITTEE FOR THE MAN AND THE BIOSPHERE (MAB) PROGRAM

Chairman

Dr. Said AL-HAFFAR
Professor of the Faculty of Agriculture
Damascus University

Members

Dr. Ahmad Dib DASHASH
Professor at the Faculty of Medicine
Damascus University

Dr. Anwar AL-KHATIB
Professor at the Faculty of Sciences
Damascus University

Dr. Anwar KAMEL
Department of Health Engineering
Ministry of Defense

Mr. Taha AL-ATRASH
Department of Health Engineering
Ministry of Municipal and Rural Affairs

Mr. Abdul-Karim AL-MALLUHI
Department of Meteorology
Ministry of Defense

Mr. Issam JANO
Deputy President
Tichreen University (U. of Latakia)

Mr. Kazem ZEITUNEH
General Director of Harbors
Ministry of Defense

Dr. Mohamed ANADANI
Department of Soils
Ministry of Agriculture and Agrarian Reform

Mr. Mohamed Hamdi AL-RIFAI
Director of Planning
Ministry of Oil and Natural Resources

Mr. Sadallah SHAWAF
Director of Pollution Control
Ministry of Public Works

Address for official correspondence:

Mr. Adnan RIFAI
Secretary-General
Supreme Council of Sciences
Abi Al-Alaa Al-Maari St.
Damascus

5.0 LEGISLATION DEALING WITH ENVIRONMENT AND NATURAL RESOURCES

5.1 WATER LEGISLATION

5.1.1 Water use and water ownership

Under the Constitution of the Syrian Arab Republic, the principal of the ownership by the people is established; this includes, among other things, natural resources to be exploited to the benefit of the people as a whole, but also allows for private ownership with maximum limits to be established by law. Under the Agrarian Reform Law of 1958 (see below), as subsequently amended, a ceiling was established on the ownership of both irrigated and non-irrigated land. In the years following the promulgation of this law, the state seized lands in excess of the authorized maximum. Waters flowing on these expropriated lands, as well as those flowing on Public Domain Lands, are thus regarded as the property of the people and, accordingly, of the state. Private ownership of land and waters is governed by the Civil Code of 1949; under this Code the principal that the ownership of the soil includes in height and depth what is above and below it up to the limit required for the use of the soil is applicable. Thus, the landowner enjoys ownership rights over springs rising on and over underground water occurring under his land (Caponera 1978:282).

The right to use public surface or underground waters is granted through the issuance of water-use licenses. The right to use private surface or underground waters is acquired by successsion or transfer of the land as recorded in the land register. However, the use of either public or private surface and underground water by pumping and of public waters by the means of small dams is subject to a license (Law no. 3 of 13 February 1972, Article 10; Decree Law no. 165 of 27 September 1958 on the installation of pumping equipment on public waters, as amended). Drilling of wells of any depth whatever is also subject to a prior authorization issued by the administrative agency concerned (Order Law no. 79 of 16 March 1960).

No order of priorities among various areas, water uses or existing rights is prescribed in any legislative or administrative instruments pertaining to water resources.

Individual laws covering water ownership and use

Order-Law no. 165 of 27 September 1958 on the installation of pumping equipment on public waters.

Legislative decree no. 284 of 25 November 1960 amending Law no. 165 of 27 September 1958 regulating the installation of pumping equipment on public waters

Order law no. 79 of 16 March 1960 making the drilling of wells subject to a prior authorization issued by the interested administrataive agency

Law no. 3 of 13 February 1972 organizing dam operations.

5.1.2 Water pollution

It is reported that the General Directorate to Combat Water Pollution with n the Ministry of Public Works and Water Resources has been seeking the issuance of unified legislation for combating water pollution. As of mid-1977, such legislation had been completed in draft form; there is no indication that this legislation has actually been issued as law (JPRS 69407, July 12, 1977: 15). In the meantime the legislation considered below appears to be the major legislation covering this area; it could not be ascertained if permits for factory construction are still to be issued by the Ministry of Agriculture and Rural Reform rather than by the Ministry of Public Works and Water Resources.

