

INDICATORS OF SCIENTIFIC AND TECHNOLOGICAL EFFORTS
IN THE MIDDLE EAST AND NORTH AFRICA

Prepared for

OFFICE OF SCIENCE AND TECHNOLOGY
AGENCY FOR INTERNATIONAL DEVELOPMENT

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SCIENCE AND TECHNOLOGY IN THE MIDDLE EAST:

STATISTICAL OVERVIEW

Background

This report contains data on the scientific and technological efforts of 13 Middle Eastern and North African countries. They are: Algeria, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Morocco, Saudi Arabia, Syria, and Tunisia. The data include information on scientific and technological (S&T) manpower, S&T funding, graduates in engineering and the sciences, published research activity, science policy bodies, and principal institutional research performers for each country. In addition, socioeconomic profiles are provided for each country so that the S&T data can be examined in the context of the national socioeconomic milieu.

The Middle East and North Africa cover a wide range of social and economic conditions. Ethnically, the region includes Berbers, Arabs, Jews, Turks, and Persians, as well as people of minor nationalities. Economically, there is a wide variation in per capita GNP levels, ranging in 1973 from \$250 in Egypt to \$12,050 in Kuwait. Excepting Israel, all of the countries in the region can be classified as underdeveloped, even the oil rich countries with their very high per capita GNP levels. The most visible trait held in common among most of the countries of the region is subscription to the Islamic faith. Israel, of course, represents an important exception to this generalization.

A word of warning is in order regarding the quality of the S&T data presented here. Most of the S&T data suffer from problems of reliability. In LDCs, manpower, funding, and educational data are often collected by inexperienced individuals. Serious definitional problems associated with the data further complicate their collection and may render them inadequate for the making of precise international comparisons. The only S&T indicators which appear to be reliable are counts of scientific papers, since these counts are straightforward and unambiguous and can be made without depending on the data collection efforts of untrained LDC personnel. Unfortunately, publication counts only provide us with a partial view of S&T in LDCs and do not in themselves fully mirror all S&T efforts. Problems associated with international S&T indicators are discussed in detail by Freeman,¹ Gilbert,² and Frame.³

To a large extent, science in the Middle East reflects the political, economic, and social conditions of the region. With certain exceptions it tends to be fragmented, underdeveloped, impoverished, and isolated from the mainstream. It is not much different in this sense from science in the other regions of the world which have been labeled lesser developed.

A unique feature of Middle Eastern science is that located in the center of the region is a scientific establishment which for its size is one of the best in the world. We refer here, of course, to Israeli science. In discussing Middle Eastern science we will generally distinguish between Israeli science and science in the rest of the region. The latter we shall loosely designate Arab science, even though it includes the scientific efforts of Iran, a non-Arab state.

One of the most salient features of science in the Middle East--including both Arab and Israeli efforts--is that it is very small. The countries in the region publish only 1.4% of the papers appearing in international scientific journals (this figure drops to 0.4% when Israel's publications are not included). They produce only 0.9% of the world's 25,000 scientific and technological journals (0.6% if Israel is not included). The Arab countries spend small quantities of funds on science. Egypt--the largest scientific entity in the region--expended only \$70 million on S&T activities in 1973 (0.8% of its \$8.8 billion GNP). In contrast, the Netherlands--with only 38% of Egypt's population, and by no means a large scientific power in the West--devoted \$1.2 billion to S&T efforts (2% of its \$58.2 billion GNP).

Scientific conditions in Israel are excellent, comparable to conditions in the most advanced countries. Staff are well trained, equipment is good, funds are relatively ample, and close ties are maintained with the international scientific community.

In contrast, conditions in the Arab countries are poor. Zahlan has summarized these conditions in an insightful article.⁴ Included in his list of obstacles to the proper fostering of Arab S&T capabilities are: shortages of science teachers and scientists with academic experience; poor quality elementary and secondary school education; lack of government and public understanding of science; poor facilities; isolation of scientific institutions from each other as well as from major metropolitan scientific centers; the need to use a foreign language as a medium of instruction; the brain drain, etc. These conditions are typical of conditions prevailing in most LDCs.⁵

The enormous gap separating the scientific efforts of the advanced countries and those of LDCs are illustrated in Table 1, which portrays the average number of articles appearing in international journals for countries in different regions of the world. There are 8,299 mainstream papers produced annually--on the average--for each country classified as developed. For the Middle East, this figure is 259 papers per year per country, a figure which drops to 85 papers per year per country when Israeli works are not included.

The research position of the Middle Eastern countries in the context of world efforts is further illustrated in Figure 1. In this Figure, the number of mainstream papers produced by different countries is plotted against gross national product. (GNP). It is seen that a rather strong positive relationship exists between publication output (an indicator of research prowess) and GNP (an indicator of the economic size of a country). Two regression lines are pictured, one for the advanced countries and one for the LDCs. The data points for the Middle Eastern countries have been circled in order to facilitate their identification.

Figure 1 shows that for the most part, the Middle Eastern countries perform according to expectation. Jordan, Tunisia, Iraq, Algeria, and Iran are located near the regression line for LDCs, indicating that given their GNP levels, they publish at levels typical for LDCs. Four countries publish at levels substantially below expectation: Saudi Arabia, Libya, Morocco, and Syria. In the case of the first two countries--which earn substantial oil revenues--their distance from the regression line may well be a reflection of their unique economic circumstances. Their high GNP levels exaggerate their state of development. The cases of Syria and Morocco, however, suggest the existence of weak indigenous scientific capabilities.

Three countries publish substantially greater quantities of scientific literature than expected, indicating the existence of solid indigenous S&T capabilities: Lebanon, Egypt, and Israel. Unfortunately, although this Figure does not show it, Lebanon's performance has declined considerably since the publication data were reported, owing to its civil war. Lebanon's good showing was largely accounted for by research undertaken at solid, Western style institutions, most notably the American University in Beirut. Egypt's relatively high performance can be attributed to the presence of an established S&T infrastructure and the existence of a number of research oriented universities, such as Ain Shams University, the University of Cairo, and Alexandria University. Israel's performance is superlative. Israel produces more scientific publications per GNP dollar than any other country in the

TABLE 1: AVERAGE NUMBER OF ARTICLES PER COUNTRY
IN VARIOUS REGIONS

<u>Region</u>	<u>No. of Pubs/Country</u>
Developed Countries (N = 31)	8,299
Black Africa (N = 29)	24
Middle East (N = 15)	
with Israel	259
without Israel	85
Latin America (N = 22)	121
Asia (N = 18)	
with India	437
without India	41

Source: Computer Horizons, Inc., based on
Science Citation Index 1974

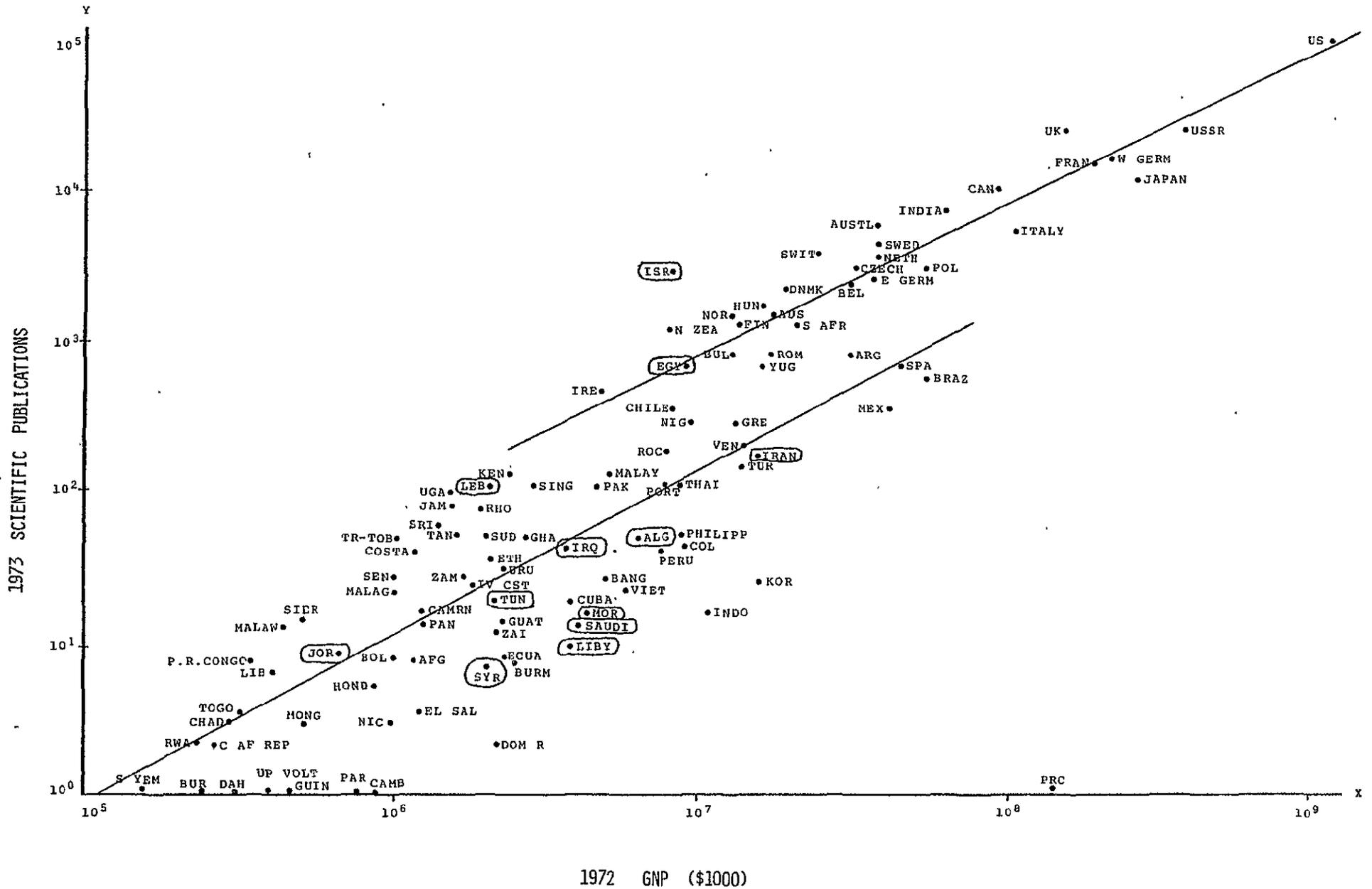


FIG. 1: PUBLICATION OUTPUT VS. GNP

world. The explanation of this performance is complex, but would include historical, cultural, and social factors unique to Israel.

In the remainder of this statistical overview we will compare the scientific capabilities of the different Middle Eastern countries using S&T funding, manpower, education, and publication indicators. Data on the performance of the Middle Eastern countries as measured by these indicators are provided in Table 2.

S&T Expenditures

S&T expenditure data are probably the least reliable of the different types of data considered here. Problems in defining S&T efforts, particularly in the private sector, make the data rather speculative to begin with. These problems are compounded when expenditure figures are converted from local currencies to U.S. dollars, since conversion rates are largely based on international transactions of consumer, primary, and manufactured goods. Such conversion rates probably distort our view of national financial commitments to S&T activities.

While S&T funding data may not be reliable in absolute terms, they appear to provide us with a reasonable ranking of countries. As Table 2 shows, the first ranked country is Israel, followed by Iran, Egypt, and Iraq as the countries making the largest financial commitments to S&T activities. The rank ordering of countries by S&T expenditures correlates most highly with publication output ($r_s = 0.97$, where r_s is Spearman's rank order correlation coefficient). This is in keeping with other studies which show that funding and publication output are generally highly correlated.⁶

It should be noted that none of the S&T funding figures given here are very high, except Israel's when its figures are viewed on a per capita basis. We do not anticipate that Middle Eastern science will flourish so long as miniscule quantities of resources are devoted to the development and maintenance of S&T efforts.

Scientists and Engineers

The counts of scientists and engineers shown in Table 2 are comprised of individuals with a post-secondary school education

	Publications ¹	Scientists & Engineers ²	S&T Higher Education Enrollments ³	S&T Higher Education-Degrees conferred ³	S&T Expenditures (x \$10 ⁶) ⁴
Algeria	43	...	13,941	832	10.8
Egypt	720	225,348	130,937	14,867	73.2
Iran	173	76,693	55,401	4,822	83.9
Iraq	53	17,310	27,163	3,400	22.0
Israel	2,703	36,000	14,060	2,510	105.3
Jordan	15	758	1,712	102	6.3
Kuwait	15	4,102	1,097	69	1.1
Lebanon	127	12,000	4,482	617	11.2
Libya	9	8,232	3,623	237	...
Morocco	18	233 ⁵	5,960	249	...
Saudi Arabia	16	5,700 ⁶	3,812	187	...
Syria	2	8,713	8,372	1,504	...
Tunisia	23	2,932	3,454	172	7.6

¹ 1974 Science Citation Index, corporate tape

² CASTARAB; Scientific Research in Israel 1976. Data are for mid-1970s.

³ Unesco Statistical Yearbook 1974; CASTARAB; Scientific Research in Israel, 1976. Data are for early to mid-1970s.

⁴ CASTARAB; World Bank's World Tables 1976. Data are for early to mid-1970s.

⁵ Includes only those individuals engaged in R&D.

⁶ NSF estimate

TABLE 2: S&T INDICATORS FOR THE MIDDLE EAST

in the natural sciences, medicine, engineering, or the agricultural sciences (i.e., individuals with an education at the third level). There are vast differences in the quality and productivity of scientists and engineers, both within countries as well as between them, so that one scientist in Country A may be "worth" several scientists in Country B. The manpower figures in Table 2 should thus be interpreted as simple S&T body counts. No inferences of S&T quality can be drawn directly from them.

The country with the largest number of S&T personnel is Egypt, which has approximately three times the manpower pool of second-place Iran. Israel ranks third, with one-sixth as many scientists and engineers as Egypt. Other sizable countries in the region include Iraq and Lebanon. (Relevant data for Algeria do not exist.)

The manpower data correlate most highly with counts of S&T students and S&T degrees conferred ($r_s = 0.95$ in both cases). These are hardly surprising results, since S&T personnel are defined primarily in terms of their educational background. The manpower data correlate least highly with publication output ($r_s = 0.69$). This modest positive correlation reflects the fact that publication output is fundamentally the product of research activity, while the great majority of individuals in the S&T manpower counts do not engage in research.

Educational Indicators

Two educational indicators are included in Table 2: numbers of S&T students enrolled in domestic institutions, and numbers of S&T degrees conferred. Educational quality varies dramatically from country to country as well as within a country. Consequently, the educational indicators presented in Table 2 should be interpreted as mere body counts, as in the case of S&T manpower figures. They do not reflect the quality of S&T students and graduates.

The enrollment and degree data are for the third level, an international categorization for educational programs beyond the secondary school level.

The country with the highest S&T student enrollment and the greatest number of S&T graduates is Egypt, followed by Iran, Iraq, and Israel. Not surprisingly, the enrollment and graduates indicators correlate most highly with each other ($r_s = 0.98$). They correlate least highly with publication output ($r_s = 0.70$ and 0.66 for enrollments and degrees

respectively), demonstrating a positive, though modest, relationship between research efforts and formal S&T training.

Publication Indicators

As was mentioned earlier, publication indicators appear to be reasonable indices of research prowess. The publication counts given in Table 2 suggest that Israel is by far the strongest producer of research in the region, followed at a great distance by Egypt, Iran, Lebanon, and Iraq. These results coincide with informed opinion.

The aggregated publication counts given in Table 2 are distributed over nine fields in Table 3. The data suggest the existence of a substantial gap between Israeli S&T efforts and those associated with other countries in the region. Israeli scientists and engineers outpublish the combined efforts of all other regional scientists and engineers in every one of the nine S&T fields. The country which comes the closest to matching Israeli output is Egypt, and the only fields in which it approaches Israeli performance are biology and chemistry.

An examination of the national distributions of publications across the nine fields shows that the countries in the Middle Eastern region which publish more than a handful of papers do not generally deviate radically from the characteristics of the world publication distribution (see the last row of the table). Israel's publication distribution, in fact, very closely parallels the world distribution. The other Middle Eastern countries tend to deviate from the pattern established by the world distribution in that they place a greater emphasis than the world norm on clinical medicine, biology (including agriculture), chemistry, and engineering/technology, and somewhat less emphasis than the norm on biomedical research, physics, the earth/space sciences, and psychology.

A factor analysis was performed on international publication data for 61 countries. The results of this analysis have been reported elsewhere.⁷ Basically, the analysis showed that each country being examined produced papers according to one of five research patterns. Iran, Lebanon, and Israel were all associated with a pattern in which research efforts were particularly pronounced in clinical medicine. The United States and United Kingdom were also associated with this pattern.

	<u>Clinical Medicine</u>	<u>Biomed Res</u>	<u>Biology</u>	<u>Chemistry</u>	<u>Physics</u>	<u>Earth/ Space</u>	<u>Eng'g/ Technol</u>	<u>Psychol</u>	<u>Math</u>	<u>Total</u>
Algeria	8	4	3	21	4	1	0	0	1	43*
Egypt	195	69	105	219	38	14	79	0	3	720
Iran	66	16	17	20	12	6	27	1	8	173
Iraq	19	5	7	13	2	2	5	0	0	53
Israel	715	433	296	343	430	97	194	61	133	2703
Jordan	1	1	3	6	0	0	3	0	1	15
Kuwait	3	0	1	5	2	0	5	0	0	15
Lebanon	46	24	12	9	20	1	4	5	6	127
Libya	0	0	3	3	1	0	3	0	0	9
Morocco	10	2	5	1	0	0	0	0	0	18
Saudi Arabia	3	1	1	2	1	1	6	0	2	16
Syria	0	0	0	0	0	2	0	0	0	2
Tunisia	10	2	1	2	2	1	0	0	3	23
WORLD (in%)	27.1	14.9	8.8	16.1	13.1	4.2	10.1	2.8	3.0	100.1% (279,892)

*Figures in table do not always sum to totals because they have been rounded to the nearest integer.

TABLE 3: NUMBER OF PUBLICATIONS IN 2400 MAINSTREAM SCIENTIFIC JOURNALS
(Source: Computer Horizons, Inc.)

The research efforts of Algeria and Egypt can be described by a different pattern, one in which emphasis is placed on research in the physical sciences, especially chemistry. Other countries associated with this pattern include all the countries of Eastern Europe.

The only other Middle Eastern country examined in the factor analysis was Iraq, which shared a common pattern with France, Germany, and Belgium. This pattern is characterized by a roughly equal emphasis on the physical sciences and clinical medicine.

The publication data displayed in Table 3 were taken from the 1974 Science Citation Index (SCI) Corporate Index computer tapes. The SCI covers about 2,400 of the world's most central S&T journals. Peripheral journals are generally excluded from coverage. Hence the SCI clearly reflects the mainstream research efforts of the countries in this study and ignores work that lies outside the mainstream.

In order to determine the consequences of overlooking peripheral indigenous scientific journals published by the countries in this study, we counted journals published in the Middle East in the nine fields listed in Table 3 plus two additional fields: social sciences and humanities. The journal counts were made from the 1974 accession list of the British Library, Lending Division (BLLD), which includes some 43,000 international serials, 25,000 of which are directed at S&T topics (contrast this with the SCI's coverage of 2,400 central S&T journals). The BLLD contains the most comprehensive collection of serials in the world.

The results of the journal counts are portrayed in Table 4. Unfortunately, the BLLD accession list provides data on journal nationality only for the major countries of the Middle East, and the other countries are aggregated into two broad categories: North Africa and Minor Arab states.

The most noteworthy feature of Table 4 is that it shows that the countries of the region, including Israel, publish very few or no journals in a number of fields: biomedical research, chemistry, physics, and psychology. In the other fields there appears to be a fair--though small--representation of indigenous journals for most of the countries.

While there is hardly a one-to-one correspondence between the BLLD and SCI counts, we can say that the journal counts roughly tend to confirm the publication counts. For example, the rank ordering of countries in both counts are nearly identical for the major Middle Eastern countries: Israel,

	Clinical Medicine	Biomedical Research	Biology (incl. Agriculture)	Chemistry	Physics	Earth/Space Sciences	Engineering & Technology	Mathematics & Statistics	Psychology	General Scientific	Subtotal	Social Studies	Humanities	Total
Egypt	16	2	16	2	0	4	2	0	0	2	44	13	1	58
Iran	6	1	7	2	0	7	4	2	0	3	32	3	0	35
Iraq	4	0	2	0	0	2	3	2	0	3	16	3	2	21
Israel	6	0	13	4	0	10	19	5	0	4	61	19	3	83
Lebanon	4	0	1	0	0	3	2	2	0	2	14	14	0	28
North Africa	4	0	9	0	1	8	3	6	0	4	35	11	0	46
Minor Arab States	2	0	0	0	0	4	0	3	0	2	11	6	1	18

TABLE 4: NUMBER OF JOURNALS PUBLISHED IN THE MIDDLE EASTERN REGION

(Source: Computer Horizons, Inc.)

Egypt, and Iran occupy the first three positions in both data bases, while Lebanon and Iraq switch positions for fourth and fifth place. Where the two counts diverge most sharply are in the areas of biomedical research, chemistry, and physics, precisely those areas in which few indigenous journals exist in the Middle East. Egypt, Israel, Lebanon, and Iran all publish more papers in biomedical research and physics than one would expect from the distribution of their indigenous S&T journals. Similarly, Egypt, Iran, and Israel produce more chemistry papers than expected. These results are hardly surprising in the case of biomedical research and physics, since these two fields are heavily oriented toward basic research. As several sociological studies have shown, basic research tends to display a strong international orientation. That is, researchers in the most basic fields write for an international--not a domestic--audience, and consequently they publish their papers in international journals.⁸

Data have also been collected on 1976/77 publication activity in a dozen areas considered to be relevant to the development needs of most LDCs. These data were taken from specialty abstracts, which have a far greater depth of international journal coverage than the SCI. Unfortunately, these publication counts--presented in Table 5--were made only for LDCs and exclude Israel. The counts generally confirm the 1974 SCI findings: the largest number of papers were generated by Egypt (171 papers), Iran(48), and Iraq(24). Lebanon's very weak performance (4 papers) illustrates the devastating impact of the civil war on its research effort. While in the 1974 SCI counts it ranked behind Egypt and Iran in publication output, in the restricted 1976/77 data base its performance is indistinguishable from that of the weakest countries in the region.

International coauthorship patterns can provide us with some understanding of the international orientation of the countries of the Middle East. Table 6 contains counts of the number of international institutional coauthorships found in papers appearing in the world's leading journals. A paper is said to involve an international institutional coauthorship if the institutional addresses of the authors are associated with at least two different countries. Such coauthorships can arise as a consequence of a number of conditions. For example, they may involve collaboration between scientists from two different countries. They may also involve collaboration between individuals coming from the same country who performed their research in two different countries.

In total, 18.6% of Arab papers involve coauthorships with non-Arab institutions. The international institutional coauthorship figure for Israel is 13.2%. By way of comparison,

Agronomy
 Fisheries
 Food Technology
 Forestry
 Meteorology
 Nutrition
 Oceanography
 Parasitology
 Plant Genetics
 Pollution
 Remote Sensing
 Water Resources
 Total

Algeria					1		1					2	
Egypt	49		31		1	49	10	6	3	6	1	19	175
Iraq	4	1	2		1	4	1	2	4	1		4	24
Iran	7		3	4	2	19		6		3		6	50
Jordan			1			1							2
Kuwait								1			1		2
Lebanon			1			2		1					4
Libya						2	4					1	7
Morocco		1						1			1		3
Saudi Arabia					1	1	2			1		1	6
Syria	1		1										2
Tunisia	1	3					1	2				1	8

TABLE 5: NUMBER OF PUBLICATIONS IN SELECTED SUBFIELDS IN A ONE YEAR PERIOD (1976/77)

(Source: Computer Horizons, Inc.)

