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in

Casas J. (ed.). Agricultural research in countries of the Mediterranean region

Montpellier : CIHEAM Options Méditerranéennes : Série Etudes; n. 1988-VI

1988 pages 157-185

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To cite this article / Pour citer cet article

Casas J. An analysis of national agricultural research systems in countries of the Mediterranean region. In : Casas J. (ed.). *Agricultural research in countries of the Mediterranean region*. Montpellier : CIHEAM, 1988. p. 157-185 (Options Méditerranéennes : Série Etudes; n. 1988-VI)



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An analysis of national agricultural research systems in the Mediterranean region

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I - The diversity of information sources

To analyse in a few pages public agricultural research (AR) in Mediterranean countries that are members of ICAMAS is hardly an easy task. The seminar in Istanbul certainly brought together for the first time a remarkable range of information thanks to the 12 national reports that were presented. However, despite the precautions that were taken by the organizers, notably the provision of a guideline, these reports were quite heterogeneous. Given the diversity of the situations analysed, it would have been difficult to have done otherwise. The task was complicated by the different significance of the concepts used, for example, the definitions of autonomous institutions, researchers, or operating costs. Moreover, most of the authors had to limit their papers and thus emphasize only certain points while neglecting or glossing over some quantitative and qualitative information which would have enabled an outside observer to better understand all of the national agricultural research systems (NARS) and compare them.

Nevertheless, the richness of the national reports incited us to rework and deepen the analysis that we presented in Istanbul. We have done this, in part, by using the results (reports and discussions) of the seminar on "Agronomic Training in Countries of the Mediterranean Region" organized by ICAMAS in Rabat in March 1987. Our knowledge of advanced agricultural schools (in the large sense) which are integral parts of NARS, was thus considerably increased. For some countries, we were also able to benefit from complementary inputs resulting from direct contacts with the authors of the national reports concerned or from recent bibliographic references.

By using a standard matrix to classify this information, we prepared summary descriptions of each NARS which are found in the annex. They provide a brief overview (generally for either 1985 or 1986) of the main public institutions concerned, their responsible ministries, their mandates, and their human and financial resources. Also included are comments on their history, their relations and on national AR policy. These descriptions provided the main basis for the following analysis of the Mediterranean NARS which focusses successively on their human and financial resources, as well as on their structure and organization.

II - Extent of the financial and human resources available

Table 1 (lines six and seven) gives an overview of these resources. We will make several comments dealing first of all with the human scientific potential, then with the financial resources. Table 1: Public agronomic research in Mediterranean countries: Estimates of research-years and national financial resources

- = No data available	Units	MOR	ALG	TUN	EGY	LEB	TUR	GRE	YUG	ITA	FRA	SPA	POR	Total 85/86
		A	В	ပ	D	ы	ΓH,	υ	Н	Ι	Ŀ	K	Г	W
1985														
1. GDP/capita	\$1,000	0.8	2.3	1,3	0,7	•	1.2	3.9	2.6	6.4	10.5	4.8	2.2	3.7
2. Agric.GDP (AGDP)	\$109	2.3	2.8	1,0	5,6	1,5	9.1	5.4	6.1	18.8	19.6	10.6	1.7	82
3. AGDP/GDP	%	17	9	14	20	,	19	16	13	5.3	3.9	6.3	8.5	
4. Agric.work. popul. (AWP)	106	2.7	1.2	0,7	5,5	0,1	11	1.0	2.6	2.2	1.7	i.9	1.0	31.6
5. AWP/Total WP	%	40	24	32	42	12	52	26	25	9.5	6.7	14	23	-
6. Total AR years (RY)	RY	500	350	300	4,450	70	2,000	700	2,960	2,150	4,600	1,200	540	19,820
a) Specialized AR institutes	:	220	50	140	3,375	55	1,650	480	1,240	1,250	3,020	850	340	12,670
b) Higher education instit.	=	190	170	80	1,075	15	350	200	460	006	600	350	145	4,535
c) Other institutions	=	90	130	80				20	1,260		980		55	2,615
7. National AR expend. (NARE)	\$106	35	40	20	40	9	I	55	75	230*	600*	06	30*	1,300*
8. NARE/AGDP	%	1.5	1.4	2.0	0.7	0.4		1.0	1.2	1.2	3.1	0.8	1.7	1.6
9. RY/AGDP (\$10 ⁸)	RY	2.2	1.2	3.0	7.9	2.3	2.2	1.7	4.9	1.3	2.3	1.1	3.2	2.4
10. RY/AWP	:	0.2	0.3	0.4	0.8	0.7	0.2	0.7	1.1	1.0	2.7	0.6	0.5	0.6
Reference years (for 6,7)		1986	1986	1985	1986	1985	1986	1985	1979	1984	1986	1985	1986	1985/1986

Sources: factsheets in annex.