Legislative Decree No. 30 on the Protection of Aquatic Life. 25 August 1964.

Chapter 6, articles 32 and 33, covers the protection of public waters. The dumping of factory and laboratory waste harmful to aquatic life and of chemical and oil waste from sewers and ships into public waters are strictly prohibited; owners of factories and laboratories as well as of oil tankers, pipe lines, and chemical substances are to "take the necessary measures to avoid damage to public waters."

Following the issuance of this decree, the construction of factories and laboratories and the laying of pipe lines for oil and chemical matters close to public waters are to be subject to authorization by the Ministry of Agriculture. The authorization is to state the measures to be taken to avoid the pollution of waters by harmful waste. Compliance is to be mandatory.

The Ministry of Agriculture is to issue orders stating general conditions for and limitations on the building of factories, the establishment of laboratories, and the laying of pipe lines in proximity to public waters; orders are also to state preventive measures to be taken by ships for the protection of public waters. Compliance is to be mandatory.

5.2 Soils

No legislation dealing directly with soils or soil conservation was identified.

5.3 Forests

Legislative Decree no. 66 of September 22, 1953, the Forest Code

Title I: Forests and forest products

Title II: State Forests
- -exploitation of state forests
- -marketing of forest products from state forests
- -transport and storage of state-forest products
- -rights to vist state forests in view of exploitation
- -usage rights in state forests
- -permits for usage rights in state forests
- -location of plants for the fumigation of tobacco

Title III: Woods and private forests belonging to villages, to individuals and to organizations

Title IV: Creation of protected zones

Title V: On the delimitation and demarcation of private forests

Title VI: On the protection of forests

Title VII: Penalties and civil liability

Legislative Decree no. 86 of September 22, 1953, Law on the Forest Police

Law no. 128 of August 23, 1958, protection of trees and plants from damage caused by goats

Each family in the western mountain region is permitted only one goat. Each village must have an appointed goatherd who carries a pass stating the number of goats in his care. Goats in excess of this number can be seized immediately by the authorities. Control of herds in assigned to the forest police.

5.4 Wildlife

Legislative Decree No. 152, issuing the hunting regulations. 23 July 1970.

Chapter I: Hunting and hunting methods

Chapter II: Hunting season

Chapter III: General provisions

Chapter IV: Hunting permits

Chapter V: The Hunting Council (Conseil Cynegetique)

Chapter VI: Secondary Hunting Councils

Chapter VII: Penalties

Legislative Decree no. 50 of April 5, 1979

This decree bans hunting for a five-year period as a measure to preserve wildlife. Penalties include fines and prison terms of up to two years (MEED, April 20, 1979: 47).

5.5 Fisheries

Legislative Decree No. 30 on the Protection of Aquatic Life. 25 August 1964.

The decree regulates fishing in: sea waters of the Republic extending 12 miles out from the coast; internal waters belonging to the State, including rivers and their tributaries; lakes, canals, streams, ponds, and provisional and permanent marshland; and the waters of estuaries. The decree covers both vegetable and animal life of economic value in public waters.

The decree establishes the Higher Council for Aquatic Resources with responsibility for the protection of aquatic life and the development of aquatic resources.

Title II, Regulation of Fishing, covers: fishing licenses (to be granted only to Syrian citizens or the nationals of other Arab Countries, with the exception of those involved in research or fisheries development, as authorized by the Ministry of Agriculture); fishing rights and taxes on fishing rights; fishing leases and fish breeding (preference is to be given to cooperative societies in leases of public sector waters either for fishing or breeding purposes; land owners may breed aquatic life in their own waters upon authorization of the Ministry of Agriculture); fishing vessels and fishermen (licensing of fishing boats under limitations laid down by the Ministry of Agriculture); fishing gear (only certain sizes of fish may be taken; use of explosives and poisons is strictly prohibited); protection of public waters (see above under water legislation); amateur fishing; the sale of catches.