TABLE 6: INTERNATIONAL INSTITUTIONAL COAUTHORSHIPS
FOR THE MIDDLE EAST (1973 SCIENCE CITATION INDEX)

<u>Arab States</u>		<u>Israel</u>	
Country	No. Coauthorships	Country	No. Coauthorships
U.S.	100	U.S.	235
France	62	U.K.	41
U.K.	25	W. Europe	31
W. Germany	13	W. Germany	27
W. Europe	8	Canada	16
Canada	7	France	13
E. Europe	6	Australia	9
USSR	5	Sweden	5
Australia	4	Blk Africa	3
Japan	4	E. Europe	2
Blk Africa	3	Italy	2
India	3	Japan	2
Israel	2	Latin America	2
Italy	2	Arab Mideast	2
Latin America	2	Asia	1
Asia	1	India	1
E. Germany	1	South Africa	1
New Zealand	0	USSR	1
South Africa	0	E. Germany	0
Sweden	0	New Zealand	0

consider the international institutional coauthorship percentages for the following countries and regions: U.S. - 4.4%, Western Europe - 11.2%, Eastern Europe - 6.4%, Latin America - 17.3%, Africa - 23.8%, and Asia - 24.4%. In general, the Arab region engages in a higher fraction of international institutional collaboration than the advanced countries, suggesting some degree of "dependence" on advanced country scientific activities, at least insofar as we focus on research reported in the world's major scientific journals. The Arab international coauthorship level is similar to that of other underdeveloped regions.

The data in Table 6 show that the greatest number of international institutional coauthorships for both Israel and the Arab states occur with the United States, followed by the countries of Western Europe. The high level of coauthorships between the U.S. and Israel is not surprising in view of the "special relationship" which has existed between these countries over the years. The relatively high level of coauthorships between the Arab countries and the U.S. is probably due in some measure to American scientific involvement in Lebanon and Iran, two countries which are eager to obtain American scientific know-how, as well as to the efforts of large numbers of American scientists who seek collaborative opportunities all over the world.

Arab collaboration with the Western European countries--particularly the U.K. and France--is at the same level as collaboration with the U.S. when the Western European countries are treated as one. This Western European orientation is probably rooted in the colonial experience of a number of the Arab states. It is also a reflection of the fact that the Western European countries produce "good" science, and consequently collaboration with them (as with the U.S.) would yield benefits to indigenous scientific activities.

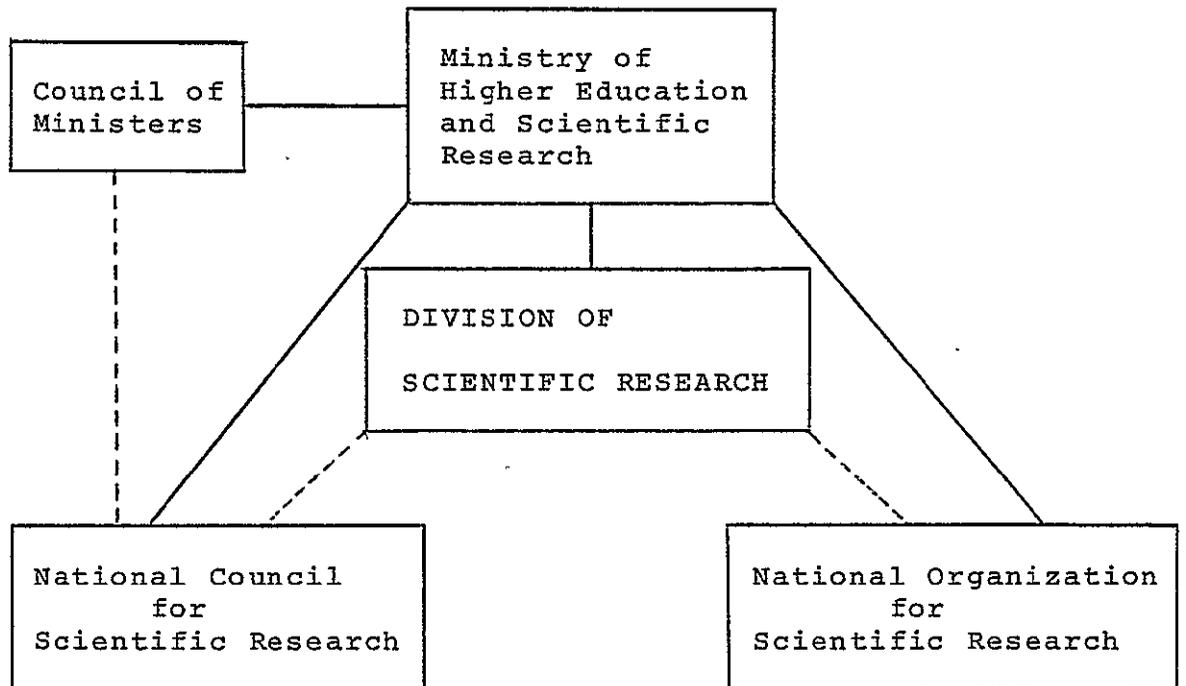
The relatively low level of international institutional collaboration between the USSR and both the Arab countries and Israel is not surprising in view of the fact that the Soviets in general engage in the least amount of international collaborative activities of any major country (1.2%). Additionally, as Table 6 shows, there appears to be little interaction between the Arab states and other lesser developed countries.

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ALGERIA

A. SCIENCE POLICY ORGANIZATION



advises

initiates, funds,
coordinates research

ALGERIA

B. SOCIOECONOMIC INDICATORS

GNP (1973)	US\$ 8,340 million
GNP per capita	US\$ 570
Average annual growth rate , GNP (1965-1973)	4.3%
Population (1975 est.)	16,776,000
% Urban	39.0%
Average annual growth rate (1965-1973)	3.4%
Literacy rate (1970)	25.0%
Telephones (1975) per 100 population	250,000 1.4
Newspapers (1974)	
* Dailies	4
Circulation	285,000
Non-dailies	14
Circulation	313,000
Radios (1974) per 1000 population	3,220,000 198
Television receivers (1974) per 1000 population	410,000 25

ALGERIA

C. HUMAN RESOURCES

Population (1975 est.)	16,776,000
Labor force (1970)	2,600,000
Percent in agriculture	50%

S&T Personnel (1972)

	Total (FTE)	per 100,000 <u>population</u>	<u>% in R&D</u>
Scientists and Engineers	242*	160	1.6%
Technicians	100*	60	.6%

*Higher education sector only

Scientists and Engineers by Field (1972) (FTE)

Natural Sciences	117
Engineering/Technology	9
Medical Sciences	33
Agriculture, Social Sciences and Humanities	<u>83</u>
Total	242

ALGERIA

D. EDUCATION AT THIRD LEVEL

Students in national institutions (1975)

Natural Sciences	}	12,234	
Engineering			
Medical Sciences			6,766
Agricultural Sciences			638
Social Sciences/Humanities			<u>22,209</u>
Total		41,847	

Students studying abroad 6,368

Total # students 48,215

Students by type of institution

University	41,847
Teacher Training	--
Other	--

Degrees awarded (1972)

Natural sciences	315
Engineering	94
Medical Sciences	376
Agricultural sciences	47
Social sciences/law	685
Humanities	897

ALGERIA

E. FISCAL RESOURCES

GNP (1973)	US\$ 8,340 million *
Expenditure on R&D (thousands of dinars) (1974)	35,394** (US\$ 8.63 million)
% of GNP spent on R&D	.13
Average per scientist & engineer (FTE)	US\$30,000
Average per capita	US\$ 0.6

Expenditure by source of funds

Government 100%

* 1973 average exchange rate: 3.912 Algerian dinars=US\$ 1.00

** UN Statistical Yearbook reports expenditures in 1972
of 78 million dinars.

ALGERIA

F. PRINCIPAL RESEARCH CENTERS

<u>Institute</u>	<u>Department or Research Area</u>
1. Ministry of Higher Education and Research	
a. University of Algiers	Institute of Sahara Research Institute of Geography Institute of Town Planning Institute of Nuclear Research Pierre & Marie Curie Anti-Cancer Center Institute of Dentistry and Stomatology Institute of Trachoma and Tropical Ophth. Overseas Institute of Health & Medicine Institute of General & Nutritional Biochem. National Institute of Agronomy Institute of Earth Sciences Institute of Meteorology & Physics of the globe Oceanographic Institute Institute of Solar Energy Algiers-Bouzareah Observatory
b. University of Oran	Medicine, pharmacy
c. University of Constantine	Institutes for medicine, sciences, biological sciences
d. Ecole Nationale Polytechnique	Technical training-- engineering, petro- chemistry, telecommu- nications, mathematics

ALGERIA

<u>Institution</u>	<u>Department or Research Area</u>
2. Ministry of Agriculture	Horticultural Techno- logy Inst.
3. Ministry of Industries	Algerian Petroleum Institute
4. Institute for Scientific Research	National Center for Forestry Research Inst. for Research- Tropical Agricultur and Food Crops Institute for Nuclear Research (at Univ. of Algiers) Pasteur Institute of Algiers Geological Service of Algeria

ALGERIA

G. PUBLICATION INDICATORS

1. Principal research institutions in certain subfields (from Computer Horizons Directories)

<u>Subfield</u>	<u>Institution</u>	<u># of Publications</u>	<u># of Scientists</u>
Nutrition	Univ. of Algiers	1	1
Parasitology	Pasteur Institute	1	1

2. Table 1 following represents total publications for 1974 (Source: Computer Horizons, Inc.). The first column represents the percentages of the total number of publications assigned to a certain subfield. The second column gives the activity index, which is defined as follows:

$$\text{Activity Index} = \frac{\% \text{ of country's publications in subfield A}}{\% \text{ of world's publications in subfield A}}$$

The activity index tells us the relative degree of research activity of the country in a given subfield, contrasted with the degree of world activity in that subfield. When the country is more active in a subfield than the world as a whole, the index is greater than one; when the country is exactly as active in a subfield as the world as a whole, the index is one; when the country's level of activity is less than the world level, the index is less than one. Activity indices which are tagged with an asterisk (*) are significantly different from 1.0 at the 1% level.

ALGERIA

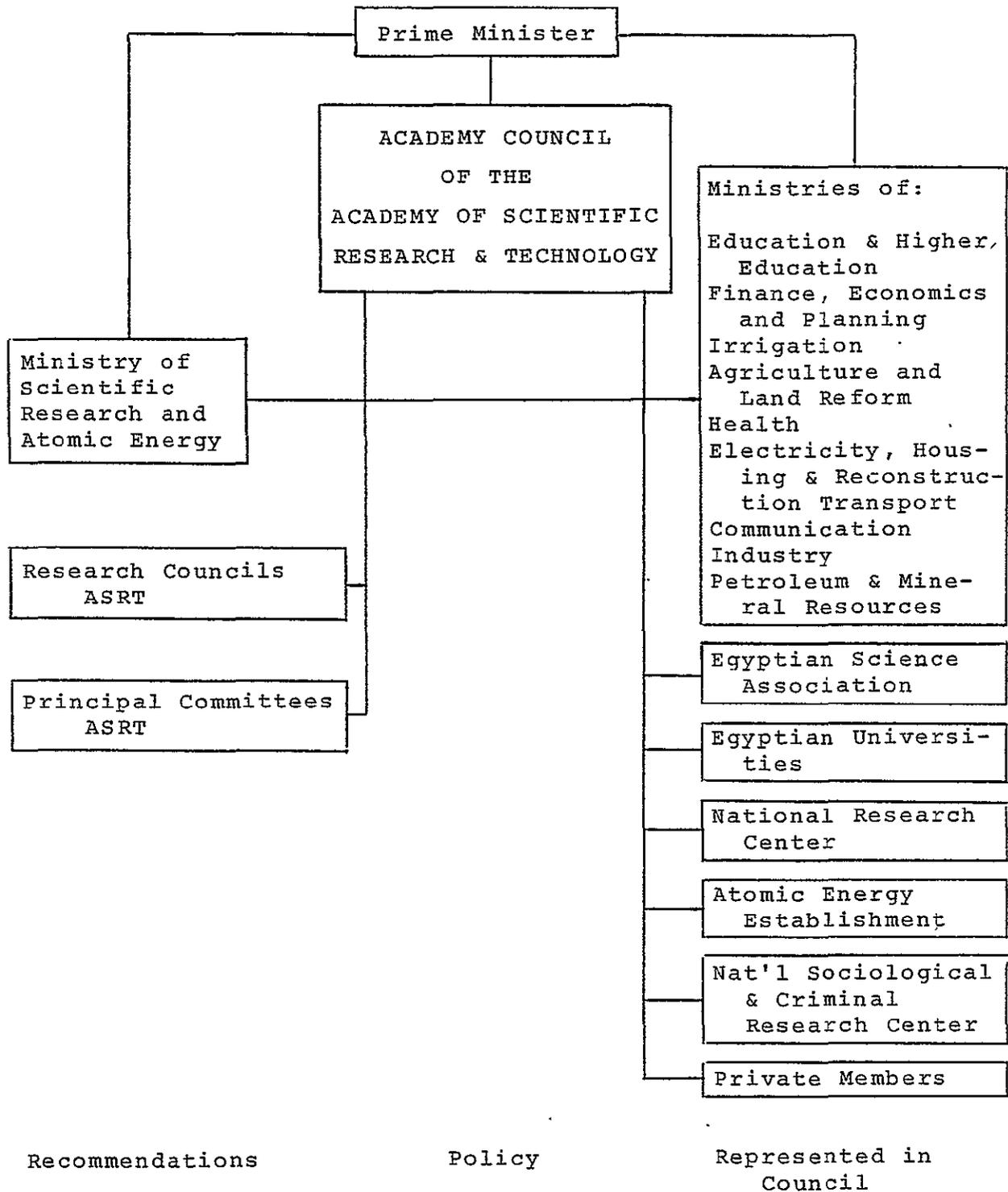
TOTAL PUBLICATIONS 1974: 43

	<u>% of Effort</u>	<u>Activity Index</u>		<u>% of Effort</u>	<u>Activity Index</u>
<u>CLINICAL MEDICINE</u>			<u>CHEMISTRY</u>		
Genrl & Internal Med	18.59	0.69-	Analytical Chemistry	1.16	0.83
Allergy	1.16	0.22	Organic Chemistry	16.27	5.99*
Anesthesiology			Inorg & Nuclear Chem	2.32	1.96
Cancer			Applied Chem		
Cardiovascular System			General Chem	15.45	2.66*
Dentistry			Polymers		
Dermatol & Venereal Dis			Physical Chem	12.78	4.19*
Endocrinology			<u>PHYSICS</u>		
Fertility				10.34	0.79
Gastroenterology	4.65	11.35	Chemical Physics		
Geriatrics			Solid State Physics		
Hematology	2.32	4.67	Fluids & Plasmas		
Immunology			Applied Physics	1.16	0.40
Obstetrics & Gynecol			Acoustics		
Neurology & Neurosurg			Optics		
Ophthalmology			General Physics	3.37	0.84
Orthopedics	4.65	11.12	Nucl & Particle Phys	5.81	5.77
Arthritis & Rheumatism			Misc Physics		
Otorhinolaryngology			<u>EARTH & SPACE SCIENCE</u>		
Pathology	2.32	3.08		2.85	0.68
Pediatrics			Astronomy & Astrophys		
Pharmacology			Meteorol & Atmosph Sci		
Pharmacy			Geology		
Psychiatry			Earth & Planetary Sci	2.85	1.62
Radiology & Nuclear Med			Geography		
Respiratory System			Oceanog & Limnology		
Surgery	3.49	2.29	<u>ENGINEERING & TECHNOLOGY</u>		
Tropical Medicine				0.12	0.01
Urology			Chemical Engineering		
Nephrology			Mechanical Eng'g		
Veterinary Med			Civil Eng'g		
Addictive Diseases			Electr Eng'g & Electron		
Hygiene & Public Health			Misc Eng'g & Technol		
Misc Clinical Medicine			Industrial Eng'g		
<u>BIOMEDICAL RESEARCH</u>			General Engineering	0.12	0.17
Physiology	10.24	0.69	Metals & Metallurgy		
Anatomy & Morphology			Materials Sci		
Embryology			Nuclear Technology		
Genetics & Heredity			Aerospace Technology		
Nutrition & Dietet			Computers		
Biochem & Molecular Biol			Library & Informat Sci		
Biophysics			Operations Res. & Mngemt		
Cell Biol, Histol & Cyto			<u>PSYCHOLOGY</u>		
Microbiology			Clinical Psychology		
Virology			Personal. & Social Psy		
Parasitology			Developm & Child Psy		
Biomedical Engineering			Experimental Psych		
Microscopy			General Psych		
Misc Biomedical Res			Misc Psych		
General Biomedical Res	10.24	3.07	Behavioral Sci		
<u>BIOLOGY</u>				2.77	0.93
General Biology	7.11	0.81	<u>MATHEMATICS</u>		
General Zoology			Probability & Stat		
Entomology	3.16	5.72	Applied Mathematics		
Misc Zoology			General Math	2.77	1.39
Marine Biol & Hydrobiol	1.16	2.02	Misc Math		
Botany	2.79	1.26			
Ecology					
Agriculture & Food Sci					
Dairy & Animal Sci					
Misc Biology					

TABLE 1: S&T PUBLICATION ACTIVITY 1974. SOURCE: COMPUTER HORIZONS, INC.

EGYPT

A. SCIENCE POLICY ORGANIZATION



EGYPT

B. SOCIOECONOMIC INDICATORS

GNP (1973)	US\$ 8,820 million
GNP per capita	US\$ 250
Average annual growth rate GNP (1965-1973)	0.8%
Population (1975 est.)	37,233,000
% Urban (1970)	42%
Avg. Annual Growth Rate (1965-1973)	2.5%
Literacy rate (1970)	40%
Telephones (1974) per 100 population	503,000 1.4
Newspapers (1972)	
Dailies	14
Circulation	773,000
Non-dailies	24
Circulation	920,000
Radios (1974) per 1000 population	5,115,000 140
Television receivers (1974) per 1000 population	610,000 17

EGYPT

C. HUMAN RESOURCES

Population (1975 est.)	37,233,000
Labor Force (1970)	9,471,100
Percent in Agriculture	49%

Scientists and Engineers (1973)	593,254
Per 100,000 population	1,657
Non-nationals	negligible

Technicians	...
Scientists and Engineers in R&D (FTE)	10,665

Scientists and Engineers by Field (1973)

	<u>Total</u>	<u>In R&D (FTE)</u>
Natural Sciences	36,948	2,175
Engineering/Technology	74,711	1,328
Medical Sciences	52,429	1,354
Agriculture	61,260	4,781
Social Sciences/Humanities	<u>367,906</u>	<u>1,027</u>
Total	593,254	10,665

Scientists and Engineers by Sector (1973)

	<u>In R&D (FTE)</u>
Productive	4,874
Higher Education	3,752
General Services	<u>2,039</u>
Total	10,665

EGYPT

D. EDUCATION AT THIRD LEVEL

Students in national institutions (1974)

Natural Sciences	14,400
Engineering	44,076
Medical Sciences	47,680
Agriculture	40,318
Social Sciences/Humanities	<u>234,543</u>
Total	381,017*

<u>Students studying abroad</u>	<u>8,090</u>
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Total # students	389,107
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Students by type of institution (1974)

University	367,734
Teacher Training	13,283
Other	27,218

Degrees awarded (1973)

		<u>Total 1965-1973</u>
Natural Sciences	1,772	20,202
Engineering	5,621	27,238
Medical Sciences	4,838	28,819
Agricultural Sciences	5,895	25,481
Social Sciences	14,609	106,069
Humanities	12,028	

* Not including 27,218 students at "Other" types of institutions

EGYPT

Scientists holding Doctoral or Master of Science degree (1972)

	<u>Ph.D.</u>	<u>M.S.</u>	<u>Total</u>
Engineering	804	483	1287
Medical Sciences	1658	213	1871
Agricultural Sciences	1170	1279	2449
Basic Sciences	1440	1221	2661
Social Sciences	<u>2027</u>	<u>897</u>	<u>2924</u>
Total	7099	4093	11192

EGYPT

E. FISCAL RESOURCES

GNP (1973)	US\$ 8,820 million*
Expenditure on R&D (thousands of pounds) (1973)	
Total (including capital expenditures)	30,140 (US\$77,160,000)
Current (salaries, supplies, etc.)	22,000
From government funds	26,950
% of GNP spent on R&D	.83%
Average per scientist & engineer (FTE)	US\$7,235
Per capita expenditure	US\$ 2.2

Expenditure by sector (thousands of pounds) (1973)

Productive	5,220
Higher Education	18,520
General Services	<u>6,400</u>
Total	30,140

Expenditure by type of research (thousands of pounds)

Basic	3,625
Applied	12,758
Experimental/Developmental	<u>5,617</u>
Total	22,000

Expenditure by source

Government	87%
Foreign	13%

* 1973 average exchange rate: 1 Egyptian pound = US\$2.56

EGYPT

F. PRINCIPAL RESEARCH CENTERS

<u>Institution</u>	<u>Department or Research Area</u>
1. Government:	
National Research Centre	Technology transfer Food and Agriculture Health & Environment Energy National Resources
Atomic Energy Establishment	
Institute of Oceanography and Fisheries	
Institute of Astronomy & Geo- physics	
National Institute of Standards	
Ministry of Petroleum & Mineral Wealth	Egyptian Petroleum Research Institute Geological Survey & Mining Authority Building Research Institute General Organization for Housing, Bldg, and Planning Res.
Ministry of Housing and Recon- struction	
Scientific Instrumentation Centre	
National Information & Documentation Centre	
2. Universities	
Ain Shams University	Middle East Research Centre Mathematics, Physics, Chemistry, Biochemistry Botany, Zoology, Ento- mology, Geology, Medi- cine, Engineering, Agriculture
Al Azhar University (oldest university in world-- founded 970)	Engineering, Medicine, Commerce, Agriculture

EGYPT

University of Alexandria

Institutes for public
health, medical
research and sanitary
engineering
Agriculture, Engineering,
Education, Commerce

University of Assiut

Sciences, Engineering,
Agriculture, Pharmacy,
Medicine, Veterinary
Medicine

University of Cairo

Institute for Statistical
Study and Research
Institute for Cancer
Research
Institute for Meteorolo-
gical Research
Institute for Mass Com-
munication
Faculty Agriculture-
Experimental Farms
Hydrobiological Institute

American University of Cairo

Solid state studies
Glass technology

Helwan University

Zagazig University

Mansoura University

Tanta University

Higher Technical Institute
Cairo Institute of Technology

Technical education
Technical education

3. Industrial

Hydrological Research Station
Metallurgical Research Center of
Helwan Steelworks
Middle Eastern Regional Radioiso-
tope Center for Arab Countries
Textile Research Center
Petroleum Research Institute

EGYPT

4. Agricultural Science

Egyptian Agricultural Organization
Desert Institute

5. Medical Science

Medical Research Executive Organi-
zation (attached to National
Research Centre. Six Institutes)
Public Health Laboratories
Research Institute and Hospital for
Tropical Diseases
Memorial Institute for Ophthalmic Research

EGYPT

G. PUBLICATION INDICATORS

1. Principal research institutions in certain subfields (from Computer Horizons' Directories)

<u>Subfield</u>	<u>Institution</u>	<u># of Publications</u>	<u># of Scientists</u>
Nutrition	A.E.E. Radioisotope Department	1	5
	Ain Shams University	4	6
	Al Azhar Univ.	1	3
	Alexandria Univ.	8	24
	Assiut Univ.	1	4
	Cairo Univ.	7	23
	Mansoura Univ.	2	10
	Natl. Research Center	19	47
	US Med. Research Unit	4	12
Zagazig Univ.	2	3	
Pollution	Natl. Res. Center	4	3
	Cairo Univ.	1	3
	Alexandria Univ.	1	1
Oceanography	Ain Shams Univ.	1	3
	Alexandria Univ.	3	2
	Dev. Consult. Assoc.	1	7
	Mansoura Univ.	4	3
	Sci. Dept. Alahram	1	1
Meteorology	Ain Shams Univ.	1	1
Plant Genetics	Alexandria Univ.	2	2
	Cairo Univ.	1	2
Remote Sensing	Acad. of Sci. Res. and Tech.	1	2
Parasitology	16 El-Nil St.	1	2
	Ain Shams Univ.	3	6
	Alexandria Med. Sch.	1	2
	Mansoura Univ.	1	2
Food Technology	Ain Shams Univ.	3	8
	Al-Azhar Univ.	2	5
	Alexandria Univ.	3	3
	Assiut Univ.	1	2
	Atomic Energy Establ.	1	2
	Cairo Univ.	4	3

EGYPT

<u>Subfield</u>	<u>Institution</u>	<u># of Publications</u>	<u># of Scientists</u>
	Middle East Region	1	2
	Radioisotope Ctr.		
	Agric. Res. Ctr.	8	15
	Natl. Res. Ctr.	5	8
Agronomy	Ain Shams Univ.	9	23
	Al-Azhar Univ.	1	2
	Alexandria Univ.	4	7
	Atomic Energy Estab.	1	1
	Cairo Univ.	10	25
	Higher Inst. Agri.	2	6
	Agri. Res. Ctr.	3	7
	Soil & Water Res. Inst.	7	29
	Natl. Res. Ctr.	5	11
	Tanta Univ.	3	6
Water Resources	Ain Shams Univ	1	4
	Alahram Scien. Dept.	1	2
	Alexandria Univ.	7	7
	Assiut Univ.	1	2
	FAO	2	1
	Mansoura Univ.	1	4
	Soil & Water Res. Inst.	4	13
	Natl. Res. Ctr.	1	1
	UNESCO Off. of Sci. & Tech for Arab States	1	1

2. Table 1 following presents total publications for 1974 (Source: Computer Horizons, Inc) The first column represents the percentage of the total number of publications assigned to a certain subfield. The second column gives the activity index, which is defined as follows:

$$\text{Activity Index} = \frac{\% \text{ of country's publications in subfield}}{\% \text{ of world's publications in subfield}}$$

The activity index tells us the relative degree of research activity of the country in a given subfield, contrasted with the degree of world activity in that subfield. When the country is more active in a subfield than the world as a whole, the index is greater than one; when the country is exactly as active in a subfield as the world as a whole, the index is one; when the country's level of activity is less than the world level

EGYPT

TOTAL PUBLICATIONS 1974: 720

	<u>% of Effort</u>	<u>Activity Index</u>		<u>% of Effort</u>	<u>Activity Index</u>
<u>CLINICAL MEDICINE</u>	27.11	1.00-	<u>CHEMISTRY</u>	30.14	1.87*
Genrl & Internal Med	0.44	0.08	Analytical Chemistry	5.28	3.77*
Allergy			Organic Chemistry	2.01	0.74-
Anesthesiology			Inorg & Nuclear Chem	1.18	1.00-
Cancer	0.14	0.14	Applied Chem	7.78	9.21*
Cardiovascular System	0.12	0.12	General Chem	10.90	1.87*
Dentistry	0.28	0.45	Polymers	1.18	1.04-
Dermatol & Venereal Dis			Physical Chem	1.81	0.59+
Endocrinology	0.42	0.41	<u>PHYSICS</u>	5.25	0.40*
Fertility	1.30	4.24*	Chemical Physics	0.25	0.17
Gastroenterology	0.05	0.11	Solid State Physics		
Geriatrics			Fluids & Plasmas	0.69	2.08+
Hematology	0.14	0.28	Applied Physics	1.46	0.50+
Immunology	0.28	0.17	Acoustics		
Obstetrics & Gynecol	0.21	0.42	Optics	0.14	0.24
Neurology & Neurosurg	0.14	0.08	General Physics	2.61	0.65+
Ophthalmology	1.25	1.91+	Nucl & Particle Phys	0.09	0.09
Orthopedics	0.28	0.66	Misc Physics		
Arthritis & Rheumatism			<u>EARTH & SPACE SCIENCE</u>	1.88	0.45*
Otorhinolaryngology	0.28	0.87	Astronomy & Astrophys		
Pathology	0.14	0.18	Meteorol & Atmosph Sci		
Pediatrics	0.28	0.36	Geology	0.83	1.26-
Pharmacology	4.24	1.78*	Earth & Planetary Sci	0.91	0.52+
Pharmacy	10.63	9.84*	Geography		
Psychiatry	0.28	0.46	Oceanog & Limnology	0.14	0.42
Radiology & Nuclear Med	0.63	0.57	<u>ENGINEERING & TECHNOLOGY</u>	10.98	1.09-
Respiratory System	0.07	0.23	Chemical Engineering	0.90	0.87-
Surgery	0.28	0.18	Mechanical Eng'g	1.53	1.29-
Tropical Medicine	2.19	12.47*	Civil Eng'g		
Urology			Electr Eng'g & Electron	1.51	0.67-
Nephrology			Misc Eng'g & Technol		
Veterinary Med	2.50	2.94*	Industrial Eng'g		
Addictive Diseases	0.14	1.57	General Engineering	1.53	2.24*
Hygiene & Public Health	0.44	0.83	Metals & Metallurgy	1.04	0.70-
Misc Clinical Medicine			Materials Sci	1.53	1.49-
<u>BIOMEDICAL RESEARCH</u>	9.63	0.65*	Nuclear Technology	2.64	4.64*
Physiology			Aerospace Technology		
Anatomy & Morphology	1.81	6.02*	Computers	0.07	0.16
Embryology	0.14	0.63	Library & Informat Sci	0.14	0.78
Genetics & Heredity	0.32	0.33	Operations Res. & Mngemt	0.09	0.55
Nutrition & Dietet	0.14	0.38	<u>PSYCHOLOGY</u>		
Biochem & Molecular Biol	0.76	0.17*	Clinical Psychology		
Biophysics			Personal. & Social Psy		
Cell Biol, Histol & Cyto	0.14	0.12	Developm & Child Psy		
Microbiology	1.95	1.66+	Experimental Psych		
Virology	0.14	0.28	General Psych		
Parasitology	1.78	6.06*	Misc Psych		
Biomedical Engineering			Behavioral Sci		
Microscopy			<u>MATHEMATICS</u>	0.49	0.16
Misc Biomedical Res	0.09	0.22	Probability & Stat	0.07	0.17
General Biomedical Res	2.36	0.71-	Applied Mathematics	0.42	0.94
<u>BIOLOGY</u>	14.53	1.66*	General Math		
General Biology	0.09	0.16	Misc Math		
General Zoology	0.14	0.41			
Entomology	1.95	2.79*			
Misc Zoology	1.11	1.72-			
Marine Biol & Hydrobiol	0.69	1.21			
Botany	6.81	3.08*			
Ecology	0.42	1.12			
Agriculture & Food Sci	3.33	1.29-			
Dairy & Animal Sci					
Misc Biology					

TABLE 1: S&T PUBLICATION ACTIVITY 1974, SOURCE: COMPUTER HORIZONS, INC.

EGYPT

the index is less than one. Activity indices which are tagged with an asterisk (*) are significantly different from 1.0 at the 1% level.

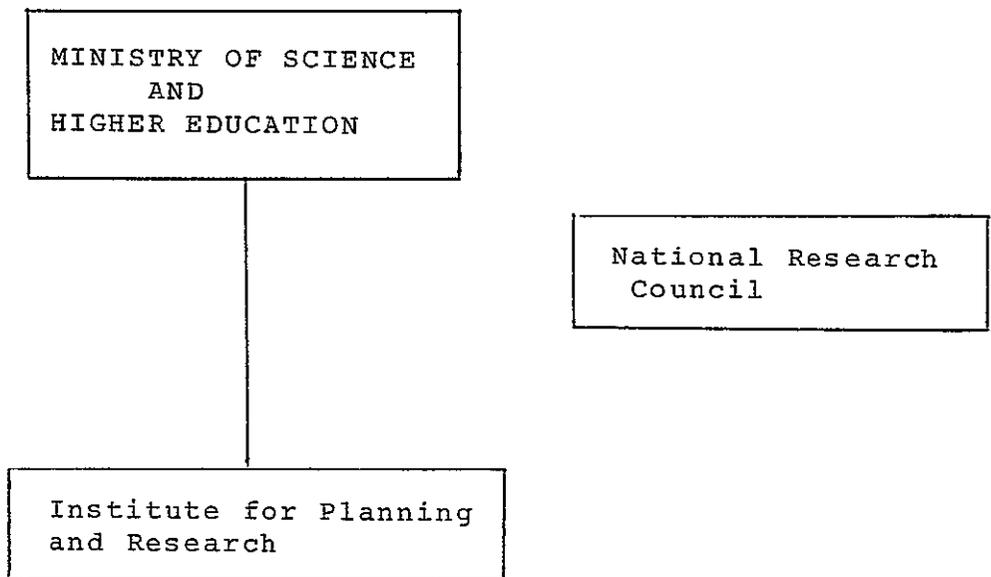
3. Table 2 following shows the number of scientific journals published in Egypt. (Source: Computer Horizons, Inc.)

TABLE 2. SCIENTIFIC JOURNALS (FROM BLLD 1974)

Clinical Medicine	16
Biomedical Research	2
Biology (includes agriculture)	16
Chemistry	2
Physics	0
Earth/Space Sciences	4
Engineering/Technology	2
Mathematics/Statistics	0
Psychology	0
General Scientific Literature	2
Social Studies	13
Humanities	1

IRAN

A. SCIENCE POLICY ORGANIZATION



IRAN

B. SOCIOECONOMIC INDICATORS

GNP (1973)	US \$27,958 million
GNP per capita (1973)	US\$ 870
Population (1975 est.)	33,019,000
% Urban (1970)	41.0%
Annual average growth rate (1965-1973)	3.2%
Literacy rate (1970)	37 %
Telephones (1975)	688,000
Per 100 population	2.0
Newspapers (1974)	
Dailies	20
Circulation	484,000
Non-dailies	51
Circulation	96,000
Radios (1974)	8,000,000
Per 1000 population	249
Television receivers (1974)	1,500,000
Per 1000 population	47

IRAN

C. HUMAN RESOURCES

Population (1975 est.)	33,019,000
Labor force (1970)	9,000,000
% in Agriculture	41%

S&T Personnel (1972)

	Total	Total in R&D	In R&D (FTE)
Scientists & Engineers	127,793	32,579	4,896
Technicians	24,668	11,064	857

Scientists & Engineers in R&D by Field (FTE) (1972)

Natural Sciences	509
Engineering/Technology	279
Medical Science	703
Agricultural Sciences	1,294
Social Sciences/Humanities	799
Not specified	1,312
Total	4,896

S&T Personnel in R&D by sector (FTE) (1972)

	Scientists & Engineers	Technicians
Productive	898	127
Higher Education	3,395	576
General Services	603	154
Total	4,896	857

IRAN

D. EDUCATION AT THIRD LEVEL

Students in national institutions (1974)

Natural Sciences	21,976
Engineering	25,868
Medical Sciences	14,965
Agricultural Sciences	6,466
Social Sciences/Humanities	<u>66,059</u>

Total 135,354

Students studying abroad 24,384

Total # students 159,738

Students by type of institution (1974)

University	51,092
Teacher Training	7,369
Other	76,893

<u>Degrees awarded (1973)</u>	<u>Bachelor</u>	<u>Postgrad</u>
Natural Sciences	2,027	171
Engineering	1,321	313
Medical Sciences	591	1,271
Agricultural Sciences	617	76
Social Sciences	5,114	330
Humanities	4,361	512

IRAN

E. FISCAL RESOURCES

GNP (1971)	754 billion rials *
	(US \$27,958 million)

Expenditure on R&D (thousands of rials) (1971)	4,856,054
--	-----------

Capital expenditure (1972)	1,285,018
Current expenditure (1972)	2,246,789

% of GNP spent on R&D	0.3%
Average per scientist & engineer	721,400 rials
Average per capita	115.6 rials

Expenditure by type of activity (1969)

Basic research	---
Applied research	US\$ 1,510,000
Experimental/Developmental	US\$ 28,000

Expenditure by sector (thousands of rials) (1972)

	<u>Total</u>	<u>Current</u>
Productive	2,742,818	1,477,109
Higher Education	581,537	575,914
General Services	207,452	193,766

Expenditure by source of funds (thousands of rials) (1971)

	<u>Total</u>	<u>Current</u>
Government	4,812,349	4,283,840
Productive	43,705	38,905
Foreign	--	--

* Average exchange rate 1971:75.75 Iranian rials = US\$ 1.00

IRAN

F. PRINCIPAL RESEARCH CENTERS

<u>Institution</u>	<u>Department or Research Area</u>
1. Ministry of Agriculture	Bureau of Statistics Plant Pest & Diseases Res. Inst. Razi Inst.-serums & Veteri- nary diseases Seed & Plant Improvement Inst. Soil Inst. of Iran State Animal Husbandry Inst. Sugar Beet Improvement Research Centre
2. Ministry of Economy	Geological Survey of Iran Inst. of Standards & Industrial Research Research Centre for Indus- trial & Trade Devel.
3. Ministry of Cooperation & Rural Affairs	Gilan Tobacco Testing Farm Iran Tobacco Monopoly Org. Research Centre Resa'iyeh Tobacco Res. Centre
4. Ministry of Public Health	Firouzgar Medical Centre Food & Nutrition Inst. Inst. Pasteur
5. Ministry of Roads	Iranian Meterological Dept.
6. Ministry of Water & Power	Ground Water Dept. Inst. of Higher Science & Water Resources Tech. Surface Hydrology Dept.
7. National Iranian Oil Co.	Research & Laboratories Dept. (NIOC)
8. Arya Mehr Univ.	Industrial engineering, mathematics, chemistry, physics, elec. engineering, metallugry, mechanical eng., computer center

IRAN

- | | |
|--|--|
| 9. Azarabadegan Univ.
(State control) | Medicine, science,
agriculture, engineering,
pharmacology |
| 10. Ferdowsi University
(state control) | Medicine, dentistry,
science, pharmacy, nutri-
tional science |
| 11. Isfahan University | Medicine, science, pharmacy |
| 12. Jondi Shapur University | Agriculture, medicine,
nursing
Department of Research on
Soils |
| 13. National University of Iran | Medicine, dentistry,
science |
| 14. Pahlavi University
(private, independent) | Department of Geology
Department of Biology
Department of Mathematics
Faculty of Medicine
Geotechnic Institute |
| 15. Tehran University | Faculty of Agriculture Res
Agricultural Economics
Agricultural industries
Agronomy
Horticulture
Mechanics
Agricultural Machinery
Department of Reclaiming
Arid Zones & Hills
Dept. of Forestry
Dept. of Wood Technology
Laboratory of Ichthyology
Amin Abad Animal Husbandry
& Research Inst.
Inst. of Geographical Res.
Inst. of Geophysics
Inst. of Experimental Medi-
cine & Medical Res.
Inst. of Public Health Res.
Taj-e-Pahlavi Cancer Res.
Inst.
Tehran Univ. Nuclear Centre
Inst. for Economic Research
Inst. for Communications
Research |

IRAN

- | | |
|--------------------------------|---|
| Tehran Univ. (cont'd) | Inst. of Hydro Science
& Water Resources Tech. |
| 16. Abadan Inst. of Technology | |
| 17. College of Forestry | |
| 18. Tehran Polytechnic | |
| 19. College of Surveying | |
| 20. Inst. of Technology | |
| 21. University of Thrace | Agriculture, natural
resources, arid zone |
| 22. Tabrig University | |
| 23. Mashad University | |

IRAN

G. PUBLICATION INDICATORS

1. Principal research institutions in certain sub-fields (from Computer Horizons' Directories)

<u>Subfield</u>	<u>Institution</u>	<u># of Publications</u>	<u># of Scientists</u>
Nutrition	Univ. Isfahan	1	1
	Food & Nutrition Inst.	1	4
	Natl. Iranian Oil Co. Hospital	1	1
	Nemazee Hospital	2	9
	Nuclear Centre	1	4
	Pahlavi Univ.	3	3
	Univ. of Tehran	10	21
Pollution	Arya-Mehr Univ.	1	3
	Pahlavi Univ.	1	2
	Univ. of Tehran	1	2
Meteorology	Univ. of Tehran	2	1
Parasitology	Med. Educ. Health Center	1	1
	Pahlavi Univ.	2	5
	Univ. of Tehran	2	5
	Univ. of Isfahan	1	4
Forestry	Pahlavi Univ.	1	
	Res. Inst. for Nat. Resources	1	2
	Univ. of Tehran	2	3
Food Technology	Pahlavi Univ.	1	3
	Univ. of Tehran	1	2
	Tehran Polytech.	1	1
Agronomy	Pahlavi Univ.	3	6
	Plant Pest & Disease Res. Inst.	1	1
	Univ. of Tehran	1	2
Water Resources	Pahlavi Univ.	3	6
	Sahand Co.	1	2
	Univ. of Tehran	2	2

IRAN

2. Table 1 following represents total publications for 1974 (Source: Computer Horizons, Inc.). The first column represents the percentages of the total number of publications assigned to a certain subfield. The second column gives the activity index, which is defined as follows:

$$\text{Activity Index} = \frac{\% \text{ of country's publications in subfield A}}{\% \text{ of world's publications in subfield A}}$$

The activity index tells us the relative degree of research activity of the country in a given subfield, contrasted with the degree of world activity in that subfield. When the country is more active in a subfield than the world as a whole, the index is greater than one; when the country is exactly as active in a subfield as the world as a whole, the index is one; when the country's level of activity is less than the world level, the index is less than one. Activity indices which are tagged with an asterisk (*) are significantly different from 1.0 at the 1% level.

3. Table 2 following shows the number of scientific journals published in Iran. (Source: Computer Horizons, Inc.)

IRAN

TOTAL PUBLICATIONS 1974: 173

	<u>% of Effort</u>	<u>Activity Index</u>		<u>% of Effort</u>	<u>Activity Index</u>
<u>CLINICAL MEDICINE</u>	37.88	1.40*	<u>CHEMISTRY</u>	11.76	0.73-
Genrl & Internal Med	6.06	1.15-	Analytical Chemistry	1.73	1.24
Allergy	0.58	4.44	Organic Chemistry	4.81	1.77+
Anesthesiology	0.58	2.01	Inorg & Nuclear Chem		
Cancer	0.58	0.60	Applied Chem	1.44	1.71
Cardiovascular System	0.69	0.70	General Chem	1.18	0.20
Dentistry	4.04	6.49*	Polymers	0.38	0.34
Dermatol & Venereal Dis			Physical Chem	2.21	0.73
Endocrinology			<u>PHYSICS</u>	7.10	0.54+
Fertility			Chemical Physics	0.58	0.37
Gastroenterology	1.15	2.82	Solid State Physics		
Geriatrics			Fluids & Plasmas		
Hematology	1.30	2.61	Applied Physics	0.87	0.30
Immunology			Acoustics	0.87	2.34
Obstetrics & Gynecol	0.58	1.17	Optics	1.15	2.01
Neurology & Neurosurg			General Physics	1.91	0.47
Ophthalmology			Nucl & Particle Phys	1.15	1.15
Orthopedics			Misc Physics	0.58	2.45
Arthritis & Rheumatism			<u>EARTH & SPACE SCIENCE</u>	3.46	0.82-
Otorhinolaryngology			Astronomy & Astrophys		
Pathology	0.58	0.76	Meteorol & Atmosph Sci	0.58	1.99
Pediatrics	5.72	7.33*	Geology	2.02	3.05
Pharmacology	0.58	0.24	Earth & Planetary Sci	0.57	0.32
Pharmacy	3.46	3.21*	Geography		
Psychiatry	0.58	0.96	Oceanog & Limnology	0.29	0.86
Radiology & Nuclear Med	1.15	1.06	<u>ENGINEERING & TECHNOLOGY</u>	15.71	1.56+
Respiratory System	0.17	0.58	Chemical Engineering	1.15	1.11
Surgery	1.15	0.76	Mechanical Eng'g	3.65	3.09*
Tropical Medicine	3.46	19.73*	Civil Eng'g	0.58	0.96
Urology			Electr Eng'g & Electron	3.75	1.67-
Nephrology			Misc Eng'g & Technol		
Veterinary Med	4.04	4.75*	Industrial Eng'g		
Addictive Diseases			General Engineering	1.96	2.87
Hygiene & Public Health	1.44	2.71	Metals & Metallurgy	0.87	0.58
Misc Clinical Medicine			Materials Sci	0.29	0.28
<u>BIOMEDICAL RESEARCH</u>	9.43	0.63+	Nuclear Technology	0.87	1.52
Physiology			Aerospace Technology	1.15	3.16
Anatomy & Morphology			Computers	0.29	0.65
Embryology			Library & Informat Sci	1.15	6.44
Genetics & Heredity	0.58	0.58	Operations Res. & Mngem		
Nutrition & Dietet	3.00	8.30*	<u>PSYCHOLOGY</u>	0.77	0.28
Biochem & Molecular Biol	1.15	0.25	Clinical Psychology	0.19	1.00
Biophysics			Personal. & Social Psy		
Cell Biol, Histol & Cyto			Developm & Child Psy		
Microbiology	1.06	0.90	Experimental Psych		
Virology			General Psych		
Parasitology	1.15	3.92	Misc Psych	0.58	1.82
Biomedical Engineering			Behavioral Sci		
Microscopy			<u>MATHEMATICS</u>	4.35	1.46-
Misc Biomedical Res	1.15	2.77	Probability & Stat		
General Biomedical Res	1.34	0.40	Applied Mathematics	0.29	0.65
<u>BIOLOGY</u>	9.55	1.09-	General Math	3.49	1.75-
General Biology	0.03	0.06	Misc Math	0.58	4.97
General Zoology					
Entomology	0.87	1.24			
Misc Zoology	0.29	0.45			
Marine Biol & Hydrobiol					
Botany	3.17	1.43-			
Ecology					
Agriculture & Food Sci	3.75	1.45-			
Dairy & Animal Sci	1.44	2.33			
Misc Biology					

TABLE 1: S&T PUBLICATION ACTIVITY 1974, SOURCE: COMPUTER HORIZONS, INC.