Title III, Regulation of Sponge Diving, includes provisions authorizing sponge diving in all waters except those declared as protected by the Minister of Agriculture, requiring diving permits valid for a single season running from April 1, to September 30 of the same year, and restricting the landing of sponges to the places indicated on licenses.

Penalties cover several types of offenses. Those against provisions prohibiting the use of explosives, etc. include, for a first offense, imprisonment of from six months to three years, fines running from 200 to 1000 Syrian pounds, and confiscation of boat and fishing gear, and for second offenses, the maximum penalty specified for first offenses and the loss of further right to a fishing license.

Certain tax exemptions are specified for some motorized fishing vessels authorized to fish for the first time as well as for those already holding licenses. Benefits in the form of exemptions from customs duties on equipment, reduction of fishing taxes, and access free of charge to certain government services such as analyses in state laboratories are provided for cooperative societies.

Implementation: basic implementation is in the hands of the Ministry of Agriculture and Rural Reform, with assistance from the Ministry of Defense (General Directorate of Harbors) in matters dealing with sea fishing, and with the cooperation of the armed forces, the police force, and customs officials.

5.6 Pollution of the sea by oil

Law No. 10 of 16 March 1972 on the pollution of Syrian Arab regional waters and neighboring international waters.

Pollution is defined as pollution of Syrian Arab regional waters and neighboring international waters by petroleum or its derivatives or by other harmful oils. Waters are considered to be polluted whenever they have been infilitrated by such products, with the exception of oily mixtures containing a proportion of oils less than one hundred parts per million in the mixture. Adverse effects are defined as those involving waters, aquatic life, the coast, crops, tourist areas, or public health.

The following are considered responsible for pollution: the ship owner, master, or approved agent where pollution is caused by a ship; the owner or operator of installations or factories, where the polluting source is land-based; the owner or operator of the apparatus or the person responsible for its possession, where pollution is caused by an apparatus used for storing, transporting, or pumping petroleum or other harmful oils. These persons are subject to a fine that increases with repeated offenses.

Masters of Syrian vessels are required to keep an oil record book as prescribed in the International Convention for the Prevention of the Sea by Oil. Fines result from failure to keep such a bock.

Any person contravening the provisions of this law is required to remove the consequences of the pollution at his own expense within a period to be established by the General Directorate of Harbors. Conditions under which exemptions from fines may be granted are stated.

5.7 Pesticides

Order no. 52 of February 10, 1971 of the Minister of Economic Affairs and Foreign Trade, rendering the importation of certain chemical products, medicinal products, domestic insecticides, and infant foods subject to the prior consent of the Ministry of Health.

Order no. 64/T of June 19, 1975, organizing the import, export, and possession of plants, agricultural pesticides, fertilizers, and other products in the field of animal husbandry and agriculture.

The order prescribes that the import or possession of certain commodities, including agricultural pesticides, and in particular agricultural insecticides and plant protection products, is subject to a license (valid until the end of the year in which issued) from the Ministry of Agriculture and Agrarian Reform.

5.8 Ionizing radiations, atomic energy

Order No. 1112 of December 19, 1973 containing provisions for the protection of workers against the hazards caused by ionizing radiations.

Law No. 12 of 5 April 1976 establishing the Public Atomic Energy Agency.

The law establishes a Public Atomic Energy Agency, responsible for all matters concerning atomic energy, including taking all necessary measures to ensure protection against the hazards caused by various forms of radiation, proposing the necessary legislation and supervising its implementation, and issuing regulations and instructions for this purpose.

5.9 Land reform and agriculture

Consolidated Text of Legislative Order No. 161 of 27 September 1958 on Agrarian Reform in the Syrian Arab Republic [in force as of 15 May 1962]

Limits land ownership, to 80 hectares of irrigated and wooded land, or 300 hectares of unirrigated land or 450 hectares in the unirrigated lands in the muhafazats of Hassake, Deir el Zor and El Rachid.