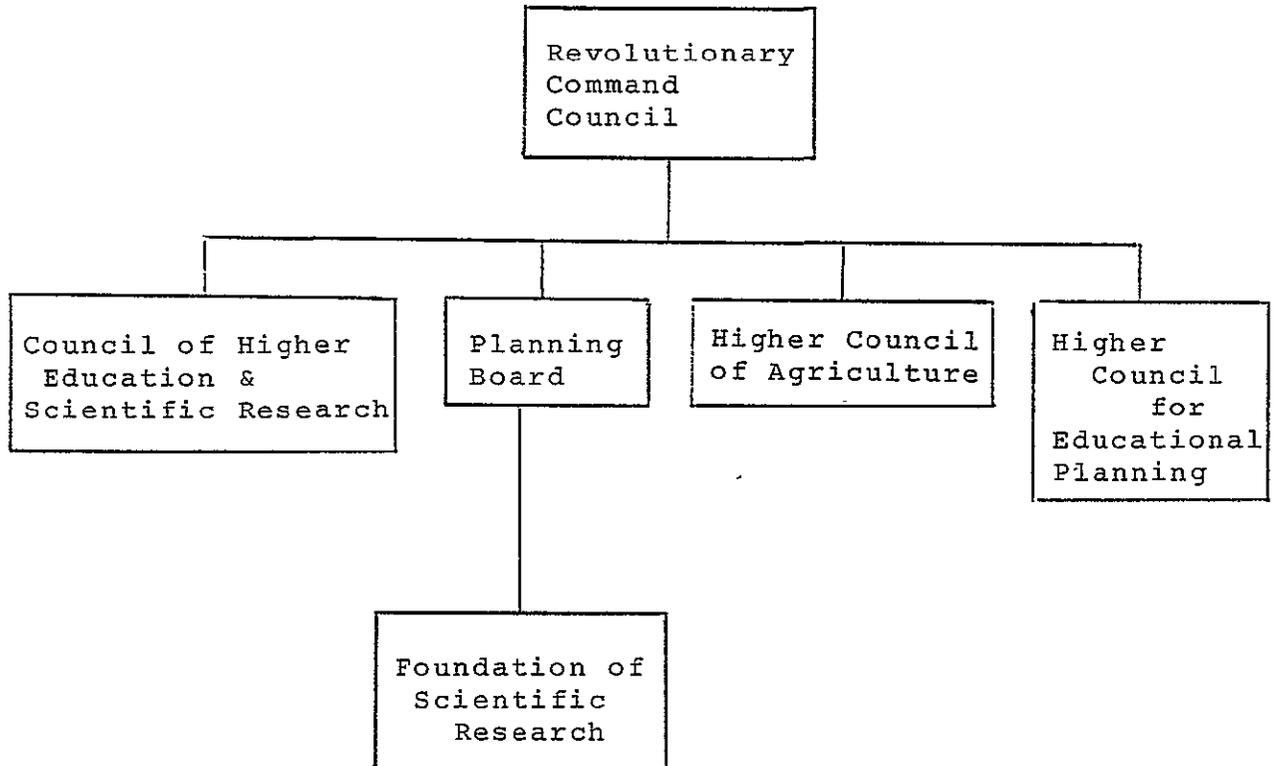
IRAN

TABLE 2: SCIENTIFIC JOURNALS (BLLD, 1974)

Clinical Medicine	6
Biomedical Research	1
Biology (includes agriculture)	7
Chemistry	2
Physics	0
Earth/Space Sciences	7
Engineering Technology	4
Mathematics/Statistics	2
Psychology	0
General Scientific Literature	3
Social Studies	3
Humanities	0

IRAQ

A. SCIENCE POLICY ORGANIZATION



IRAQ

B. SOCIOECONOMIC INDICATORS

GNP (1973)	US\$ 8,880 million
GNP per capita (1973)	US\$ 850
Average annual growth rate GNP (1965-1973)	2.9%
Population (1975 est.)	11,124,000
% Urban	51.0%
Average annual growth rate (1965-1973)	3.3%
Literacy Rate (1970)	26.0%
Telephones (1975)	185,000
per 100 population	1.7
Newspapers (1973)	
Dailies	4
Circulation	226,000
Non-dailies	6
Circulation	...
Radios (1974)	1,250,000
per 1000 population	116
Television receivers (1973)	520,000
per 100 population	50

IRAQ

C. HUMAN RESOURCES

Population (1975 est.)	11,124,000
Labor force (1974)	2,850,000
Percent in agriculture	59%

S&T Personnel (1974)

	<u>Total</u>	Per 100,000 <u>population</u>	<u>In R&D (FTE)</u>
Scientists & engineers	43,645*	432	1,486*
Non-nationals	4,674		112
Technicians	24,689**	244	376
Non-nationals	980**		

Scientists and Engineers by Field (1974)

	<u>Total</u>	<u>In R&D (FTE)</u>
Natural Sciences	5,156	439
Engineering/Technology	5,477	173
Medical Sciences	5,276	46
Agriculture	1,401	417
Social Sciences/Humanities	26,335	411
Total	43,645	1,486

S&T Personnel in R&D by sector (1974)

	<u>Scientists & Engineers</u>	<u>Technicians</u>
Productive	489	141
Higher Education	244	...
General Services	753	235
Total	1,486	376

* Government employees only

** Estimated. This figure is questionable in any case; CASTARAB and Unesco Statistical Yearbook 1974 give this figure as "Technicians", Unesco Statistical Yearbook 1976 uses the same figure as "Scientists and Engineers in R&D".

IRAQ

E. FISCAL RESOURCES

GNP (1973) US\$ 8,880 million**

Expenditure on R&D (thousands of Dinars) (1974)

Total (including capital expenditures)	7,409 dinars* (US\$ 25 million)
Current (salaries, supplies, etc.)	4,909

% of GNP spent on R&D	.25%
Average per scientist & engineer	US\$16,840
Average per capita	US\$ 2.3

Expenditure by sector (thousands of Dinars) (1974)

Productive	3,285
Higher Education	1,750
General Services	<u>2,374</u>
Total	7,909

Expenditure by type of research (thousands of Dinars)

Basic	1,335
Applied	1,787
Experimental/Developmental	<u>1,786</u>
Total	4,909

Expenditure by source of funding

Government	100%
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*Government only. Does not include productive sector.

**Average exchange rate 1973: US\$1.00=3.38 Iraqi Dinar.

IRAQ

F. PRINCIPAL RESEARCH CENTERS

<u>Institution</u>	<u>Department or Research Area</u>
1. Foundation for Scientific Research	Inst. for Applied Research on Natural Resources Petroleum Research Inst. Building Research Centre Dates & Date Palm Research Centre Biological Research Centre Agricultural Research Centre Scientific Documentation Centre Directorate General of Youth Scientific Welfare
2. Iraqi Atomic Energy Commission	Nuclear Research Inst. Inst. of Radiology & Nuclear Medicine
3. University of Baghdad (under the jurisdiction of the Ministry of Higher Education)	Science, engineering, medicine, agriculture, veterinary medicine, law, economics, arts, education Educational & Psychological Research Centre Economics & Administration Research Centre Palestinian Studies Research Centre Urban & Regional Planning Research Centre Psychology Clinic Medical Research Centre Natural History Research Centre
4. University of Basrah	Science, engineering, medicine School of Higher Studies & Scientific Research
5. University of Mosul	Forestry, Animal Products, Soil Sciences, Field Crops, Food Technology, Plant Production, Horticulture,

IRAQ

- | | |
|--------------------------------|--|
| Univ. of Mosul (cont'd.) | Veterinary Medicine,
Agricultural Economics |
| 6. Al-Mustansiriyah University | Science, technology
Inst. of Agricultural
Co-operative Studies |
| 7. University of Sulamaniyah | Science, arts, engineering
agriculture |

IRAQ

G. PUBLICATION INDICATORS

1. Principal research institutions in certain sub-fields (from Computer Horizons' Directories)

<u>Subfield</u>	<u>Institution</u>	<u># of Publications</u>	<u># of Scientists</u>
Nutrition	Iraqi Atomic Energy Commission	1	3
	Univ. of Baghdad	2	4
	Univ. of Mosul	1	2
Pollution	Univ. of Mosul	1	3
Oceanography	Univ. of Basrah	1	3
Fisheries	Univ. of Basrah	1	2
Parasitology	Univ. of Basrah	1	2
	Vet. Lab. Research Inst.	1	2
Food Technology	Univ. of Baghdad	2	2
Agronomy	College of Agri. Abu-Ghraib	1	1
	Univ. of Baghdad	1	1
	Univ. of Mosul	1	1
	Univ. of Sulaimania	1	1
Water Resources	Univ. of Baghdad	1	1
	Higher Agricultural Council	1	1
	Univ. of Mosul	1	3
	State Organization of Soils & Land Reclamation	1	1

IRAQ

2. Table 1 following represents total publications for 1974 (Source: Computer Horizons, Inc.). The first column represents the percentages of the total number of publications assigned to a certain subfield. The second column gives the activity index, which is defined as follows:

$$\text{Activity Index} = \frac{\% \text{ of country's publications in subfield A}}{\% \text{ of world's publications in subfield A}}$$

The activity index tells us the relative degree of research activity of the country in a given subfield, contrasted with the degree of world activity in that subfield. When the country is more active in a subfield than the world as a whole, the index is greater than one; when the country is exactly as active in a subfield as the world as a whole, the index is one; when the country's level of activity is less than the world level, the index is less than one. Activity indices which are tagged with an asterisk (*) are significantly different from 1.0 at the 1% level.

3. Table 2 following shows the number of scientific journals published in Iraq. (Source: Computer Horizons, Inc.)

IRAQ

TOTAL PUBLICATIONS 1974: 53

	<u>% of Effort</u>	<u>Activity Index</u>		<u>% of Effort</u>	<u>Activity Index</u>
<u>CLINICAL MEDICINE</u>	35.53	1.31-	<u>CHEMISTRY</u>	25.00	1.55+
Genrl & Internal Med	3.77	0.71	Analytical Chemistry	6.60	4.72
Allergy			Organic Chemistry		
Anesthesiology			Inorg & Nuclear Chem	5.66	4.77
Cancer			Applied Chem		
Cardiovascular System			General Chem	7.08	1.22
Dentistry	1.89	3.03	Polymers		
Dermatol & Venereal Dis			Physical Chem	5.66	1.86
Endocrinology	1.89	1.85	<u>PHYSICS</u>	4.59	0.35
Fertility			Chemical Physics		
Gastroenterology			Solid State Physics		
Geriatrics			Fluids & Plasmas		
Hematology			Applied Physics	2.83	0.97
Immunology			Acoustics	0.63	1.70
Obstetrics & Gynecol			Optics		
Neurology & Neurosurg	5.66	3.33	General Physics	1.13	0.28
Ophthalmology			Nucl & Particle Phys		
Orthopedics			Misc Physics		
Arthritis & Rheumatism			<u>EARTH & SPACE SCIENCE</u>	4.15	0.99
Otorhinolaryngology			Astronomy & Astrophys		
Pathology			Meteorol & Atmosph Sci		
Pediatrics	1.89	2.42	Geology		
Pharmacology	1.89	0.79	Earth & Planetary Sci	4.15	2.36
Pharmacy			Geography		
Psychiatry			Oceanog & Limnology		
Radiology & Nuclear Med			<u>ENGINEERING & TECHNOLOGY</u>	8.58	0.85
Respiratory System	1.89	6.35	Chemical Engineering	2.83	2.72
Surgery	3.77	2.48	Mechanical Eng'g	0.94	0.80
Tropical Medicine	2.83	16.13	Civil Eng'g	0.94	1.57
Urology			Electr Eng'g & Electron	1.89	0.84
Nephrology			Misc Eng'g & Technol		
Veterinary Med	8.18	9.62	Industrial Eng'g		
Addictive Diseases			General Engineering	0.09	0.14
Hygiene & Public Health	1.89	3.54	Metals & Metallurgy		
Misc Clinical Medicine			Materials Sci	1.89	1.84
<u>BIOMEDICAL RESEARCH</u>	8.65	0.58	Nuclear Technology		
Physiology			Aerospace Technology		
Anatomy & Morphology			Computers		
Embryology			Library & Informat Sci		
Genetics & Heredity			Operations Res. & Mngemt		
Nutrition & Dietet			<u>PSYCHOLOGY</u>		
Biochem & Molecular Biol	3.77	0.82	Clinical Psychology		
Biophysics			Personal. & Social Psy		
Cell Biol, Histol & Cyto			Developm & Child Psy		
Microbiology			Experimental Psych		
Virology			General Psych		
Parasitology			Misc Psych		
Biomedical Engineering			Behavioral Sci		
Microscopy	0.63	6.11	<u>MATHEMATICS</u>		
Misc Biomedical Res	3.77	9.07	Probability & Stat		
General Biomedical Res	0.47	0.14	Applied Mathematics		
<u>BIOLOGY</u>	13.49	1.54-	General Math		
General Biology	0.28	0.51	Misc Math		
General Zoology	1.89	5.58			
Entomology					
Misc Zoology					
Marine Biol & Hydrobiol	1.89	3.28			
Botany	4.72	2.13			
Ecology					
Agriculture & Food Sci	4.72	1.83			
Dairy & Animal Sci					
Misc Biology					

TABLE 1: S&T PUBLICATION ACTIVITY 1974. SOURCE: COMPUTER HORIZONS, INC.

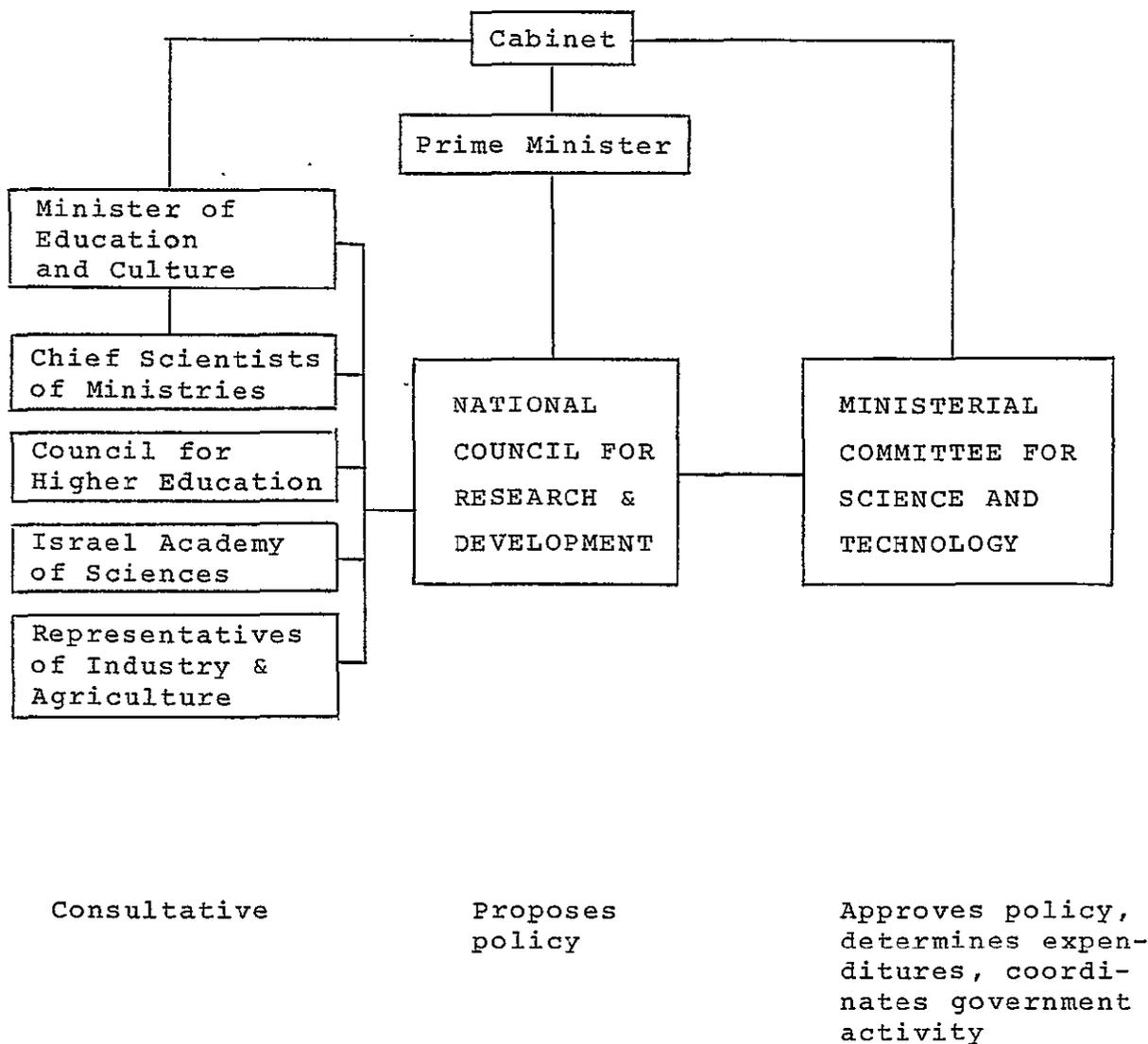
IRAQ

TABLE 2: SCIENTIFIC JOURNALS (FROM BLLD 1974)

Clinical Medicine	4
Biomedical Research	0
Biology (includes agriculture)	2
Chemistry	0
Physics	0
Earth/Space sciences	2
Engineering/Technology	3
Mathematics/Statistics	2
Psychology	0
General Scientific Literature	3
Social Studies	3
Humanities	2

ISRAEL

A. SCIENCE POLICY ORGANIZATION



ISRAEL

B. SOCIOECONOMIC INDICATORS

GNP (1976)	IL 26,582 million
(1973)	US\$ 9,572 million
GNP per capita (1976)	IL 26,992
(1973)	US\$ 3,010
Population (1976)	3,371,000
% Urban	86.0%
Average annual growth rate (1965-1973)	2.8%
Literacy rate	84%
Telephones (1975)	813,000
per 100 population	23.1
Newspapers	
Dailies (1974)	26
Circulation	1,330,000
Non-dailies	107
Circulation	...
Radios (1975)	51,630,000
per 1000 population	465
Television receivers (1973)	599,000
per 1000 population	180

ISRAEL

C. HUMAN RESOURCES

Population (1975)	3,371,000
Labor Force (1976)	1,169,300
Percent in Agriculture	6%

S&T Personnel (1973)

	Total	In R&D (FTE)
Scientists & Engineers	36,000*	3,100
Technicians	40,000*	

R&D Personnel (1974)**

Mathematics/Science (including Agriculture)	7,700
Engineering/Architecture	5,900
Medicine	2,800
Social Sciences	3,400
Humanities	2,000
Total	21,800

R&D Personnel By Sector

Productive	6,100
Higher Education	6,200
General Services	9,500
Total	21,800

*This Unesco estimate does not include social sciences and humanities. Unesco Statistical Yearbook 1976 gives a total for Scientists and Engineers of 96,300 with no breakdown by field.

**These figures are from Statistical Abstract of Israel 1977.

ISRAEL

D. EDUCATION AT THIRD LEVEL

Students in national institutions (1976)

Natural Sciences	6,640
Engineering/Technology	9,055
Medical Sciences	2,565
Agricultural Sciences	1,056
Social Sciences/Humanities	<u>30,994</u>
Total	50,310

Students by type of institution (1976)

University	50,310
Teacher Training & Vocational	26,741

<u>Degrees awarded (1973)</u>	<u>Bachelor</u>	<u>Postgrad</u>
Natural Sciences	829	533
Engineering/Technology	1,234	228
Medical Sciences	310	17
Agricultural Sciences	212	66
Social Sciences	2,034	316
Humanities	2,045	851

University graduates & holders of post-secondary degrees (1974)

Mathematics/Science incl. agriculture.	1,103
Engineering/Architecture	9,377
Medicine	14,026
Social Sciences	7,013
Humanities	<u>47,201</u>
Total	78,720

ISRAEL

E. FISCAL RESOURCES

GNP (1973)	US\$ 9,572 million*
(1976)	IL 26,582 million
Expenditure on R&D (millions of pounds) (1974-75)	634

% of GNP spent on R&D (civilian and military)	2%
% of GNP spent on R&D (civilian)	1.1%
Average per capita (pounds)	181
Average per scientist & engineer (pounds)	82,337

Expenditure by sector (IL millions) 1974-1975
on civilian R&D

Productive	140
Higher Education	379
Government (including Hospitals)	<u>115</u>
Total	634

Expenditure on R&D by type of research (IL millions)

Basic research	312
Applied research	<u>322</u>
Total	634

Expenditure on R&D by source (IL millions)

Government	397
Higher Education	127
Industry	106
Hospitals	<u>7</u>
Total	634

* Average exchange rate 1973: 4.2 Israeli pounds = US\$ 1.00
Exchange rate April, 1977: 9.24 Israeli pounds = US\$ 1.00

ISRAEL

F. PRINCIPAL RESEARCH CENTERS

<u>Institution</u>	<u>Department or Research Area</u>
Government:	
1. Agricultural Research Organization (Ministry of Agriculture)	Inst. of Soil & Water Inst. of Field & Garden Crops Inst. of Horticulture Inst. of Animal Science Inst. of Agricultural Engineering Inst. of Plant Protection Inst. of Technology & Sto- rage of Agri. Products Kimron Veterinary Inst. Fisheries Technology Unit Lab. for Research of Fish Disease Water Commission Hydrological Service Center for Industrial Research
2. Ministry of Agriculture	Israel Fiber Inst. . National Physical Lab. Paint Research Assoc. Israel Ceramic & Silicate Inst. Rubber Research Inst. Israel Inst. of Metals Fermentation Unit Geological Survey Inst. for Petroleum Res. & Geophysics Oceanographic & Limnologi- cal Research Co.
3. Industrial Research Organization (Ministry of Commerce and Industry)	Food Industries Advisory Service Government hospitals Division for Air Pollution and Radiation Control Public Health Labs. Chams Memorial Pulmonary Diseases Prevention Ctr Environmental Hygiene Lab. Inst. for Safety & Hygiene Inst. for Control & Stan- dardization of Drugs
4. Ministry of Commerce (with Manufacturers Assoc.)	
5. Ministry of Health	
6. Government Laboratories	

ISRAEL

<u>Institution</u>	<u>Department or Research Area</u>
Government Labs (cont'd.)	Israel Inst. for Biological Research Med. Inst. for Road Safety Wingate Inst. for Physical Education & Sport
7. Ministry of Transportation	Israel Meteorological Svc.
8. Ministry of Interior	Environmental Protection Service
9. Atomic Energy Commission	
Universities:	
1. Technion-Israel Institute of Technology	Agricultural research Regional & environmental studies Aba Khouzky Sch. of Med. Ramban Univ. Hospital Technion R&D Foundation
2. Hebrew University	Agriculture, chemistry, atmospheric sciences, geography, geology, oceanography, biology, botany, mathematics, physics, applied S&T Hadassah Medical School Yissum Research Development Co.
3. Weizmann Institute of Science	Yeda Research & Development Co.
4. Tel Aviv University	Agricultural research Sackler Medical School Beilinson Medical Center Chaim Sheba Medical Center
5. Bar Ilan University	Bar Ilan R&D Corp.
6. Ben Gurion University of Negev	R&D Authority-Chemicals, natural products, environmental studies, desert research Center for Health Science Soroka Medical Center
Private:	
1. Citrus Marketing Board	Biological Control Inst.
2. Inst. of Animal Research	
3. Hazera Ltd.	Seeds

ISRAEL .

<u>Institution</u>	<u>Department or Research Area</u>
4. Mer Memorial Research Lab.	Irrigation
5. IMI Institute for R&D	
6. Israel Inst. of Packaging	
7. Israel Shipping Research Inst.	
8. Israel Wine Institute	
9. Scientific Research Foundation	
10. Standards Inst. of Israel	
11. Desert Research Institute	
12. E.E. Eljim Ecology, Ltd.	
13. Inst. for Planning & Development	
14. Israel Inst. of Transportaion Planning & Research	

ISRAEL

G. PUBLICATION INDICATORS

1. Number of scientists and engineers who published first author papers in international scientific journals (1973) 2,304
2. Table 1 following represents total publications for 1974 (Source: Computer Horizons, Inc.). The first column represents the percentage of the total number of publications assigned to a certain subfield. The second column gives the activity index, which is defined as follows:

$$\text{Activity Index} = \frac{\% \text{ of country's publications in subfield A}}{\% \text{ of world's publications in subfield A}}$$

- The activity index tells us the relative degree of research activity of Israel in a given subfield, contrasted with the degree of world activity in that subfield. When Israel is more active in a subfield than the world as a whole, the index is greater than one; when Israel is exactly as active in a subfield as the world as a whole, the index is one; when the Israeli level of activity is less than the world level, the index is less than one. Activity indices which are tagged with an asterisk (*) are significantly different from 1.0 at the 1% level.
3. Table 2 following shows the number of scientific journals published in Israel. (Source: Computer Horizons, Inc.)

ISRAEL

TOTAL PUBLICATIONS 1974: 2

	<u>% of Effort</u>	<u>Activity Index</u>		<u>% of Effort</u>	<u>Activity Index</u>
<u>CLINICAL MEDICINE</u>	26.44	0.98-	<u>CHEMISTRY</u>	12.70	0.79*
Genrl & Internal Med	6.44	1.22*	Analytical Chemistry	0.57	0.41*
Allergy	0.07	0.57	Organic Chemistry	3.40	1.25+
Anesthesiology	0.04	0.13	Inorganic & Nuc. Chemistry	0.62	0.52*
Cancer	1.02	1.06-	Applied Chemistry	0.18	0.22*
Cardiovascular System	1.02	1.03-	General Chemistry	3.76	0.65*
Dentistry	0.90	1.45+	Polymers	1.07	0.95-
Dermatology & Venerl Disease	0.41	0.97-	Physical Chemistry	3.09	1.01-
Endocrinology	1.03	1.01-			
Fertility	0.67	2.18*	<u>PHYSICS</u>	15.92	1.22*
Gastroenterology	0.44	1.08-	Chemical Physics	4.14	2.69*
Geriatrics	0.22	1.03-	Solid State Physics	3.31	1.60*
Hematology	0.60	1.20-	Fluids & Plasmas	0.22	0.65-
Immunology	2.58	1.59*	Applied Physics	2.45	0.84-
Obstetrics & Gynecology	1.07	2.17*	Acoustics	0.22	0.60-
Neurology & Neurosurgery	1.41	0.83-	Optics	0.52	0.90-
Ophthalmology	0.76	1.16-	General Physics	2.81	0.70*
Orthopedics	0.31	0.74-	Nuc. & Particle Physics	2.13	2.11*
Arthritis & Rheumatism	0.04	0.31	Misc Physics	0.13	0.55
Otorhinolaryngology	0.26	0.81-			
Pathology	0.39	0.52+	<u>EARTH & SPACE SCIENCE</u>	3.59	0.85-
Pediatrics	0.98	1.26-	Astronomy & Astrophysics	0.78	0.68+
Pharmacology	1.63	0.68+	Meteorology & Atmos. Science	0.26	0.89-
Pharmacy	0.06	0.05	Geology	0.44	0.66-
Psychiatry	0.47	0.77-	Earth & Planetary Sciences	1.82	1.03-
Radiology & Nuclear Medicine	0.62	0.56+	Geography		
Respiratory System	0.17	0.57	Oceanography & Limnology	0.30	0.89-
Surgery	1.17	0.77-			
Tropical Medicine	0.18	1.05	<u>ENGINEERING & TECHNOLOGY</u>	7.18	0.71*
Urology	0.22	0.77-	Chemical Engineering	0.61	0.59+
Nephrology	0.18	3.23	Mechanical Engineering	0.80	0.67+
Veterinary Medicine	0.44	0.52+	Civil Engineering	1.07	1.79*
Addictive Diseases	0.15	1.68	Elec. Engr. & Electronics	1.26	0.56*
Hygiene and Public Health	0.40	0.75-	Misc. Engineering & Tech.	0.07	1.13
Misc Clinical Medicine	0.11	0.90	Industrial Engineering		
			General Engineering	0.59	0.87-
<u>BIOMEDICAL RESEARCH</u>	16.01	1.07-	Metals & Metallurgy	0.43	0.29*
Physiology	0.51	0.56+	Materials Science	0.52	0.51*
Anatomy and Morphology	0.41	1.36-	Nuclear Technology	0.38	0.67-
Embryology	0.07	0.34	Aerospace Technology	0.46	1.27-
Genetics & Heredity	0.98	0.99-	Computers	0.58	1.29-
Nutrition & Dietet	0.42	1.16-	Library & Information Sci.	0.04	0.21
Biochemistry & Mol. Biol.	7.27	1.58*	Operations Res & Mngmt Sci.	0.37	2.20+
Biophysics	0.09	0.43			
Cell Biol., Histology & Cyt.	1.24	1.03-	<u>PSYCHOLOGY</u>	2.26	0.82-
Microbiology	0.93	0.79-	Clinical Psychology		
Virology	1.06	2.11*	Personality & Social Psych.	0.47	1.68+
Parasitology	0.18	0.63-	Developmentl & Child Psych.	0.22	1.55-
Biomedical Engineering	0.15	0.53	Experimental Psych.	0.55	0.73-
Microscopy	0.09	0.90	General Psychology	0.24	0.39+
Misc. Biomedical Research	0.38	0.92-	Misc. Psychology	0.39	1.24-
General Biomedical Research	2.21	0.66*	Behavioral Science	0.37	0.82-
<u>BIOLOGY</u>	10.96	1.25*	<u>MATHEMATICS</u>	4.93	1.65*
General Biology	0.24	0.43+	Probability & Statistics	0.46	1.10-
General Zoology	0.50	1.48-	Applied Mathematics	0.66	1.47-
Entomology	0.76	1.09-	General Mathematics	3.53	1.77*
Misc Zoology	0.63	0.97-	Misc. Mathematics	0.28	2.39+
Marine Biol. & Hydrobiol.	0.53	0.92-			
Botany	4.56	2.06*			
Ecology	0.37	1.00-			
Agrl. & Food Science	2.36	0.91-			
Dairy & Animal Science	0.91	1.47+			
Misc. Biology	0.11	0.64			

TABLE 1: S&T PUBLICATION ACTIVITY 1974, SOURCE: COMPUTER HORIZONS, INC.

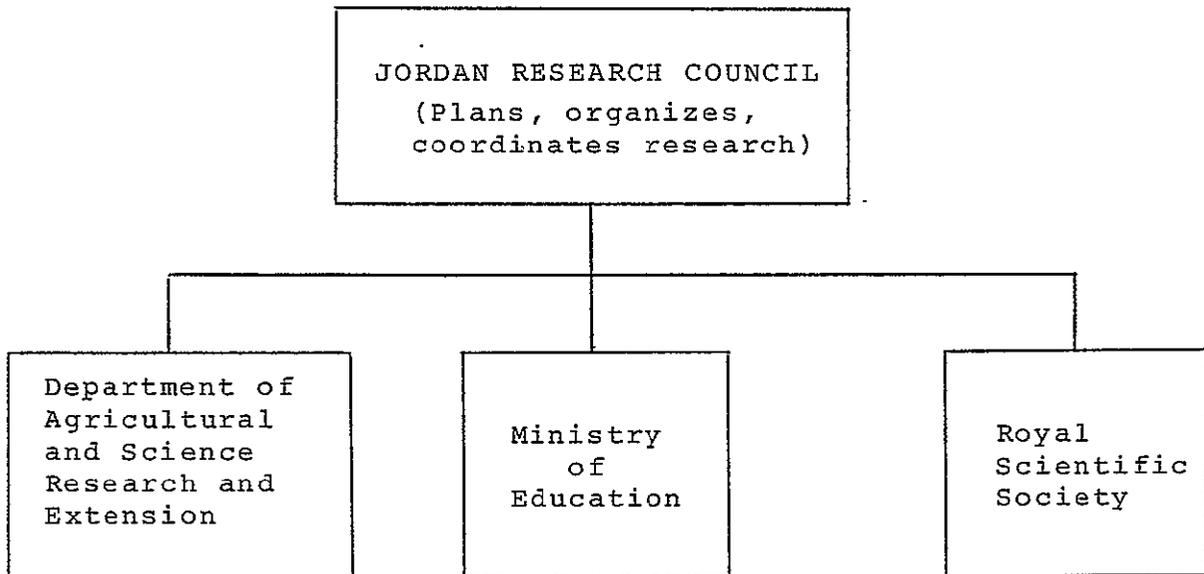
ISRAEL

TABLE 2. SCIENTIFIC JOURNALS (BLLD, 1974)

Clinical Medicine	6
Biomedical Research	0
Biology (includes agriculture)	13
Chemistry	4
Physics	0
Earth/Space Sciences	10
Engineering Technology	19
Mathematics/Statistics	5
Psychology	0
General Scientific Literature	4
Social Studies	19
Humanities	3

JORDAN

A. SCIENCE POLICY ORGANIZATION



JORDAN

B. SOCIOECONOMIC INDICATORS

GNP (1976)	523,880,000 Dinars (US\$1,582 million)
GNP per capita	260 JD (US\$784)
Average annual growth rate GNP (1965-1973)	-2.6%
Population (Est 1976) (East Bank)	2,018,330
% Urban	60%
Average annual growth rate (1965-1973)	3.4%
Literacy Rate	71%
Telephones (1973) per 100 population	40,000 1.6
Newspapers (1974)	
Dailies	4
Circulation	58,000
Non-dailies	6
Circulation	43,000
Radios (1974) per 1000 population	529,000 198
Television receivers per 1000 population	85,000 32

JORDAN

C. HUMAN RESOURCES

Population (East Bank)(Est. 1976)	2,018,330
Labor Force (1976)	403,000
Percent in agriculture	18%

S & T Personnel (1976)

	Total	per 100,000 population	FTE	in R & D
Scientists & Engineers	1422	170	1288.2	208.3
Non-nationals	2.3%		"	
Technicians	745	43	626	109
Non-nationals	...			

Scientists and Engineers by Field (1976)

	Total	# in R&D	In R&D FTE
Natural Sciences	256	109	36.7
Engineering/Technology	244	122	42.2
Medical Sciences	125	28	6.8
Agriculture	133	101	42.9
Social Sciences/Humanities	664	223	79.7
Total	1422	583	208.3

Scientists and Engineers by Sector (1976)

	Total	# in R & D (FTE)
Productive	101	15.9
Higher Education	827	75.3
General Services	494	117.1
Total	1422	208.3

Trained Personnel (1975)

	<u>Excluding Teachers</u>	<u>Including Teachers</u>
Holding university degree , in science & engineering	1950	2632
Holding university degree in social sciences & humanities	8179	11410
Completing two-year post- secondary education	5498	19594

JORDAN

D. EDUCATION AT THIRD LEVEL

<u>Number of Students*(1975)</u>	<u>In Jordan</u>	<u>Outside Jordan</u>	<u>Total</u>
Natural Sciences	1119	2113	3232
Engineering	119	5623	5742
Medical Sciences	310	7471	7781
Agriculture	164	1144	1308
Social Sciences/Humanities	3595	20920	24515
Other	--	2085	2085
Total	5307	39356	44663

Students in Higher Education (1975-76 Academic Year)

University	5307
Teacher Training	5104
Vocational	1335
Other	127
Total	11873

Degrees awarded (1974) *

	<u>Bachelor</u>	<u>Post-Graduate</u>
Natural Sciences	110	6
Engineering		
Medical Sciences		
Agricultural Sciences		
Social Sciences	271	
Humanities	292	192

*East Bank only

JORDAN

E. FISCAL RESOURCES

GNP (1976)	523,880,000JD ** (US\$1,582million)
Expenditure on S&T	14.9million JD (US\$44.9million)
Expenditure on R&D	2.1million JD (US\$6.45million)
% of GNP spent on S&T	2.42%
% of GNP spent on R&D	.40%

Expenditure by Sector (JD)

	<u>Intramural</u>		<u>Extramural</u>		<u>Total</u>
	<u>R&D</u>	<u>Other STAs ***</u>	<u>Inside Jordan</u>	<u>Outside Jordan</u>	
Productive Higher	140,045	925,371	10,000	49,145	1,124,561
Education General	613,989	5,359,083	--	--	5,973,072
Services'	1,320,186	5,338,278	11,500	2,169,320	7,839,917
Total	2,074,220				14,936,917

Expenditure by source (JD)

	<u>R&D</u>	<u>Other STAs</u>	<u>Total</u>
Private sector	143,545	1,097,621	1,241,165
Public sector	1,196,101	8,303,230	9,249,331
Other*	734,574	1,221,881	1,956,455

*Includes Royal Scientific Society

Expenditure by Type of Research (1973)

Basic research	83,000 JD
Applied research	56,000
Experimental/Development	---
TOTAL	139,000 JD

** Exchange rate 1976: 1 Jordanian Dinar = US\$ 3.02

***"Scientific and Technological Activity" -See Glossary

JORDAN

F. PRINCIPAL RESEARCH CENTERS

<u>Institution</u>	<u>Department or Research Area</u>
1. Royal Scientific Society (Independent, non-profit, reports directly to Crown Prince. Has library & printing press.)	Computer systems Mechanical engineering Electronic Engineering Economics Education
2. University of Jordan (Government-supported, not under jurisdiction of Ministry of Education.)	Arts Economics Law Agriculture Nursing Education Psychology Engineering/Technology Medicine
3. King Hussein Medical Center	Medical Science
4. Yarmouk University	

JORDAN

G. PUBLICATION INDICATORS

1. Principal research institutions in certain sub-fields (from Computer Horizons' Directories)

<u>Subfield</u>	<u>Institution</u>	<u># of Publi- cations</u>	<u># of Scientists</u>
Nutrition/Health	Univ. of Jordan	1	3
Food Technology	Agricultural Research Council	1	2

2. Publications (1974-1976)*

	<u>Books</u>	<u>Articles in prof. journals</u>	<u>Reports & Studies</u>
Natural sciences	9	99	36
Medical sciences	-	52	8
Engineering sciences	1	5	19
Agricultural sciences	4	13	28
Social sciences/ Humanities	60	27	82
Other	<u>1</u>	<u>-</u>	<u>19</u>
Total	75	196	192

*(Source: Survey of Scientific and Technological
Potential for Jordan in 1976.)

JORDAN

3. Table 1 following represents total publications for 1974 (Source: Computer Horizons, Inc.). The first column represents the percentages of the total number of publications assigned to a certain subfield. The second column gives the activity index, which is defined as follows:

$$\text{Activity Index} = \frac{\% \text{ of country's publications in subfield A}}{\% \text{ of world's publications in subfield A}}$$

The activity index tells us the relative degree of research activity of the country in a given subfield, contrasted with the degree of world activity in that subfield. When the country is more active in a subfield than the world as a whole, the index is greater than one; when the country is exactly as active in a subfield as the world as a whole, the index is one; when the country's level of activity is less than the world level, the index is less than one. Activity indices which are tagged with an asterisk (*) are significantly different from 1.0 at the 1% level.

JORDAN

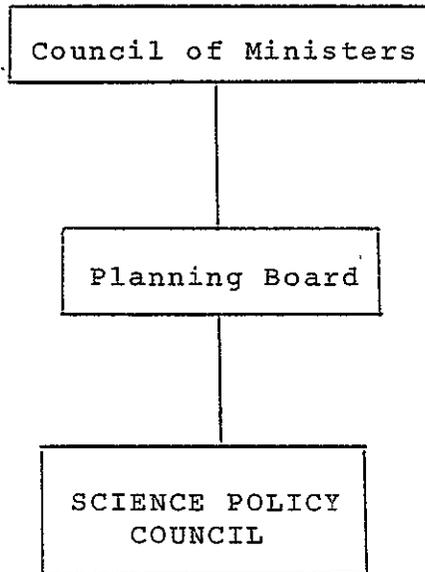
TOTAL PUBLICATIONS 1974: 15

	<u>% of Effort</u>	<u>Activity Index</u>		<u>% of Effort</u>	<u>Activity Index</u>
<u>CLINICAL MEDICINE</u>	6.45	0.24	<u>CHEMISTRY</u>	38.71	2.40+
Genrl & Internal Med			Analytical Chemistry	6.45	4.61
Allergy			Organic Chemistry		
Anesthesiology			Inorg & Nuclear Chem	19.35	16.33
Cancer			Applied Chem		
Cardiovascular System			General Chem	6.45	1.11
Dentistry			Polymers	3.23	2.84
Dermatol & Venereal Dis	6.45	15.39	Physical Chem	3.23	1.06
Endocrinology					
Fertility			<u>PHYSICS</u>		
Gastroenterology			Chemical Physics		
Geriatrics			Solid State Physics		
Hematology			Fluids & Plasmas		
Immunology			Applied Physics		
Obstetrics & Gynecol			Acoustics		
Neurology & Neurosurg			Optics		
Ophthalmology			General Physics		
Orthopedics			Nucl & Particle Phys		
Arthritis & Rheumatism			Misc Physics		
Otorhinolaryngology					
Pathology			<u>EARTH & SPACE SCIENCE</u>		
Pediatrics			Astronomy & Astrophys		
Pharmacology			Meteorol & Atmosph Sci		
Pharmacy			Geology		
Psychiatry			Earth & Planetary Sci		
Radiology & Nuclear Med			Geography		
Respiratory System			Oceanog & Limnology		
Surgery					
Tropical Medicine			<u>ENGINEERING & TECHNOLOGY</u>	22.58	2.24
Urology			Chemical Engineering	19.35	18.61
Nephrology			Mechanical Eng'g		
Veterinary Med			Civil Eng'g	3.23	5.37
Addictive Diseases			Electr Eng'g & Electron		
Hygiene & Public Health			Misc Eng'g & Technol		
Misc Clinical Medicine			Industrial Eng'g		
			General Engineering		
<u>BIOMEDICAL RESEARCH</u>	6.45	0.43	Metals & Metallurgy		
Physiology			Materials Sci		
Anatomy & Morphology			Nuclear Technology		
Embryology			Aerospace Technology		
Genetics & Heredity			Computers		
Nutrition & Dietet	6.45	17.84	Library & Informat Sci		
Biochem & Molecular Biol			Operations Res. & Mngemt		
Biophysics					
Cell Biol, Histol & Cyto			<u>PSYCHOLOGY</u>		
Microbiology			Clinical Psychology		
Virology			Personal. & Social Psy		
Parasitology			Developm & Child Psy		
Biomedical Engineering			Experimental Psych		
Microscopy			General Psych		
Misc Biomedical Res			Misc Psych		
General Biomedical Res			Behavioral Sci		
<u>BIOLOGY</u>	19.35	2.21	<u>MATHEMATICS</u>	6.45	2.17
General Biology			Probability & Stat		
General Zoology			Applied Mathematics		
Entomology			General Math	6.45	3.23
Misc Zoology			Misc Math		
Marine Biol & Hydrobiol	6.45	11.23			
Botany	12.90	5.83			
Ecology					
Agriculture & Food Sci					
Dairy & Animal Sci					
Misc Biology					

TABLE 1: S&T PUBLICATION ACTIVITY 1974. SOURCE: COMPUTER HORIZONS, INC.

KUWAIT

A. SCIENCE POLICY ORGANIZATION



(National 5 year development plan 1975-1980)

(Study by National Science Foundation to be completed
November 1978)

KUWAIT

B. SOCIOECONOMIC INDICATORS

GNP (1973)	US\$ 10,610million
GNP per capita	US\$ 12,050
Average annual growth rate GNP (1965-1973)	-2.9%
Population (1975)	991,390
% Urban	22.0%
Average annual growth rate (1965-1973)	8.2%
Literacy rate	55.0%
Telephones (1975)	128,000
per 100 population	12.3
Newspapers (1974)	
Dailies	6
Circulation	80,000
Non-dailies	10
Circulation	90,000
Radios (1974)	215,000
per 1000 population	231
Television receivers (1974)	182,000
per 1000 population	196

KUWAIT

C. HUMAN RESOURCES

Population (1975)	991,390
Labor force (1970)	239,271
Percent in agriculture	2%

<u>S&T Personnel</u> (1973)	<u>Total</u>	<u>Per 100,000 population</u>	<u>In R&D (FTE)</u>
Scientists and engineers	10,754	1139	176*
Non-nationals	8,603		161
Technicians	2,930	310	15
Non-nationals	2,344		10

Scientists and Engineers by Field (1973)

	<u>Total</u>	<u>In R&D (FTE)</u>
Natural Sciences	670	25*
Engineering/Technology	2425	13*
Medical Sciences	992	22*
Agriculture	15	6*
Social Sciences/ Humanities	<u>6652</u>	<u>110*</u>
Total	10754	176

Scientists and Engineers in R&D by Sector (FTE)

Productive	176*
Higher Education	--
General Services	<u>--</u>
Total	176

*Estimated. This CASTARAB figure does not include 29 scientists and engineers in the higher education sector listed by Unesco.

KUWAIT

D. EDUCATION AT THIRD LEVEL

Students in national institutions (1974)

Natural Sciences	1,153
Engineering	--
Medical Sciences	152
Agricultural Sciences	--
Social Sciences/Humanities	<u>4,495</u>
Total	5,800

<u>Students studying abroad</u>	<u>1,191</u>
---------------------------------	--------------

Total # students	6,991
------------------	-------

Students by type of institution (1974)

University	4,658
Teacher Training	990
Other	152

Degrees awarded (1974)

Natural Sciences	100
Social Sciences/Humanities	497

KUWAIT

E. FISCAL RESOURCES

GNP (1973)	US\$ 10,610million *
Expenditure on R&D (thousands of dinars) (1973)	
Total (including capital expenditure)	230 D ** (US\$786;000)
Current (salaries, supplies, etc.)	73 D
% of GNP spent on R&D	.01%
Average per scientist & engineer	US\$17,100
Average per capita	US\$ 0.08

Expenditure by sector (thousands of Dinar)

Productive	230 D
Higher Education	--
General Service	--

Expenditure by type of research

Basic Research	...
Applied research	...
Experimental/Developmental	...