Deals with conditions of expropriation and various exceptions to the basic land ownership limits.

5.10 Mining and minerals

Mining Law no. 7 of 21 December 1953

Under this basic legislation and its regulations property in and control of all minerals in Syria are vested in the Government.

5.11 Antiquities

Decree Law no. 52 of August 10, 1977; amends Law 222 of 1963.

REFERENCE LIST

ACSAD [Arab Center for the Studies of Arid Zones and Dry Lands]. 1978. Objectives and Activities. ACSAD P.R./P4/78. Damascus: ACSAD, Public Relations Section.

A.I.D. 1975a. Syria--Damascus Water Distribution Project. AID-DLC/P-2113. Washington, D.C.: U.S. Dept. of State, Agency for International Development.

A.I.D. 1975b. Syria: Agricultural Inputs and Production Loan. AID/DLC/P-2069. Washington, D.C.: U.S. Dept. of State, Agency for International Development.

A.I.D. 1976. Syria--Euphrates Basin Irrigation Maintenance. AID-DLC-P-2167. Washington, D.C.: U.S. Dept. of State, Agency for International Development.

A.I.D. 1977. Syria: Rural Electrification. AID-DLC/P2252. Washington, D.C.: U.S. Dept. of State, Agency for International Development.

A.I.D. 1979. Project Paper. Syria: Provincial Water Supply. Project 276-0024. Washington, D.C.: U.S. Dept. of State, Agency for International Development.

A.I.D./B.N.E. 1979. Regional Cooperation in the Middle East. Washington, D.C. U.S. Dept. of State, Agency for International Development, Bureau for the Near East.

Akhraf, C. 1973. "Syria." In: World Atlas of Agriculture, vol. 2: 475-490. Novara, Italy: Instituto Geographico de Agostini.

Arab Economic Report. 1979. Beirut: General Union of Chambers of Commerce, Industry and Agriculture for Arab Countries. January 1979.

Caponera, D.A. 1978. Water Laws in Moslem Countries--2. FAO Irrigation and Drainage Paper 20/2. Rome: Food and Agricultural Organization of the United Nations.

Beaumont, Peter. 1978. "The Euphrates River--an International Problem of Water Resources Development." Environmental Conservation, vol. 5, no. 1 (Spring 1978):35-43.

Eastaff, D.J., C.J. Beggs, and M.D. McElhinney. 1978. "Middle East--Geotechnical Collection." The Quarterly Journal of Engineering Geology, vol. 11, no. 1, pages 51-63.

Economist Intelligence Unit. 1979. Quarterly Economic Review of Syria, Lebanon, Cyprus. Annual Supplement 1979. London: The Economist Intelligence Unit Ltd.

ECWA (U.N. Economic Commission for Western Asia). 1977. Report of the Economic Commission for Western Asia Regional Preparatory Meeting for the United Nations Water Conference. Baghdad, 11-16 December 1976. E/Conf. 70/8, 28 January 1977.

Elbabaly, Mostafa M. 1977. "Salinity and Waterlogging in the Near-East Region." Ambio, vol. 6, no. 1.

FAO/Unesco. 1977. FAO-Unesco Soil Map of the World 1:5,000,000. Volume VII. South Asia. Paris: Unesco.

Fisher, William B. 1978. The Middle East: A Physical, Social and Regional Geography. Seventh edition, completed revised and reset. London: Methuen & Co.

Frame, J. Davidson, and Aileen N. Sprague. 1978. Indicators of Scientific and Technological Efforts in the Middle East and North Africa. Prepared for the Office of Science and Technology, Agency for International Development. Washington, D.C.: Computer Horizons.

GSO [German Statistical Office]. 1978. Laenderkurzbericht: Syrien 1978. Stuttgart: W. Kohlhammer GmBH.