Expenditure by source of funding

Government	100%
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*Average exchange rate 1973: 1 Kuwaiti Dinar = US\$ 3.41
 **Not including universities

KUWAIT

F. PRINCIPAL RESEARCH CENTERS

(All S&T institutions are state controlled and financed)

<u>Institution</u>	<u>Department or Research Area</u>
1. Ministry of Public Works (Department of Agriculture)	Agricultural Experi- mental Station
2. Ministry of Electricity and Water	Nuclear energy Desalination
3. Water Resources Development Center (UN Development Pro- gramme)	Water resources
4. Kuwait Institute for Scientific Research	Petroleum sciences Marine biology Construction Energy Arid Zone Agriculture
5. University of Kuwait (under Ministry of Education)	Science, law, arts and education, commerce economics and political science

KUWAIT

G. PUBLICATION INDICATORS

1. Principal research institutions in certain subfields (from Computer Horizons Directories)

<u>Subfield</u>	<u>Institution</u>	<u># of Publications</u>	<u># of Scientists</u>
Parasitology	Univ. Kuwait	1	2

2. Table 1 following represents total publications for 1974 (Source: Computer Horizons, Inc.). The first column represents the percentages of the total number of publications assigned to a certain subfield. The second column gives the activity index, which is defined as follows:

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KUWAIT

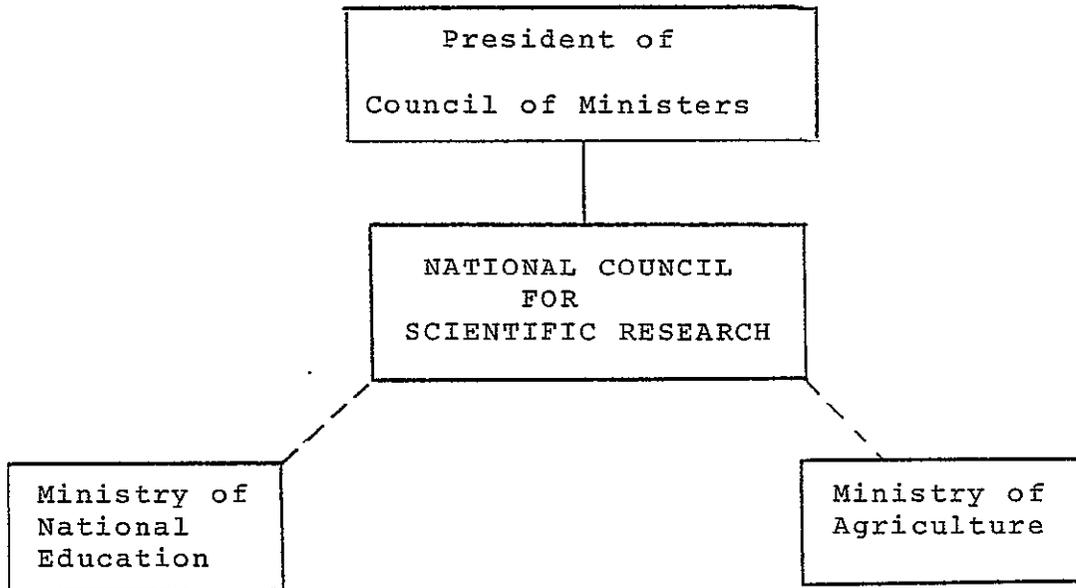
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<u>CLINICAL MEDICINE</u>	19.57	0.72	<u>CHEMISTRY</u>	35.87	2.22+
Genrl & Internal Med			Analytical Chemistry		
Allergy			Organic Chemistry		
Anesthesiology			Inorg & Nuclear Chem	6.52	5.50
Cancer			Applied Chem	6.52	7.72
Cardiovascular System			General Chem	6.52	1.12
Dentistry			Polymers		
Dermatol & Venereal Dis	13.04	31.11	Physical Chem	16.30	5.35
Endocrinology			<u>PHYSICS</u>	9.78	0.75
Fertility			Chemical Physics	3.26	2.11
Gastroenterology			Solid State Physics		
Geriatrics			Fluids & Plasmas		
Hematology			Applied Physics		
Immunology			Acoustics		
Obstetrics & Gynecol	6.52	13.20	Optics		
Neurology & Neurosurg			General Physics	6.52	1.62
Ophthalmology			Nucl & Particle Phys		
Orthopedics			Misc Physics		
Arthritis & Rheumatism			<u>EARTH & SPACE SCIENCE</u>		
Otorhinolaryngology			Astronomy & Astrophys		
Pathology			Meteorol & Atmosph Sci		
Pediatrics			Geology		
Pharmacology			Earth & Planetary Sci		
Pharmacy			Geography		
Psychiatry			Oceanog & Limnology		
Radiology & Nuclear Med			<u>ENGINEERING & TECHNOLOGY</u>	29.35	2.91
Respiratory System			Chemical Engineering	16.30	15.68
Surgery			Mechanical Eng'g		
Tropical Medicine			Civil Eng'g		
Urology			Electr Eng'g & Electron		
Nephrology			Misc Eng'g & Technol		
Veterinary Med			Industrial Eng'g		
Addictive Diseases			General Engineering		
Hygiene & Public Health			Metals & Metallurgy	13.04	8.77
Misc Clinical Medicine			Materials Sci		
<u>BIOMEDICAL RESEARCH</u>	2.17	0.15	Nuclear Technology		
Physiology			Aerospace Technology		
Anatomy & Morphology	2.17	2.37	Computers		
Embryology			Library & Informat Sci		
Genetics & Heredity			Operations Res. & Mngemt		
Nutrition & Dietet			<u>PSYCHOLOGY</u>		
Biochem & Molecular Biol			Clinical Psychology		
Biophysics			Personal. & Social Psy		
Cell Biol, Histol & Cyto			Developm & Child Psy		
Microbiology			Experimental Psych		
Virology			General Psych		
Parasitology			Misc Psych		
Biomedical Engineering			Behavioral Sci		
Microscopy			<u>MATHEMATICS</u>		
Misc Biomedical Res			Probability & Stat		
General Biomedical Res			Applied Mathematics		
<u>BIOLOGY</u>	3.26	0.37	General Math		
General Biology			Misc Math		
General Zoology					
Entomology					
Misc Zoology					
Marine Biol & Hydrobiol	3.26	5.68			
Botany					
Ecology					
Agriculture & Food Sci					
Dairy & Animal Sci					
Misc Biology					

TABLE 1: S&T PUBLICATION ACTIVITY 1974, SOURCE: COMPUTER HORIZONS, INC.

LEBANON

A. SCIENCE POLICY ORGANIZATION



National 6 year plan (1972-1977)

LEBANON

B. SOCIOECONOMIC INDICATORS

GNP (1973)	US\$ 2,790 million
GNP per capita	US\$ 940
Average annual growth rate GNP (1965-1973)	3.5%
Population (1975 est.)	2,869,000
% Urban	58.0%
Average annual growth rate (1965-1973)	2.7%
Literacy rate (1970)	69.0%
Telephones (1972)	227,000
per 100 population	7.7
Newspapers (1974)	
Dailies	37
Circulation	293,000
Non-dailies	46
Circulation	...
Radios	1,321,000
Per 1000 population	474
Television receivers	375,000
Per 1000 population	135

LEBANON

C. HUMAN RESOURCES

Population (1975 est.)	2,869,000
Labor force (1970)	570,000
% in agriculture	19%

<u>S&T Personnel (1973)</u>	<u>Total</u>	<u>per 100,000 population</u>	<u>In R&D (FTE)</u>
Scientists & Engineers	37,000	1,163	340
Non-nationals	800		79
Technicians	8,000	250	225
Non-nationals	...		

Scientists and Engineers by Field (1973)

	<u>Total</u>	<u>In R&D (FTE)</u>
Natural Sciences	2,600	65
Engineering/Technology	5,000	15
Medical Sciences	4,000	65
Agricultural Sciences	400	95
Social Sciences/Humanities	25,000	100
Total	37,000	340

S&T Personnel in R&D by sector (FTE)

	<u>Scientists & Engineers</u>	<u>Technicians</u>
Productive	45	75
Higher Education	220	150
General Services	75	--
Total	340	225

LEBANON

D. EDUCATION AT THIRD LEVEL

Students in national institutions (1969)*

Natural Sciences	2,176
Engineering	788
Medical Sciences	1,243
Agricultural sciences	275
Social Sciences/Humanities	33,576
Other	462
Total	38,520

Students studying abroad 5,238

Total # students 43,758

Number of students by type of institution (1971)

University	44,296
Teacher Training	--
Other	--
Total	44,296

Degrees awarded (1969)

	<u>Bachelor</u>	<u>Postgrad</u>
Natural Sciences	250	16
Engineering	125	7
Medical Sciences	146	8
Agricultural Sciences	26	39
Social Sciences	1167	30
Humanities	1941	318

*Number of students 1971 - 44,296

LEBANON

E. FISCAL RESOURCES

GNP (1973) US\$ 2,790 million *

Expenditure on R&D (thousands of pounds) (1973)

Total (including capital expenditure) 30,000

Current (Salaries, Supplies, etc.) 25,200

% of GNP spent on R&D 0.4%

Average per scientist & engineer US\$ 22,400

Average per capita US\$ 2.4

Expenditure by sector (thousands of pounds) (1973)

Productive 7,800

Higher Education 8,400

General Services 13,800

Total 30,000

Expenditure by type of research (thousands of pounds)

Basic 5,500

Applied 21,400

Experimental/Developmental 3,100

Expenditure by source of funding

Government 93.7%

Foreign 6.3%

* Average exchange rate 1973: 2.54 Lebanese pounds=US\$ 1.00

LEBANON

F. PRINCIPAL RESEARCH CENTERS

<u>Institution</u>	<u>Department or Research Area</u>
American University of Beirut	Center for Behavioral Res. Center for English Language Research & Teaching Economic Research Inst. Graduate Center for Mid- Eastern Studies Science & Mathematics Education Center Biology, Chemistry, geology, mathematics, phy- sics, medicine, pharmacy, nursing, public health, engineering, agricultural sciences
Lebanese University (Under Ministry of Education)	Inst. for information sciences Humanities, sciences, law, business administration, education
Beirut Arab University (associated with Univ. of Alexandria, Egypt. Founded and financed by Muslim Benevolent Society)	
St. Joseph University	Medicine, engineering
Mathematics & Physics Research Center (allied to Faculty of Science of University of Lyon, France)	Mathematics, physics
National Council for Scientific Research	Electronics, nuclear re- search, geophysical re- search, atomic & molecular physics, solar energy
Ministry of Agriculture	Institute for Agricultural Research
Ministry of Industry	Institute of Industrial Research
Ministry of Health	Laboratory of Hygiene & Public Health

LEBANON

G. PUBLICATION INDICATORS

1. Principal research institutions in certain subfields (from Computer Horizons' Directories)

<u>Subfield</u>	<u>Institution</u>	<u># of Publications</u>	<u># of Scientists</u>
Food Technology	Natl. Council for Scientific Res.	1	1
Nutrition	American University	2	4
Parasitology	American University	1	1

2. Table 1 following represents total publications for 1974 (Source: Computer Horizons, Inc.). The first column represents the percentages of the total number of publications assigned to a certain subfield. The second column gives the activity index, which is defined as follows:

$$\text{Activity Index} = \frac{\% \text{ of country's publications in subfield A}}{\% \text{ of world's publications in subfield A}}$$

The activity index tells us the relative degree of research activity of the country in a given subfield, contrasted with the degree of world activity in that subfield. When the country is more active in a subfield than the world as a whole, the index is greater than one; when the country is exactly as active in a subfield as the world as a whole, the index is one; when the country's level of activity is less than the world level, the index is less than one. Activity indices which are tagged with an asterisk (*) are significantly different from 1.0 at the 1% level.

3. Table 2 following shows the number of scientific journals published in Lebanon (Source: Computer Horizons, Inc.)

LEBANON

TOTAL PUBLICATIONS 1974: 127

	<u>% of Effort</u>	<u>Activity Index</u>		<u>% of Effort</u>	<u>Activity Index</u>
<u>CLINICAL MEDICINE</u>	36.10	1.33+	<u>CHEMISTRY</u>	7.46	0.46*
Genrl & Internal Med	1.83	0.35	Analytical Chemistry	0.78	0.56
Allergy			Organic Chemistry	2.75	1.01
Anesthesiology	1.57	5.46	Inorg & Nuclear Chem	1.57	1.32
Cancer			Applied Chem		
Cardiovascular System	1.57	1.59	General Chem	1.57	0.27
Dentistry	0.78	1.26	Polymers		
Dermatol & Venereal Dis	3.53	8.42	Physical Chem	0.78	0.26
Endocrinology			<u>PHYSICS</u>	16.09	1.23-
Fertility	0.78	2.57	Chemical Physics	3.14	2.04
Gastroenterology	0.78	1.92	Solid State Physics	5.89	2.84*
Geriatrics			Fluids & Plasmas		
Hematology			Applied Physics		
Immunology			Acoustics		
Obstetrics & Gynecol			Optics		
Neurology & Neurosurg	5.23	3.08*	General Physics	1.96	0.49
Ophthalmology	0.78	1.20	Nucl & Particle Phys	4.32	4.29*
Orthopedics	0.78	1.88	Misc Physics	0.78	3.33
Arthritis & Rheumatism			<u>EARTH & SPACE SCIENCE</u>	1.05	0.25
Otorhinolaryngology			Astronomy & Astrophys		
Pathology	1.57	2.08	Meteorol & Atmosph Sci	0.78	2.70
Pediatrics	6.28	8.04*	Geology		
Pharmacology	3.53	1.48	Earth & Planetary Sci	0.26	0.15
Pharmacy	1.57	1.45	Geography		
Psychiatry			Oceanog & Limnology		
Radiology & Nuclear Med	0.78	0.72	<u>ENGINEERING & TECHNOLOGY</u>	3.14	0.31
Respiratory System			Chemical Engineering		
Surgery	3.14	2.07	Mechanical Eng'g	0.78	0.66
Tropical Medicine			Civil Eng'g	0.78	1.31
Urology			Electr Eng'g & Electron	1.57	0.70
Nephrology			Misc Eng'g & Technol		
Veterinary Med	1.57	1.85	Industrial Eng'g		
Addictive Diseases			General Engineering		
Hygiene & Public Health			Metals & Metallurgy		
Misc Clinical Medicine			Materials Sci		
<u>BIOMEDICAL RESEARCH</u>	18.55	1.24-	Nuclear Technology		
Physiology	5.36	5.85*	Aerospace Technology		
Anatomy & Morphology	0.78	2.62	Computers		
Embryology			Library & Informat Sci		
Genetics & Heredity	1.57	1.58	Operations Res. & Mngemt		
Nutrition & Dietet	2.35	6.51	<u>PSYCHOLOGY</u>	3.73	1.35
Biochem & Molecular Biol	2.35	0.51	Clinical Psychology		
Biophysics			Personal. & Social Psy	0.78	2.78
Cell Biol, Histol & Cyto.	3.14	2.61	Developm & Child Psy		
Microbiology	0.78	0.67	Experimental Psych	1.57	2.08
Virology			General Psych	0.39	0.64
Parasitology			Misc Psych	0.78	2.47
Biomedical Engineering	1.57	5.60	Behavioral Sci	0.20	0.44
Microscopy			<u>MATHEMATICS</u>	4.71	1.58-
Misc Biomedical Res			Probability & Stat	0.78	1.87
General Biomedical Res	0.63	0.19	Applied Mathematics		
<u>BIOLOGY</u>	9.18	1.05-	General Math	3.92	1.96-
General Biology	0.16	0.28	Misc Math		
General Zoology					
Entomology	0.78	1.13			
Misc Zoology	1.57	2.43			
Marine Biol & Hydrobiol					
Botany	2.35	1.06			
Ecology					
Agriculture & Food Sci	2.75	1.06			
Dairy & Animal Sci	0.78	1.27			
Misc Biology	0.78	4.54			

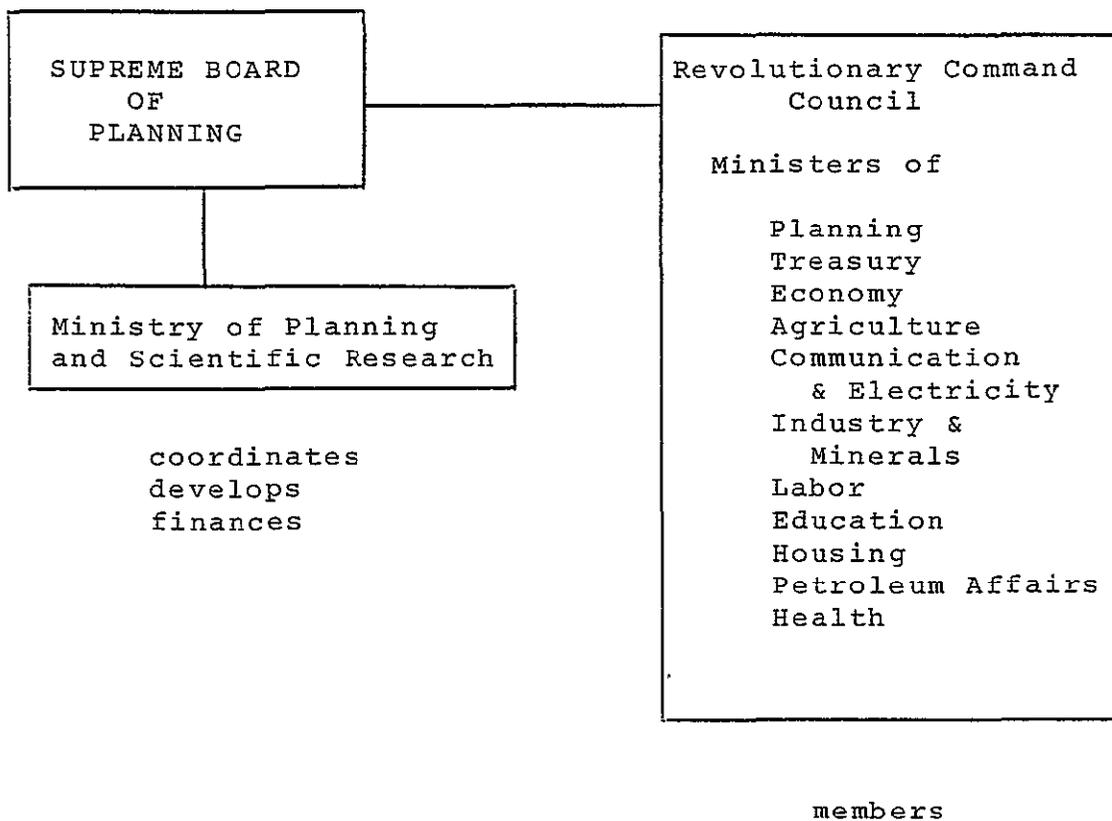
TABLE 1: S&T PUBLICATION ACTIVITY 1974. SOURCE: COMPUTER HORIZONS, INC.

TABLE 2: NUMBER OF SCIENTIFIC JOURNALS PUBLISHED
IN LEBANON (1974)

Clinical Medicine	4
Biomedical Research	0
Biology (includes agriculture)	1
Chemistry	0
Physics	0
Earth and Space Sciences	3
Engineering and Technology	2
Mathematics and Statistics	2
Psychology	0
General Scientific Literature	2
Social Studies	14
Humanities	0

LIBYA

A. SCIENCE POLICY ORGANIZATION



LIBYA

B. SOCIOECONOMIC INDICATORS

GNP (1973)	US\$ 7,620 million
GNP per capita	US\$ 3,530
Average annual growth rate GNP (1965-1973)	5.7%
Population (1975 est.)	2,444,000
% Urban (1970)	28%
Average annual growth rate (1965-1973)	3.7%
Literacy rate (1960)	22%
Telephones (1970)	41,000
Per 100 population	2.1
Newspapers (1975)	
Dailies	2
Circulation	41,000
Non-dailies	5
Circulation	111,000
Radios (1974)	105,000
Per 1000 population	45
Television receivers	6,000
Per 1000 population	3

LIBYA

C. HUMAN RESOURCES

Population (1975 est.)	2,444,000
Labor force (1970)	400,000
Percent in agriculture	37%

S&T Personnel (1973)

	<u>Total</u>	per 100,000 <u>population</u>	In R&D (FTE)
Scientists & Engineers	8,319*	392	50**
Non-nationals	6,533		40**
Technicians	10,602	500	142
Non-nationals	3,617		57

Scientists and Engineers by Field (1973)

	<u>Total</u>	In R&D (FTE)
Natural Sciences	264	} 25*
Engineering/Technology	4,860	
Medical Sciences	2,388	5*
Agricultural Sciences	720	12*
Social Sciences/Humanities	<u>87</u>	<u>8*</u>
Total	8,319	50*

S&T Personnel in R&D by Sector (1973)

	<u>Scientists & Engineers</u>	<u>Technicians</u>
Productive	30*	95
Higher Education	14*	45
General Services	<u>6*</u>	<u>--</u>
Total	50*	142

*Government employees only
**Estimated

LIBYA

D. EDUCATION AT THIRD LEVEL

Students in national institutions (1973)

Natural Sciences	596
Engineering	1,130
Medical Sciences	321
Agricultural Sciences	620
Social Sciences/Humanities	<u>6,923</u>
Total	9,590

Students studying abroad 1,665

Total # students 11,255

Students by type of institution (1974)

University	11,997
Teacher Training	--
Other	--

Degrees awarded (1972)

Natural Sciences	73
Engineering	88
Agriculture	76
Social Sciences/Humanities	774

LIBYA

E. FISCAL RESOURCES

GNP (1973) US\$ 7,620 million *

Expenditures on R&D (1973)
(Million Libyan Dinars) 34

Expenditure by sector (1973) (Million LD)

Res. & Experimental Devel.	11.8
Higher Education	1.0
General Services	1.2
Capital Expenditures	21

Expenditure by source

Government	100%
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* Average exchange rate 1973: 1 Libyan Dinar = US\$ 3.38

LIBYA

F. PRINCIPAL RESEARCH CENTERS

<u>Institution</u>	<u>Department or Research Area</u>
1. Ministry of Agriculture & Agrarian Reform (Agricultural Research Center)	Agricultural education, agronomy, animal husbandry, forestry, horticulture, plant protection, soil & water conservation, veteri- nary science
2. Ministry of Food & Marine Resources	Marine Research Centre
3. Libyan National Oil Co.	
4. Industrial Research Center	Geological Research & Mining Department Technology & Economic Department Financial & Administrative Affairs Dept.
5. Univ. of Libya at Benghazi	Arts, commerce, economics, law, Arabic & Islamic studies, medicine
6. Univ. of Tripoli	Sciences, agriculture, engineering, petroleum engineering, education
7. Al-Fateh University	
8. Atomic Energy Commission	
9. Arab Development Institute	Dept of Scientific & Technical Research; Dept of Documentation, Publi- cation, and Translation; Dept of Computers and Data Processing

LIBYA

G. PUBLICATION INDICATORS

1. Principal research institutions in certain subfields (from Computer Horizons' Directories)

<u>Subfield</u>	<u>Institution</u>	<u># of Publications</u>	<u># of Scientists</u>
Nutrition	Univ. of Benghazi	2	2
Oceanography	Al-Fateh University	4	6
Water Resources	Al-Fateh University	1	4

2. Table 1 following represents total publications for 1974 (Source: Computer Horizons, Inc.). The first column represents the percentages of the total number of publications assigned to a certain subfield. The second column gives the activity index, which is defined as follows:

$$\text{Activity Index} = \frac{\% \text{ of country's publications in subfield A}}{\% \text{ of world's publications in subfield A}}$$

The activity index tells us the relative degree of research activity of the country in a given subfield, contrasted with the degree of world activity in that subfield. When the country is more active in a subfield than the world as a whole, the index is greater than one; when the country is exactly as active in a subfield as the world as a whole, the index is one; when the country's level of activity is less than the world level, the index is less than one. Activity indices which are tagged with an asterisk (*) are significantly different from 1.0 at the 1% level.