Human Environment: Volume II: Summaries of National Reports: Submitted in Preparation for the United Nations Conference on the Human Environment. 1972. Environment Series 201. Washington, D.C.: Woodrow Wilson International Center for Scholars.

IUCN. International Commission on National Parks. 1971. United Nations List of National Parks and Equivalent Reserves. 2nd edition. Brussels: Hayez.

Johnson, Jack D., and Michael Norvelle. 1978. Cooperative Research Potential in the Middle East: A Report to U.S. Agency for International Development Near-East Bureau. Tucson: University of Arizona, Arid Lands Natural Resources Committee.

JPRS [U.S. Joint Publications Research Service]. Worldwide Report: Environmental Quality [Earlier Title: Translations on Environmental Quality]. Arlington, Virginia: U.S. Joint Publications Research Service, Foreign Broadcast Information Service [Cited by JPRS no., series no., date, and page].

Khouri, Jean, and Wathek Rasoul Agha. 1977. Ground Water in the Syrian Arab Republic. Damascus: Arab Center for the Studies of Arid Zones and Dry Lands.

Kurian, George Thomas. 1978. Encyclopaedia of the Third World. New York: Facts on File.

La Fay, Howard, 1978. "Syria." National Geographic, vol. 154, no. 3 (September 1978).

MEED (Middle East Economic Digest). London: Meed House. Weekly.

National Basic Intelligence Factbook. 1980. GC BIF 79-001. January 1980. Washington, D.C.: Government Printing Office

Nyrop, Richard F. 1971. Area Handbook for Syria. (DA Pam 550-47). Washington, D.C: Government Printing Office.

Nyrop, Richard F. 1979. Syria: A Country Study. (DA Pam 550-47). Washington, D.C.: Government Printing Office.

Osterberg, Charles, and Stjepan Keckes. 1977. "The State of Pollution of the Mediterranean Sea." Ambio, vol. 6, no. 6, pages 321-328.

Paylore, Patricia. 1977. Arid Lands Research Institutions: A World Directory 1977. Revised and updated edition. Tucson: University of Arizona Press.

SMA (Syria et Monde Arabe: Etude mensuelle economique, politique et statistique). Damascus. Monthly publication.

Strebel, Otto. 1967. "Bodengesellschaften Syriens and des Libanon." Geologisches Jahrbuch, vol. 84, pages 1-22.

Syrian Arab Republic(SAR). Central Bureau of Statistics. 1977. Statistical Abstract 1978. Damascus: Central Bureau of Statistics.

Syrian Arab Republic (SAR). Central Bureau of Statistics. 1978. Statistical Abstract 1978. Damascus: Central Bureau of Statistics.

Tangi, Mohamed. 1977. "Tourism and the Environment." Ambio, vol. 6, no. 6, pages 336-341.

Unesco/MAB (Unesco Man and the Biosphere Program). 1978. Regional Meeting on Integrated Ecological Research and Training Needs in North East Africa and in the Near and Middle East, with Emphasis on the Ecological Effects of Irrigation Derived from Large River Basins. Alexandria 24-27 February 1976. Final Report. MAB report series no. 40. Paris: Unesco.

United Nations. Department of Economic and Social Affairs. 1972. Abstraction and Use of Water: A Comparison of Legal Regimes. New York: United Nations.

Weissman, Juliana. 1977. Syncrisis, the Dynamics of Health. XXIII: The Syrian Arab Republic. Washington, D.C.: Public Health Service, Office of International Health, Division of Program Analysis.

Wirth, Eugen. 1971. Syrien: Eine Geographische Landeskunde. Darmstadt: Wissenschaftlishce Buchgesellschaft.

Wolfart, Reinhard. 1967. Geologie von Syrien and dem Libanon. Berlin-Nikolassee: Gebruder Borntraeger.

World Bank. WDR. 1979. World Development Report, 1979. Washington, D.C.: World Bank.

WPDS (World Population Data Sheet). 1980. Washington, D.C.: Population Reference Bureau, Inc.

APPENDIX 1

CLASSIFICATION OF SYRIAN SOILS IN THE FAO/UNESCO SOIL MAP OF THE WORLD

The following breakdown, derived from the FAO/Unesco Soil Map of the World (Sheet VII-1; Volume VII:South Asia), accounts for 185,180 square kilometers of land. Seven dominant soil types are seen to occur in Syria, with the first two types accounting for about 65% of the total land area: Xerosols, Yermosols, Vertisols, Lithosols, Luvisols, Cambisols, and Fluvisols. These are presented below in the order of their predominance in the country. Subtypes of these major classes such as, for example, Calcic xerosols, usually occur in association with other soil types; the number immediately following the letter designation (for example, Xk9-2/3a) summarizes these associations and allows them to be more precisely indicated on the full color-coded map, only a schematic representation of which appears on A-2. In the listing below, these groupings are also shown under ass and inc; those soils listed as ass (associated) share more than 20% of the area with the dominant group; those listed as inc(included) occupy less than 20%. Soil texture is indicated by the number immediately following the dash (1:coarse; 2:medium; 3:fine) and slope by the small letter following this number (a:level to gently undulating; b:rolling to hilly; c:strongly dissected to mountainous).

XEROSOLS 34.64% of area

Calcic xerosols (Map Symbol: Xk) 24.4% of total area

Xk9-2/3a 1,473,000 hectares; 7.95%
ass: Xy
climate: subtropical semi-arid Mediterranean

Xk25-2c 35,000 hectares; 0.19%
ass: I Rc
inc.: LcZ
phase: stony
climate: subtropical semi-arid Mediterranean

Xk26-2/3a 1,422,000 hectares; 7.68%
inc.: RcVc
climate: hot subtropical desert; subtropical semi-arid Mediterranean

Xk26-2/3a 126,000 hectares; 0.68%
inc.: Rc Vc
phase: stony
climate: subtropical semi-arid Mediterranean

Xk 27-2ab 1,462,000 hectares 7.9%
ass.: Xl
incl: Rc I
phase: petrocalcic
climate: subtropical Mediterranean; subtropical semi-arid Mediterranean

Gypsic Xerosols (Map symbol: Xy)

Xy4-2/3a 1,897,000 hectares 10.24%
ass.: Xk
inc.: Rc I
phase: stony
climate: subtropical semi-arid Mediterranean

BROAD SOIL REGIONS OF SYRIA (FAO-Unesco 1977)

XEROSOLS

YERMOSOLS

LITHOSOLS

LUVISOLS

VERTISOLS

CAMBISOLS

FLUVISOLS

YERMOSOLS 5,689,000 hectares; 30.7% of area

Luvic Yermosols (Map symbol: Yl)

Yl19-3ab 1,372,000 hectares; 7.41%
ass.: I Yk
incl: Rc
phase: stony
climate: Hot subtropical desert

Yl30-3a 28,000 hectares; 0.15%
ass.: Yk
inc.: Yy
climate: Hot subtropical desert

Gypsic Yermosols (Map symbol: Yy)

Yyl0-2/3a 3,515,000 hectares; 19.0%
ass:I Yk
phase: petrogypsic
climate: hot subtropical desert

Yyll-2/3a 774,000 hectares; 4.2%
ass: Yk
inc: I
phase: stony
climate: hot subtropical desert

LITHOSOLS (Map symbol: I-) 2,921,000 hectares; 9.44% of area

I-Be-Lc-2/3c 63,000 hectares: 0.34%
phase: stony
climate: subtropical Mediterranean

I-Xk-2c 1,687,000 hectares: 9.1%
phase: stony
climate: hot subtropical desert; subtropical semi-arid Mediterranean