LIBYA

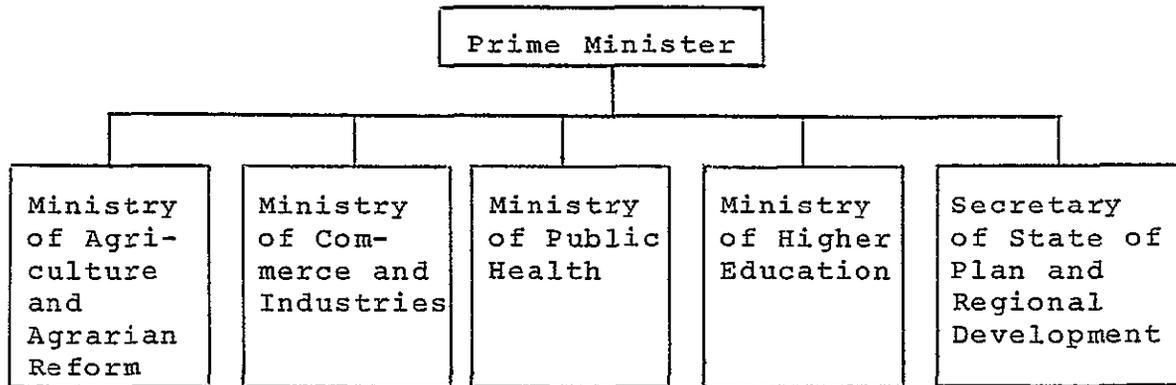
TOTAL PUBLICATIONS 1974: 9

	<u>% of Effort</u>	<u>Activity Index</u>		<u>% of Effort</u>	<u>Activity Index</u>
<u>CLINICAL MEDICINE</u>			<u>CHEMISTRY</u>	27.05	1.68
Genrl & Internal Med			Analytical Chemistry		
Allergy			Organic Chemistry	10.71	3.95
Anesthesiology			Inorg & Nuclear Chem		
Cancer			Applied Chem		
Cardiovascular System			General Chem	0.27	0.05
Dentistry			Polymers		
Dermatol & Venereal Dis			Physical Chem	16.07	5.27
Endocrinology			<u>PHYSICS</u>	10.98	0.84
Fertility			Chemical Physics		
Gastroenterology			Solid State Physics		
Geriatrics			Fluids & Plasmas		
Hematology			Applied Physics	10.71	3.67
Immunology			Acoustics		
Obstetrics & Gynecol			Optics		
Neurology & Neurosurg			General Physics	0.27	0.07
Ophthalmology			Nucl & Particle Phys		
Orthopedics			Misc Physics		
Arthritis & Rheumatism			<u>EARTH & SPACE SCIENCE</u>	0.27	0.06
Otorhinolaryngology			Astronomy & Astrophys		
Pathology			Meteorol & Atmosph Sci		
Pediatrics			Geology		
Pharmacology			Earth & Planetary Sci	0.27	0.15
Pharmacy			Geography		
Psychiatry			Oceanog & Limnology		
Radiology & Nuclear Med			<u>ENGINEERING & TECHNOLOGY</u>	30.62	3.04
Respiratory System			Chemical Engineering		
Surgery			Mechanical Eng'g	16.07	13.59
Tropical Medicine			Civil Eng'g	10.71	17.85
Urology			Electr Eng'g & Electron	3.57	1.59
Nephrology			Misc Eng'g & Technol		
Veterinary Med			Industrial Eng'g		
Addictive Diseases			General Engineering	0.27	0.39
Hygiene & Public Health			Metals & Metallurgy		
Misc Clinical Medicine			Materials Sci		
<u>BIOMEDICAL RESEARCH</u>	2.14	0.14	Nuclear Technology		
Physiology			Aerospace Technology		
Anatomy & Morphology			Computers		
Embryology			Library & Informat Sci		
Genetics & Heredity			Operations Res. & Mngemt		
Nutrition & Dietet			<u>PSYCHOLOGY</u>	1.07	0.39
Biochem & Molecular Biol			Clinical Psychology		
Biophysics			Personal. & Social Psy		
Cell Biol, Histol & Cyto			Developm & Child Psy		
Microbiology			Experimental Psych		
Virology			General Psych	1.07	1.75
Parasitology			Misc Psych		
Biomedical Engineering			Behavioral Sci		
Microscopy			<u>MATHEMATICS</u>		
Misc Biomedical Res			Probability & Stat		
General Biomedical Res	2.14	0.64	Applied Mathematics		
<u>BIOLOGY</u>	27.86	3.18	General Math		
General Biology	1.07	1.94	Misc Math		
General Zoology					
Entomology					
Misc Zoology					
Marine Biol & Hydrobiol					
Botany	21.43	9.69			
Ecology					
Agriculture & Food Sci	5.36	2.07			
Dairy & Animal Sci					
Misc Biology					

TABLE 1: S&T PUBLICATION ACTIVITY 1974. SOURCE: COMPUTER HORIZONS, INC.

MOROCCO

A. SCIENCE POLICY ORGANIZATION



(Current five-year plan (1973-1978) -- Emphasis on discovering and exploiting new mineral resources.)

MOROCCO

B. SOCIOECONOMIC INDICATORS

GNP (1973)	US\$ 5,080 million
GNP per capita	US\$ 320
Average annual growth rate GNP (1965-1973)	2.5%
Population (1975 est)	17,305,000
% Urban (1970)	35.0%
Average annual growth rate (1965-1973)	2.4%
Literacy rate	24%
Telephones (1970)	168,000
Per 100 population	1.0
Newspapers (1975)	
Dailies	9
Circulation	360,000
Non-dailies	31
Circulation	124,000
Radios (1974)	1,600,000
Per 1000 population	92
Television receivers (1975)	460,000
Per 1000 population	27

MOROCCO

C. HUMAN RESOURCES

Population (1975 est.)	17,305,000
Labor force (1970)	4,000,000
Percent in agriculture	50-65%

Scientists and Engineers (1970) (full and part-time)	253
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Technicians	390
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Scientists & Engineers by Field (1970)

Natural Sciences	64
Engineering/Technology	20
Medical Sciences	22
Agricultural Sciences	127
Social Sciences/Humanities	<u>20</u>
Total	253

S&T Personnel by Sector (1970)

	<u>Scientists & Engineers</u>	<u>Technicians</u>
Productive	182	328
Higher Education	49	29
General Services	22	33

MOROCCO

D. EDUCATION AT THIRD LEVEL

Students in national institutions (1974)

Natural Sciences	1,678
Engineering	702
Medical Sciences	4,239
Agricultural Sciences	1,761
Social Sciences/Humanities	25,142
Not specified	<u>570</u>

Total 34,092

Students studying abroad 8,472

Total # students 42,564

Students by type of institution

University	26,698
Teacher Training	--
Other	7,394

Degrees awarded (1974)

Natural Sciences	50
Engineering	16
Medical Sciences	78
Social Sciences/Humanities	1,230

MOROCCO

E. FISCAL RESOURCES

GNP (1973)

US\$ 5080 million*

* Average exchange rate 1973: 4.075 Moroccan Dirhams=US\$1.00

MOROCCO

F. PRINCIPAL RESEARCH CENTERS

<u>Institution</u>	<u>Department or Research Area</u>
1. Ministry of Agriculture & Agrarian Reform (Agricultural Research Directorate)	National Inst. for Agronomic Research-INRA Hassan II Agricultural & Veterinary Inst.
2. Bureau of Prospecting & Mines	
3. Ministry of Commerce & Industries	Geology Division
4. Moroccan Phosphates Office (state-owned)	
5. Ministry of Public Health	Technical Services Dept. (research in public health, hygiene, epi- demiology) National Inst. of Health Pasteur Inst. of Morocco
6. Ministry of Education -- Moroccan Scientific Inst.	Geology, geography, carto- graphy, cryptogamy, phane- rogamy, zoology, entomolo- gy, geophysics Biological station Seismological obersvatories Sahara Research Station
7. ORSTOM	Oceanography
8. Mohammed V University (State institution under the Ministry of Education)	Mathematics, physics, natural sciences, medicine and pharmacy, engineering Scientific Research Center
9. Al-Quarawiyin University	Humanities, law

MOROCCO

G. PUBLICATION INDICATORS

1. Principal research institutions in certain subfields (from Computer Horizons' Directories)

<u>Subfield</u>	<u>Institution</u>	<u># of Publications</u>	<u># of Scientists</u>
Oceanography	Faculty Science (Rabat)	1	1
Fisheries	Administration Eaux & Forets	1	1
Remote Sensing	Ecole Nationale Forestiere & Ingenieurs	1	1

2. Table 1 following represents total publications for 1974 (Source: Computer Horizons, Inc.). The first column represents the percentages of the total number of publications assigned to a certain subfield. The second column gives the activity index, which is defined as follows:

$$\text{Activity Index} = \frac{\% \text{ of country's publications in subfield A}}{\% \text{ of world's publications in subfield A}}$$

The activity index tells us the relative degree of research activity of the country in a given subfield, contrasted with the degree of world activity in that subfield. When the country is more active in a subfield than the world as a whole, the index is greater than one; when the country is exactly as active in a subfield as the world as a whole, the index is one; when the country's level of activity is less than the world level, the index is less than one. Activity indices which are tagged with an asterisk (*) are significantly different from 1.0 at the 1% level.

MOROCCO

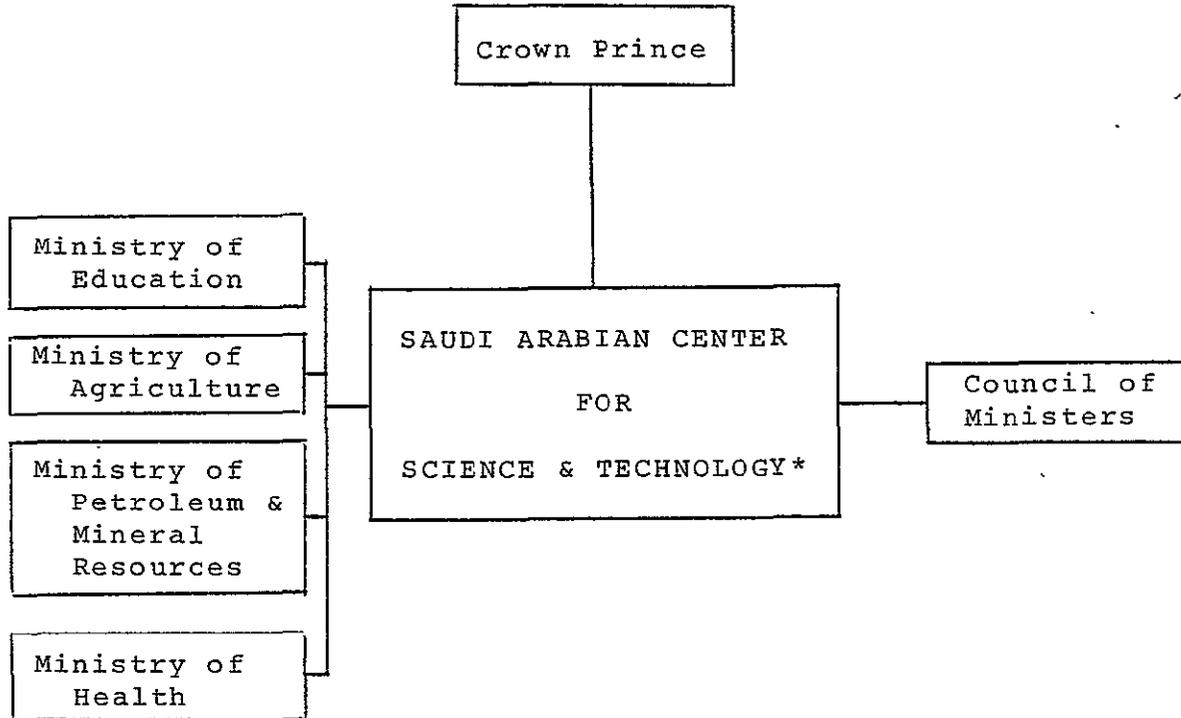
TOTAL PUBLICATIONS 1974: 18

	<u>% of Effort</u>	<u>Activity Index</u>		<u>% of Effort</u>	<u>Activity Index</u>
<u>CLINICAL MEDICINE</u>	55.86	2.06*	<u>CHEMISTRY</u>	2.70	0.17
Genrl & Internal Med	10.81	2.05	Analytical Chemistry		
Allergy			Organic Chemistry		
Anesthesiology			Inorg & Nuclear Chem		
Cancer			Applied Chem		
Cardiovascular System			General Chem		
Dentistry			Polymers		
Dermatol & Venereal Dis	21.62	51.56	Physical Chem	2.70	0.89
Endocrinology					
Fertility			<u>PHYSICS</u>		
Gastroenterology			Chemical Physics		
Geriatrics			Solid State Physics		
Hematology			Fluids & Plasmas		
Immunology			Applied Physics		
Obstetrics & Gynecol			Acoustics		
Neurology & Neurosurg	5.41	3.18	Optics		
Ophthalmology			General Physics		
Orthopedics			Nucl & Particle Phys		
Arthritis & Rheumatism			Misc Physics		
Otorhinolaryngology					
Pathology			<u>EARTH & SPACE SCIENCE</u>	1.80	0.43
Pediatrics			Astronomy & Astrophys		
Pharmacology			Meteorol & Atmosph Sci		
Pharmacy			Geology	1.80	2.72
Psychiatry			Earth & Planetary Sci		
Radiology & Nuclear Med	5.41	4.95	Geography		
Respiratory System			Oceanog & Limnology		
Surgery					
Tropical Medicine			<u>ENGINEERING & TECHNOLOGY</u>		
Urology	10.81	37.68	Chemical Engineering		
Nephrology			Mechanical Eng'g		
Veterinary Med			Civil Eng'g		
Addictive Diseases			Electr Eng'g & Electron		
Hygiene & Public Health	1.80	3.38	Misc Eng'g & Technol		
Misc Clinical Medicine			Industrial Eng'g		
			General Engineering		
<u>BIOMEDICAL RESEARCH</u>	12.97	0.87	Metals & Metallurgy		
Physiology			Materials Sci		
Anatomy & Morphology			Nuclear Technology		
Embryology			Aerospace Technology		
Genetics & Heredity			Computers		
Nutrition & Dietet			Library & Informat Sci		
Biochem & Molecular Biol			Operations Res. & Mngamt		
Biophysics					
Cell Biol, Histol & Cyto			<u>PSYCHOLOGY</u>		
Microbiology			Clinical Psychology		
Virology			Personal. & Social Psy		
Parasitology			Developm & Child Psy		
Biomedical Engineering			Experimental Psych		
Microscopy			General Psych		
Misc Biomedical Res			Misc Psych		
General Biomedical Res	12.97	3.89	Behavioral Sci		
<u>BIOLOGY</u>	26.67	3.04	<u>MATHEMATICS</u>		
General Biology	3.24	5.88	Probability & Stat		
General Ecology			Applied Mathematics		
Entomology			General Math		
Misc Zoology			Misc Math		
Marine Biol & Hydrobiol					
Botany	18.02	8.15			
Ecology					
Agriculture & Food Sci	5.41	2.09			
Dairy & Animal Sci					
Misc Biology					

TABLE 1: S&T PUBLICATION ACTIVITY 1974. SOURCE: COMPUTER HORIZONS, INC.

SAUDI ARABIA

A. SCIENCE POLICY ORGANIZATION



Information
and
Recommendations

Policy

Review

*Established Spring, 1978, as part of National Development Plan, 1976-1980.

SAUDI ARABIA

B. SOCIOECONOMIC INDICATORS

GNP (1973)	US\$ 12,470 million
GNP per capita (1973)	US\$ 1,610
Average annual growth rate GNP (1965-1973)	10.1%
Population (1975 est.)	8,966,000
Average annual growth rate (1965-1973)	1.7%
Literacy rate	15%
Telephones (1973) per 100 population	85,000 1.1
Newspapers (1974)	
Dailies	11
Circulation	96,000
Non-dailies	8
Circulation	30,000
Radios (1975) per 1000 population	255,000 28
Television receivers (1974) per 1000 population	122,000 14

SAUDI ARABIA

C. HUMAN RESOURCES

Population (1975 est.)	8,966,000
Labor force (1975)	1,522,100
,Percent in agriculture	61%

Scientists and Engineers (1975)**

Saudis holding doctorate in sciences	200*
Saudis holding master's degrees in sciences	500*
Saudis holding bachelor's degrees in sciences	5000*
Non-nationals	15000*

Scientists and Engineers by Field (1975)

	University Teachers	In R&D
Natural sciences	243	78
Engineering/Technology	217	7
Agricultural Sciences	118	
Medical Sciences	42	

*Estimated

** CASTARAB gives 1974 total of Scientists and Engineers as 33,376.

SAUDI ARABIA

D. EDUCATION AT THIRD LEVEL

<u>Students in national institutions (1974)</u>	(1976) *
Natural Sciences	1,116
Engineering	2,368
Medical Sciences	617
Agricultural Sciences	523
Social Sciences/Humanities	<u>15,149</u>
Total	19,773
<u>Students studying abroad</u>	<u>2,255</u>
Total # students	22,028
<u>Students by type of institution (1974)</u>	
University	19,093
Teacher Training	504
Other	176
<u>Degrees awarded (1974)</u>	
Natural Sciences	98
Engineering	180
Medical Sciences	39
Agriculture	61
Social Sciences/Humanities	1,479

* Source: Statistical Indicators, Kingdom of Saudi Arabia

SAUDI ARABIA 1

E. FISCAL RESOURCES

GNP (1973) US\$ 12,470 million *

Data on R&D have not been gathered systematically up to the present. The Saudi Arabian Center for Science and Technology, established in Spring, 1978, has as one of its first objectives the gathering of information on Saudi Arabian Science and Technology. The National Science Foundation will complete its study of Saudi S&T in January, 1979 (see Bibliography).

* Average exchange rate 1973: 3.64 Saudi Arabian Riyals=US\$ 1

SAUDI ARABIA

F. PRINCIPAL RESEARCH INSTITUTIONS

<u>Institution</u>	<u>Department or Research Area</u>
1. University of Riyadh (under Ministry of Education)	Commerce, education, arts, botany, zoology, chemistry, physics, geology, math. Engineering-research center
2. King Abd-Al-Aziz University (public university under Supreme Council for Higher Education)	Physics, chemistry, biology mathematics, geology, oceanography, astronomy, medicine, engineering Economics & administration (R&D center) Center for Applied Geology
3. University of Petroleum and Minerals (attached to Ministry of Petroleum)	Engineering, chemistry, geology, mathematics, physics
4. King Faisal University	
5. Ministry of Petroleum & Mineral Resources	Minerals Survey Lab.
6. Ministry of Health	King Faisal Medical City
7. Ministry of Commerce & Industry	Quality Assurance Lab.
8. USGS Chemical Analysis Lab	
9. Chemical Lab for French Mission	
10. Ministry of Agriculture and Water	Agricultural Research Ctr.
11. Department of Public Works	
12. Saline Water Conversion Corp.	Sea Water Desalination Plant
13. Saudi Arabian Fertilizer Co.	
14. Industrial Studies & Develop- ment Center	
15. General Petroleum & Mineral Org. (PETROMIN)	

SAUDI ARABIA

G. PUBLICATION INDICATORS

1. Principal research institutions in certain subfields (from Computer Horizons Directories)

<u>Subfield</u>	<u>Institution</u>	<u># of Publications</u>	<u># of Scientists</u>
Nutrition	Univ. of Riyadh	1	1
Pollution	King Faisal Univ.	1	3
Oceanography	Univ. of Riyadh	1	1
	Saline Water Conversion Corp.	1	1
Meteorology	Ministry of Agriculture & Water		
	Locust Research Station	1	2
Water Resources	Univ. of Riyadh	1	2

2. The following table represents the total publications for 1974 (Source: Computer Horizons, Inc.). The first column represents the percentage of the total number of publications assigned to a certain subfield. The second column gives the activity index which is defined as follows:

$$\text{Activity Index} = \frac{\% \text{ of country's publications in subfield}}{\% \text{ of world's publications in subfield}}$$

The activity index tells us the relative degree of research activity of Saudi Arabia in a given subfield, contrasted with the degree of world activity in that subfield. When Saudi Arabia is more active in a subfield than the world as a whole, the index is greater than one; when Saudi Arabia is exactly as active in a subfield as the world as a whole, the index is one; when then country's level of activity is less than the world level, the index is less than one. Activity indices which are tagged with an asterisk (*) are significantly different from 1.0 at the 1% level.

SAUDI ARABIA

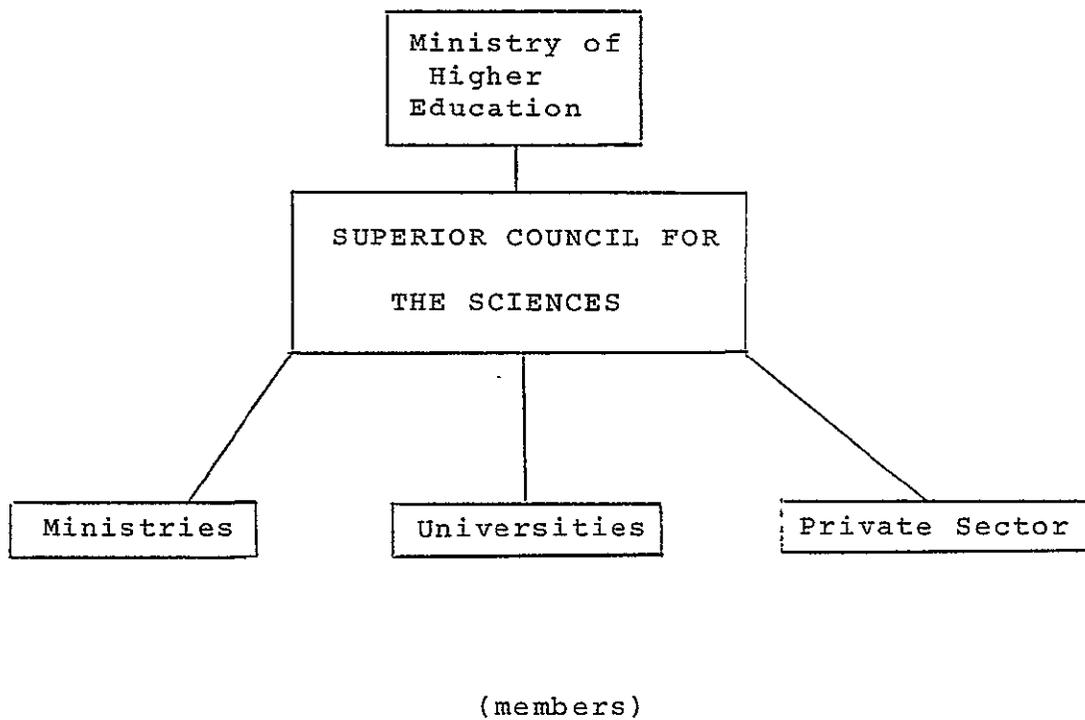
TOTAL PUBLICATIONS 1974: 16

	<u>% of Effort</u>	<u>Activity Index</u>		<u>% of Effort</u>	<u>Activity Index</u>
<u>CLINICAL MEDICINE</u>	17.62	0.65	<u>CHEMISTRY</u>	9.33	0.58
Genrl & Internal Med			Analytical Chemistry		
Allergy			Organic Chemistry		
Anesthesiology			Inorg & Nuclear Chem		
Cancer			Applied Chem		
Cardiovascular System			General Chem	9.33	1.60
Dentistry			Polymers		
Dermatol & Venereal Dis			Physical Chem		
Endocrinology			<u>PHYSICS</u>	6.22	0.48
Fertility			Chemical Physics	6.22	4.03
Gastroenterology			Solid State Physics		
Geriatrics			Fluids & Plasmas		
Hematology			Applied Physics		
Immunology	6.22	12.58	Acoustics		
Obstetrics & Gynecol			Optics		
Neurology & Neurosurg			General Physics		
Ophthalmology			Nucl & Particle Phys		
Orthopedics			Misc Physics		
Arthritis & Rheumatism			<u>EARTH & SPACE SCIENCE</u>	7.77	1.85
Otorhinolaryngology			Astronomy & Astrophys		
Pathology			Meteorol & Atmosph Sci		
Pediatrics			Geology	7.77	11.75
Pharmacology	6.22	2.61	Earth & Planetary Sci		
Pharmacy	2.07	1.92	Geography		
Psychiatry	3.11	5.15	Oceanog & Limnology		
Radiology & Nuclear Med			<u>ENGINEERING & TECHNOLOGY</u>	37.31	3.70*
Respiratory System			Chemical Engineering	3.11	2.99
Surgery			Mechanical Eng'g		
Tropical Medicine			Civil Eng'g	12.44	20.72
Urology			Electr Eng'g & Electron	18.65	8.32
Nephrology			Misc Eng'g & Technol		
Veterinary Med			Industrial Eng'g		
Addictive Diseases			General Engineering		
Hygiene & Public Health			Metals & Metallurgy	3.11	2.09
Misc Clinical Medicine			Materials Sci		
<u>BIOMEDICAL RESEARCH</u>	6.22	0.42	Nuclear Technology		
Physiology			Aerospace Technology		
Anatomy & Morphology			Computers		
Embryology			Library & Informat Sci		
Genetics & Heredity			Operations Res. & Mngemt		
Nutrition & Dietet			<u>PSYCHOLOGY</u>		
Biochem & Molecular Biol			Clinical Psychology		
Biophysics			Personal. & Social Psy		
Cell Biol, Histol & Cyto			Developm & Child Psy		
Microbiology			Experimental Psych		
Virology			General Psych		
Parasitology			Misc Psych		
Biomedical Engineering			Behavioral Sci		
Microscopy			<u>MATHEMATICS</u>	12.44	4.17
Misc Biomedical Res	6.22	14.94	Probability & Stat	6.22	14.82
General Biomedical Res			Applied Mathematics		
<u>BIOLOGY</u>	3.11	0.35	General Math	6.22	3.11
General Biology			Misc Math		
General Zoology	3.11	9.20			
Entomology					
Misc Zoology					
Marine Biol & Hydrobiol					
Botany					
Ecology					
Agriculture & Food Sci					
Dairy & Animal Sci					
Misc Biology					

TABLE 1: S&T PUBLICATION ACTIVITY 1974. SOURCE: COMPUTER HORIZONS, INC.

SYRIA

A. SCIENCE POLICY ORGANIZATION



SYRIA

B. SOCIOECONOMIC INDICATORS

GNP (1973)	US\$ 2,800 million
GNP per capita	US\$ 400
Average annual growth rate GNP (1965-1973)	3.6%
Population (1975 est.)	7,355,000
Percent Urban	44%
Annual Average growth rate (1965-1973)	3.3%
Literacy rate (1970)	40%
Telephones (1974)	152,000
Per 100 population	2.1
Newspapers (1974)	
Dailies	6
Circulation	64,000
Non-dailies	6
Circulation	...
Radios (1972)	2,500,000
Per 1000 population	374
Television receivers (1972)	224,000
Per 1000 population	31

SYRIA

C. HUMAN RESOURCES

Population (1975 est.)	7,355,000
Labor force (1970)	1,530,000
Percent in agriculture	54%

<u>Scientists & Engineers per 100,000 population (1973)</u>	125
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Scientists & Engineers (1972)

Fundamental sciences	1240
Agricultural sciences	1031
Medical sciences	3287
Engineers	<u>3155</u>
Total	8713

Scientists & Engineers by Sector (1972)

Productive	1481
General Services	5780
Public Adminis.	<u>1482</u>
Total	8713

SYRIA

D. EDUCATION AT THE THIRD LEVEL

Students in national institutions (1974)

Natural Sciences	8,291
Engineering	8,758
Medical Sciences	6,219
Agricultural Sciences	6,876
Social Sciences/Humanities	<u>33,950</u>

Total	64,094
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<u>Students studying abroad</u>	<u>6,546</u>
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Total # students	70,640
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Students by type of institution (1974)

University	61,153
Teacher Training	194
Other	2,747

Degrees awarded (1974)

Natural Sciences	616
Engineering	496
Medical Sciences	597
Agricultural Sciences	625
Social Sciences/Humanities	3,337

SYRIA

E. FISCAL RESOURCES

GNP (1973)

US\$ 2,800 million**

(During the Third 5-year Plan (1971-1975) the government had budgeted 29,163,000 pounds for the development of scientific research. In addition, 13,600,000 pounds were budgeted to create centers for scientific research. 1% of the total state budget was to be devoted to the development of scientific research.)*

*Source: National Science and Technology Policies in the Arab States.

**Average exchange rate 1973: 3.925 Syrian pounds=US\$ 1.00

SYRIA

F. PRINCIPAL RESEARCH CENTERS

<u>Institution</u>	<u>Department or Research Area</u>
1. Ministry of Agriculture and Agrarian Reform	Agricultural Research Department Syrian Cotton Bureau
2. University of Aleppo	Agricultural Res. Ctr. Faculty of Engineering- Strength of materials, geodesy, soil mechanics, geology, hydraulics, electrical communication & machines, electronics, fuels, metrology, machine design, workshop tech. Faculty of Agriculture- chemistry, soils, plant physiology, food techno- logy, horticulture, geology, arid zone Faculty of Science- chemistry, physics, elec- tronics, thermodynamics Faculty of Medicine Faculty of Veterinary Med.
3. University of Damascus	Agriculture, dentistry, engineering, electrical & mechanical engineering, medicine, pharmacy, sciences
4. University of Lattakia	Letters, agriculture, sciences, engineering

SYRIA

G. PUBLICATION INDICATORS

1. Principal research institutions in certain subfields (from Computer Horizons' Directories)

<u>Subfield</u>	<u>Institution</u>	<u># of Publications</u>	<u># of Scientists</u>
Food Technology	Univ. of Aleppo	1	2
Agronomy	Cotton Bureau	1	1

2. Table 1 following represents total publications for 1974 (Source: Computer Horizons, Inc.). The first column represents the percentages of the total number of publications assigned to a certain subfield. The second column gives the activity index, which is defined as follows:

$$\text{Activity Index} = \frac{\% \text{ of country's publications in subfield A}}{\% \text{ of world's publications in subfield A}}$$

The activity index tells us the relative degree of research activity of the country in a given subfield, contrasted with the degree of world activity in that subfield. When the country is more active in a subfield than the world as a whole, the index is greater than one; when the country is exactly as active in a subfield as the world as a whole, the index is one; when the country's level of activity is less than the world level, the index is less than one. Activity indices which are tagged with an asterisk (*) are significantly different from 1.0 at the 1% level.

SYRIA

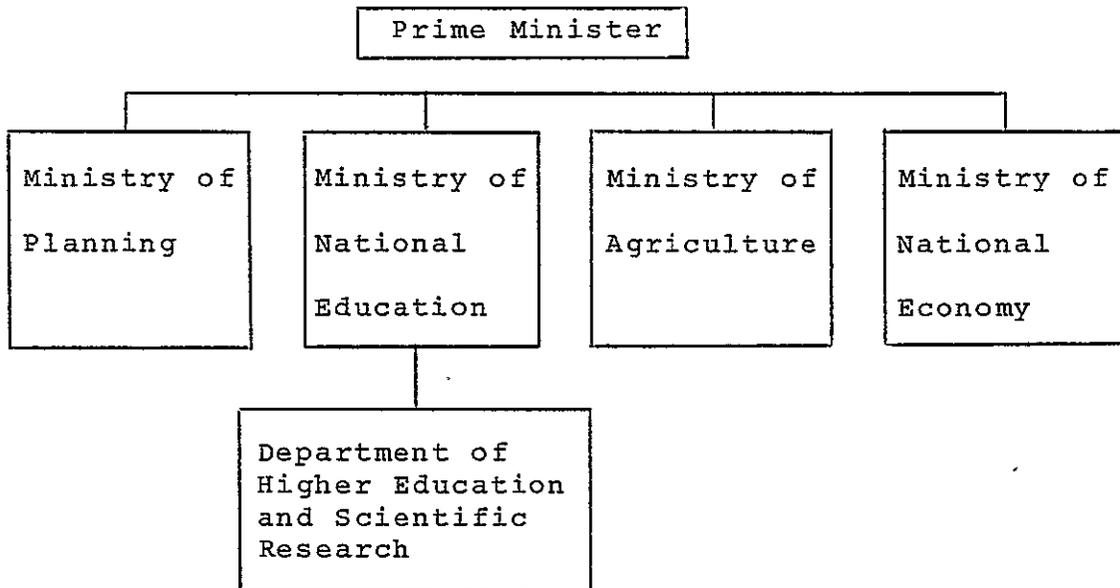
TOTAL PUBLICATIONS 1974: 2

	<u>% of Effort</u>	<u>Activity Index</u>		<u>% of Effort</u>	<u>Activity Index</u>
<u>CLINICAL MEDICINE</u>			<u>CHEMISTRY</u>		
Genrl & Internal Med			Analytical Chemistry		
Allergy			Organic Chemistry		
Anesthesiology			Inorg & Nuclear Chem		
Cancer			Applied Chem		
Cardiovascular System			General Chem		
Dentistry			Polymers		
Dermatol & Venereal Dis			Physical Chem		
Endocrinology					
Fertility			<u>PHYSICS</u>		
Gastroenterology			Chemical Physics		
Geriatrics			Solid State Physics		
Hematology			Fluids & Plasmas		
Immunology			Applied Physics		
Obstetrics & Gynecol			Acoustics		
Neurology & Neurosurg			Optics		
Ophthalmology			General Physics		
Orthopedics			Nucl & Particle Phys		
Arthritis & Rheumatism			Misc Physics		
Otorhinolaryngology					
Pathology			<u>EARTH & SPACE SCIENCE</u>		
Pediatrics			Astronomy & Astrophys	75.00	17.84
Pharmacology			Meteorol & Atmosph Sci	50.00	43.53
Pharmacy			Geology	25.00	37.80
Psychiatry			Earth & Planetary Sci		
Radiology & Nuclear Med			Geography		
Respiratory System			Oceanog & Limnology		
Surgery					
Tropical Medicine			<u>ENGINEERING & TECHNOLOGY</u>		
Urology			Chemical Engineering		
Nephrology			Mechanical Eng'g		
Veterinary Med			Civil Eng'g		
Addictive Diseases			Electr Eng'g & Electron		
Hygiene & Public Health			Misc Eng'g & Technol		
Misc Clinical Medicine			Industrial Eng'g		
			General Engineering		
<u>BIOMEDICAL RESEARCH</u>	20.00	1.34	Metals & Metallurgy		
Physiology			Materials Sci		
Anatomy & Morphology			Nuclear Technology		
Embryology			Aerospace Technology		
Genetics & Heredity			Computers		
Nutrition & Dietet			Library & Informat Sci		
Biochem & Molecular Biol			Operations Res. & Mngemt		
Biophysics					
Cell Biol, Histol & Cyto			<u>PSYCHOLOGY</u>		
Microbiology			Clinical Psychology		
Virology			Personal. & Social Psy		
Parasitology			Developm & Child Psy		
Biomedical Engineering			Experimental Psych		
Microscopy			General Psych		
Misc Biomedical Res			Misc Psych		
General Biomedical Res	20.00	5.99	Behavioral Sci		
<u>BIOLOGY</u>	5.00	0.57	<u>MATHEMATICS</u>		
General Biology	5.00	9.06	Probability & Stat		
General Zoology			Applied Mathematics		
Entomology			General Math		
Misc Zoology			Misc Math		
Marine Biol & Hydrobiol					
Botany					
Ecology					
Agriculture & Food Sci					
Dairy & Animal Sci					
Misc Biology					

TABLE 1: S&T PUBLICATION ACTIVITY 1974. SOURCE: COMPUTER HORIZONS, INC.

TUNISIA

A. SCIENCE POLICY ORGANIZATION



TUNISIA

B. SOCIOECONOMIC INDICATORS

GNP (1973)	US\$ 2,530 million
GNP per capita	US\$ 460
Average annual growth rate GNP (1961-1973)	4.9%
Population (1975)	4,533,347
% Urban	44%
Average annual growth rate (1965-1973)	2.1%
Literacy rate (1970)	55%
Telephones (1975)	129,000
per 100 population	2.3
Newspapers (1975)	
Daily	4
Circulation	190,000
Non-daily	7
Circulation	110,000
Radios (1975)	280,000
per 1000 population	49
Television receivers (1970)	51,000
per 1000 population	10

TUNISIA

C. HUMAN RESOURCES

Population (1975)	4,533,347
Labor force (1975)	1,093,735
% in Agriculture	40.8%

S&T Personnel (1974)

	<u>Total</u>	<u>per 100,000 population</u>	<u>In R&D (FTE)</u>
Scientists & Engineers	3,421	61	550*
Non-nationals	770		110*
Technicians	7,714	140	552

Scientists and Engineers by Field (1974)

Natural Sciences	299
Engineering/Technology	478
Medical Sciences	1,161
Agricultural Sciences	994
Social Sciences/Humanities	<u>489</u>
Total	3,421

S&T Personnel by sector

	<u>Scientists & Engineers</u>	<u>Technicians</u>
Productive
Higher Education	136*	23*
General Services

*Estimated

TUNISIA

D. EDUCATION AT THIRD LEVEL

Students in national institutions (1975)

Natural Sciences	3,398
Engineering	808
Medical Sciences	2,675
Agricultural Sciences	305
Social Sciences/Humanities	<u>10,354</u>
Total	17,540

Students studying abroad 7,724

Total # students 24,264

Students by type of institution (1975)

University	17,540
Teacher Training	--
Other	—

Degrees awarded (1974)

Natural Sciences	231
Engineering	54
Medicine	117
Agricultural Sciences	50
Social Sciences/Humanities	837

TUNISIA

E. FISCAL RESOURCES

GNP (1973)	US\$ 2,530 million*
Expenditure on R&D (1972)	
Total (including capital expenditures)	2,889,000 dinars (US\$ 6,019,000)
Current	...
% of GNP spent on R&D	0.3%
Average/R&D scientist & engineer (FTE)	US\$ 10,900
Average per capita	US\$ 1.1

Expenditure on R&D by sector (thousands of dinars)

Productive	1,544
Higher Education	690
General Services	<u>654</u>
Total	2,889

Expenditure by source of funds

Government	81.4%
Foreign	<u>18.6%</u>
	100.0%

*Average exchange rate: 1 Tunisian Dinar = US\$ 2.27

TUNISIA

F. PRINCIPAL RESEARCH CENTERS

<u>Institution</u>	<u>Department or Research Area</u>
Ministry of Agriculture	National Agronomic Research Inst. of Tunisia (INRAT) National Veterinary Research Institute National Forestry Research Institute National Scientific & Tech. Inst. for Oceanography and Fisheries, water and forest service
University of Tunis (State institution)	Inst. of Science & Technology Research Inst. of Nuclear Physics Arid Zone Research Center National Inst. of Agronomy
ORSTOM (Mission at Ministry of Agriculture)	Pedology, hydrology, plant biology, botany, phytopathology, applied zoology
Institute Pasteur	

TUNISIA

G. PUBLICATION INDICATORS

1. Principal research institutions in certain subfields (from Computer Horizons' Directories)

<u>Subfield</u>	<u>Institution</u>	<u># of Publications</u>	<u># of Scientists</u>
Fisheries	Natl. Scientific & Tech. Inst.	3	3
Oceanography	Univ. of Tunisia	1	1
Parasitology	Inst. Pasteur	2	2
Water Resources	Natl. Scientific & Tech. Inst.	1	2
Agronomy	INRAT	1	1

2. Table 1 following presents total publications for 1974 (Source: Science Citation Index). The first column represents the percentage of the total number of publications assigned to a certain subfield. The second column gives the activity index, which is defined as follows:

$$\text{Activity Index} = \frac{\% \text{ of country's publications in subfield A}}{\% \text{ of world's publications in subfield A}}$$

The activity index tells us the relative degree of research activity of Tunisia in a given subfield, contrasted with the degree of world activity in that subfield. When Tunisia is more active in a subfield than the world as a whole, the index is greater than one; when Tunisia is exactly as active in a subfield as the world as a whole, the index is one; when the Tunisian level of activity is less than the world level, the index is less than one. Activity indices which are tagged with an asterisk (*) are significantly different from 1.0 at the 1% level.

TUNISIA

TOTAL PUBLICATIONS 1974: 23

	% of Effort	Activity Index		% of Effort	Activity Index
<u>CLINICAL MEDICINE</u>	44.93	1.66+	<u>CHEMISTRY</u>	10.87	0.67
Genrl & Internal Med	3.26	0.62	Analytical Chemistry		
Allergy			Organic Chemistry	5.07	1.87
Anesthesiology			Inorg & Nuclear Chem		
Cancer	4.35	4.51	Applied Chem		
Cardiovascular System	4.35	4.40	General Chem	5.80	1.00
Dentistry			Polymers		
Dermatol & Venereal Dis			Physical Chem		
Endocrinology			<u>PHYSICS</u>	10.29	0.79
Fertility			Chemical Physics		
Gastroenterology			Solid State Physics	1.45	0.70
Geriatrics			Fluids & Plasmas		
Hematology			Applied Physics	2.17	0.75
Immunology			Acoustics		
Obstetrics & Gynecol			Optics		
Neurology & Neurosurg			General Physics	6.67	1.66
Ophthalmology	2.54	3.87	Nucl & Particle Phys		
Orthopedics	8.70	20.80	Misc Physics		
Arthritis & Rheumatism			<u>EARTH & SPACE SCIENCE</u>	5.65	1.34
Otorhinolaryngology			Astronomy & Astrophys		
Pathology			Meteorol & Atmosph Sci		
Pediatrics			Geology	4.35	6.57
Pharmacology			Earth & Planetary Sci	1.30	0.74
Pharmacy			Geography		
Psychiatry			Oceanog & Limnology		
Radiology & Nuclear Med	4.35	3.98	<u>ENGINEERING & TECHNOLOGY</u>		
Respiratory System			Chemical Engineering		
Surgery			Mechanical Eng'g		
Tropical Medicine	4.35	2.86	Civil Eng'g		
Urology			Electr Eng'g & Electron		
Nephrology			Misc Eng'g & Technol		
Veterinary Med			Industrial Eng'g		
Addictive Diseases			General Engineering		
Hygiene & Public Health	13.04	24.47	Metals & Metallurgy		
Misc Clinical Medicine			Materials Sci		
<u>BIOMEDICAL RESEARCH</u>	10.87	0.73	Nuclear Technology		
Physiology			Aerospace Technology		
Anatomy & Morphology			Computers		
Embryology			Library & Informat Sci		
Genetics & Heredity			Operations Res. & Mngemt		
Nutrition & Dietet			<u>PSYCHOLOGY</u>		
Biochem & Molecular Biol			Clinical Psychology		
Biophysics			Personal. & Social Psy		
Cell Biol, Histol & Cyto			Developm & Child Psy		
Microbiology	2.17	1.85	Experimental Psych		
Virology			General Psych		
Parasitology			Misc Psych		
Biomedical Engineering			Behavioral Sci		
Microscopy			<u>MATHEMATICS</u>	13.04	4.38
Misc Biomedical Res			Probability & Stat		
General Biomedical Res	8.70	2.61	Applied Mathematics		
<u>BIOLOGY</u>	4.35	0.50	General Math	13.04	6.53
General Biology	2.17	3.94	Misc Math		
General Zoology					
Entomology					
Misc Zoology					
Marine Biol & Hydrobiol					
Botany					
Ecology					
Agriculture & Food Sci	2.17	0.84			
Dairy & Animal Sci					
Misc Biology					

TABLE 1: S&T PUBLICATION ACTIVITY 1974. SOURCE: COMPUTER HORIZONS, INC.

DATA SOURCES

A complete list of data sources for the study of S&T capabilities in the Middle East countries is found in the attached bibliography. The bulk of manpower and funding statistics were obtained from the Statistics on S&T Manpower and Expenditures for Research and Experimental Development in Arab Countries, one of the reports of the Conference of Ministers of Arab States Responsible for the Application of Science and Technology to Development (CASTARAB) in Rabat, Morocco, in August, 1976. Demographic data were gathered from the latest UN and Unesco Statistical Yearbooks and from the World Tables and World Atlas published by the World Bank. Information on research institutions was gathered primarily from the Guide to World Science.

These collections of data were supplemented by and compared with data from relevant publications, reports and studies on individual countries. The most recent data, or those believed to be the most reliable, were used in this report. Conflicts in figures presented by different sources are noted.

Publication data were obtained largely from studies performed by Computer Horizons, Inc. for the National Science Foundation. One study involved the preparation of bibliographic directories identifying researchers and research institutions publishing in 15 selected subfields. These data were obtained from specialized abstracts covering the particular subfield being investigated. Unfortunately, Israel was not covered in this study.

Another study investigated publication patterns of all countries publishing in the 2400 scientific journals covered

by the Science Citation Index in 1974. These articles were assigned to approximately 100 subfields according to the journals in which they were published. The subfields in turn were aggregated into nine major fields.

A third study entailed the research field identification of the 43,000 serials contained in the British Library Lending Division collection, the most comprehensive collection of journals in the world.

A cautionary word should be made about the reliability of the S&T data presented in this report. In general, international comparisons of S&T activity which are based on S&T indicators should be viewed with a healthy skepticism. Regrettably, criteria for defining S&T indicators differ from country to country. The Organization of Economic Cooperation and Development (OECD) has made substantial progress in unifying data reporting among its member countries, but even here basic structural differences in national S&T systems confound the promulgation of uniform statistics. Fundamental differences in educational structures and requirements, R&D funding mechanisms, and classes of research performers are some of the more obvious differences.

In the case of lesser developed countries, problems of data reliability and comparability are even more acute. LDCs often do not have the will, financial resources, or trained manpower necessary to conduct adequate surveys of their S&T capabilities. International statistical yearbooks are filled with data covering all aspects of LDC life, but the precision of these data is questionable.

One of the most appealing things about employing publication indicators to examine LDC S&T efforts is that these

indicators are not dependent upon LDC survey efforts. Publication data are highly reliable, in the sense that we know precisely how they are generated and where they come from. Unfortunately, publication indicators tell us little about unpublished research efforts.

A word should be said about the data employed in the introductory Overview presented at the outset of this report. The manpower and education data given in the Overview are frequently for the early 1970's, while the figures appearing in the national S&T profiles are the most recently available data--often for the mid- to late 1970's. Older manpower and education data were utilized in the Overview analysis in order to keep these data in line with the funding and publication figures. The basic conclusions remain the same regardless of whether we use the older or more recent data in the Overview analysis.

INFORMATION SYSTEMS ON RESEARCH IN PROGRESS

Israel: National Center of Scientific and Technological Information (COSTI) (Initiated 1968)

Lebanon: Scientific Documentation and Information Centre (Initiated 1974)

- Iran:
- a. Annual Directory of Research Projects (Initiated 1976)
 - b. Bureau for Coordination and Centralization of Agricultural Research (Initiated 1976)
 - c. Iranian Documentation Centre (IRANDOC) (Initiated 1968)
 - d. Technical Documentation Centre (Initiated 1971)

Kuwait: Research and Development Information System

Tunisia: Information on Ongoing Research in Agronomy and Associated Sciences in Tunisia (Initiated 1976)

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GLOSSARY

Unesco definitions of S&T activities include:

STA - scientific and technological activity. Includes:

1. Research and development - any or all of:
 - a. Fundamental research - aimed at increasing basic knowledge
 - b. Applied research - having a specific practical objective
 - c. Experimental/developmental - use of fundamental and applied research
2. Related STAs:
 - a. Third level teaching
 - b. Public service activities
 - c. Activities involved in production of goods & services

Sector -

- a. Productive - establishments producing and distributing goods and services for sale; includes nationalized industries, public utilities, post offices and communications
- b. Higher education - third level education
- c. General services - administration, defense, health, cultural & other social services and promotion of economic growth and technological development.

FTE - Full-time equivalent. Translates the portion of time given to research activity by a number of scientists into its equivalency if that activity were engaged in on a full-time basis

Intramural expenditures - devoted to an organization's own S&T activities

Extramural expenditures - carried out by other institutions

Total expenditures - include capital expenses

Current expenditures - salaries, expendable supplies, etc.

Scientist & engineer - one who has completed third level education or has had equivalent experience

Technician - one who has completed vocational or technical training one-two years beyond secondary education