I-Yk-2ab 1,171,000 hectares: 6.3%
phase: stony
climate: subtropical semi-arid Mediterrancan

LUVISOLS 1,260,000 hectares; 6.8% of area

Chromic luvisols (Map symbol: Lc) 6.8% of area

Lc63-3bc 702,000 hectares: 3.79%
ass.: Bk I
inc.: Rc
phase: stony
climate: subtropical Mediterranean

Lc69-3a 558,000 hectares: 3.01%
ass.: Lk
inc: I
phase: stony
climate: subtropical Mediterranean

VERTISOLS 958,000 hectares; 5.6% of area

Chromic Vertisols (Map symbol: Vc) 958,000 hectares; 11.95% of area

Vc1-3 94,000 hectares: 0.51%
climate: subtropical Mediterranean

Vc46-3a 31,000 hectares 0.17%
ass: Bv
inc.: Lc
climate: subtropical Mediterranean

Vc47-3b 654,000 hectares 3.5%
ass: Bk Bv
inc: I Lc
phase: stony
climate: hot subtropical desert; subtropical Mediterranean

Vc48-3a 179,000 hectares 0.97%
ass: Gc
inc: Jc Z
climate: subtropical semi-arid Mediterranean

Pellic vertisols (Map symbol: Vp) 94,000 hectares; 10.51% of area

Vp39-3b
ass: Bv
incl. Rc Bk
climate: subtropical Mediterranean

CAMBISOLS 649,000 hectares; 3.54% of area

Eutric cambisols (Map symbol: Be) 101,000 hectares: 0.54% of land

Be-65-ab
ass. Bk Lc Re
inc. V Je
phase: stony
climate: subtropical Mediterranean

Vertic cambisols (Map symbol: Bv) 548,000 hectares: 3.0% of land

Bv15-3b
ass.: Lo Vc
inc: E I
phase: stony
climate: subtropical semi-arid Mediterranean

FLUVISOLS 532,000 hectares; 2.87% of area

Calcaric fluvisols (Map symbol: Jc)

Jc36-2/3a 532,000 hectares: 2.87%
inc.: Bk Z G
phase: saline
climate: 3.27, 6.87

AREA, PRODUCTION & YIELD OF CULTIVATED LANDS BY CROPS, 1971-1977

Area (1000 ha.) Production (1000 T.)

SOURCE: Syrian Arab Republic, Central Bureau of Statistics. 1978.

Table 16/4

Years	Fruits الاشجار المثمرة					Industrial Crops المحاصيل الصناعية			Vegetables الخضروات			Dry Legumes البقول			Cereals الحبوب		
	الغلة كغ/شجرة Yield Kg/Tree	الانتاج Produc.	عدد الاشجار No. of trees المثمرة (بالالوف) Fruits bearing (1000)	المجموع (بالالوف) Total (1000)	المساحة المروية Area	الغلة Yield T/ha.	الانتاج Produc.	المساحة Area	الغلة Yield T/ha.	الانتاج Produc.	المساحة Area	الغلة Yield T/ha.	الانتاج Produc.	المساحة Area	الغلة Yield T/ha.	الانتاج Produc.	المساحة Area
1971	7.2	523	72510	88390	260	2.3	678	293	8.6	1106	129	0.7	153	216	0.5	815	1741
1972	6.2	592	72201	90176	291	2.3	730	317	9.7	1542	159	0.9	214	236	1.3	2562	1995
1973	5.3	414	77984	97092	328	2.3	600	260	7.9	1011	128	0.3	81	241	0.3	725	2426
1974	8.1	683	83865	106397	345	2.0	575	288	9.3	1171	201	0.8	210	255	1.0	2324	2277
1975	8.1	702	86879	110829	351	2.2	668	304	11.2	3245	300	0.7	147	223	0.8	2190	2743
1976	8.9	841	94209	124412	412	2.6	711	278	10.1	2316	229	0.9	275	312	1.0	2913	2803
1977	8.7	829	95815	125897	436	2.6	729	276	10.4	2590	249	0.7	226	318	0.6	1638	2603
Index No. of 1977 1970=100	146	190	135	144	164	118	112	94	150	327	216	140	207	139	150	135	103

AREA, PRODUCTION & YIELD OF CULTIVATED LANDS UNDER CROPS BY MOHAFAZAT, 1977

Area (1000 ha.) Production (1000 T.)

Source: Syrian Arab Republic. Central Bureau of Statistics. 1978.

Table 17/4

Mohafazat	Fruits الاشجار المثمرة					Industrial Crops المحاصيل الصناعية			Vegetables الخضراوات			Dry Legumes البقول			Cereals الحبوب		
	Yield Kg/Tree الغلة كغ/شجرة	Produc. الانتاج	No. of trees عدد الاشجار: Fruits bearing (1000) المثمر منها بالالوف	Total (1000) المجموع (بالالوف)	Area المساحة المروية	Yield T/ha. الغلة	Produc. الانتاج	Area المساحة	Yield T/ha. الغلة	Produc. الانتاج	Area المساحة	Yield T/ha. الغلة	Produc. الانتاج	Area المساحة	Yield T/ha. الغلة	Produc. الانتاج	Area المساحة
Damascus	10.1	165.6	16354	19259	41.4	7.9	56.1	7.1	17.6	369.3	21.0	1.1	14.3	12.9	1.5	81.1	54.5
Aleppo	10.3	175.0	17008	25[illegible]	109.5	1.[illegible]	[illegible]	[illegible]	9.3	512.4	65.5	0.8	54.3	71.0	0.7	357.3	545.5
Homs	4.0	89.6	22423	25[illegible]	30.[illegible]	[illegible]	[illegible]	[illegible]	12.5	252.9	20.3	0.7	26.6	35.1	0.6	95.8	149.3
Hama	5.9	69.2	10085	13[illegible]	21.7	[illegible]	[illegible]	[illegible]	10.3	314.4	30.6	1.1	31.5	29.2	1.0	225.9	223.7
Lattakia	17.5	72.2	4117	5659	29.5	1.[illegible]	21.[illegible]	[illegible]	14.1	201.4	14.3	0.8	1.9	2.5	1.2	31.2	26.5
Deir-ez-Zor	20.6	12.0	583	815	3.2	1.5	69.3	47.6	16.0	138.0	8.7	1.6	2.3	1.4	1.0	96.9	99.7
Idleb	12.1	100.1	8257	12700	98.0	0.9	17.0	20.0	5.5	180.6	33.1	1.0	38.8	38.1	1.3	158.4	119.6
Al-Ha[illegible]ch	6.5	5.0	766	1[illegible]	1.4	[illegible]	92.[illegible]	[illegible]	10.1	170.1	16.8	0.3	16.1	48.9	0.4	334.5	958.7
Al-Rakka	3.	0.4	116	3[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	15.4	0.9	1.3	2.6	2.0	0.5	153.7	340.0
Al- Sweida	10.[illegible]	79.3	7916	9709	19.7	—	—	—	0.4	4.2	11.4	0.3	3.9	14.6	0.3	16.0	51.0
Dar'a	22.9	6.1	273	669	3.6	0.2	0.9	3.7	11.1	119.2	10.7	0.5	25.4	47.5	0.5	40.1	87.6
Tartous	6.5	46.6	7180	10015	65.7	1.3	10.2	8.0	13.3	203.6	15.3	0.8	5.9	7.0	0.9	42.4	44.7
Quneitra	[illegible].7	7.1	732	885	1.0	—	—	—	14.0	7.0	0.5	0.5	2.4	4.6	0.6	4.9	7.7
Total	8.7	828.[illegible]	95815	125897	425.9	2.6	329.3	276.3	10.4	2590.3	249.1	0.7	226.0	317.8	0.6	1638.2	2602.9