Notes:

7-I, J, L: not including AR for development activities with Third World countries (810 RY, \$175 million for France)

7 - M: rounded off totals 7: using December 1986 exchange rate for the dollar

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The use of quantitative indicators allows one to make basic comparisons of the AR efforts made by the different countries concerned. Finally, we will provide a few more qualitative assessments on these two types of resources.

1. Considerable human scientific potential

In 1985-86, Mediterranean NARS represented about 20,000 research years (RY) or equivalent full time researchers. This number takes into account only scientists that have at least a university degree (agricultural engineers, veterinarians, bachelors or masters of science, etc) awarded after at least four years of post-secondary education.

Of this total, nearly 13,000 researchers generally work full time in institutions specialized in AR or in the AR departments of institutions with wider mandates. Half of these researchers can be found in Egypt and France alone.

About 4,500 RY (44% of them in Egypt and Italy) are accounted for by advanced educational institutions, specialized in agriculture (agronomic, veterinarian schools and faculties) or not (agricultural divisions of universities, faculties of science, economics, etc). This number also includes teachers working part time in AR (2).

Finally, less than 2,700 RY (84% of them in France and Yugoslavia) consist of scientists working full or part time in other organizations, most often involved with "research-development", development, services, studies, etc.

All of these data should be treated with some circumspection for different reasons according to the mandates of the various institutions.

Many institutes involved in AR have marginal mandates for development (production and quality control of seeds, soil analysis, research on development or extension services, studies, etc). An often high number of researchers have significant teaching loads and, within their own institute, administrative or management responsibilities. In most national reports, however, all senior officers with advanced scientific training are generally regarded as full time researchers (which is the case in most countries of the world). We maintained this approach, even though for the above reasons the total of 13,000 researchers should really be reduced by about 20%. In advanced educational institutions, the estimate of part time researchers in RY remains somewhat subjective. Some national reports attempted to do this by assimilating teachers at varying rates into RY (0.5 in Morocco, Yugoslavia, France and Greece; 0.7 in Italy) and by applying these ratios to all agricultural teaching institutions or only those that are known to be directly involved in AR (as was the case in Algeria, Spain and Portugal). For countries for which we have no national estimates (Egypt, Tunisia and Turkey) their recognized inadequacy of research means (both national and foreign) led us to adopt an average ratio of 0.25 RY per teacher which is obviously generous for the first two countries cited (3). Finally, it should be noted that the 4,500 RY calculated for advanced teaching institutions remains very approximate. Overall, it reveals a research capacity that is quite inferior to the scientific potential represented by the estimated 14,000 teachers included in higher education establishments with training programs that last at least four years. One can thus conclude that most of the Mediterranean advanced educational institutions give very inadequate attention to AR. This situation is obviously unfortunate not only for the quality of the research but of the education. It is particularly regrettable for some countries, such as Algeria, Greece, Morocco and Tunisia, where teachers have an average educational level that is higher (much larger proportion of doctorates) than that of researchers.

The inventory of research capacities in the other institutions leaves many questions unanswered. Seven of the twelve countries are concerned and the corresponding estimates are obviously less precise than those related to the research institutes and the higher education institutions. But in the other five countries, was an accurate inventory made of their development, bodies, services, studies involved in AR? Here it is quite likely that the total of 2,655 RY is less than the reality even though one can sometimes doubt the scientific quality of applied or part time work.

From the totals, one can observe that the number of RY in Mediterranean countries is equivalent to those in Western European countries and higher than those in the United States. To go beyond such rather rough comparisons, however, one must take into consideration the high level of dispersion of the Mediterranean scientific potential, first in the twelve countries studied and then within each country (see Chapter III). Attention should also be paid to the difference of contents represented by

such RY. On this last point, it must be acknowledged that in many Mediterranean countries, quite a large proportion of the scientists are less qualified or experienced than their counterparts in more developed countries (4) or do not have sufficient working tools to enable them to express their research potential.

2. Financial resources: more difficult to estimate

The financial resources shown in **Table 1** correspond to the consolidated budgets arrived at by totalling all national and other research budgets (internal resources, contracts with public or private organizations). This does not include foreign resources (important for Egypt, less so for the other southern Mediterranean countries) and public resources used for public or private companies (significant only in France and Italy).

We thus reached about \$1.3 billion (including \$600 million for France, \$230 million for Italy and only \$140 million for the four southern Mediterranean countries (Algeria, Egypt, Morocco and Tunisia).

The relative precision of these data should not be misinterpreted. In reality, only the reports from Spain, Italy, France and Morocco provided precise estimates of total national AR expenditures. For most of the other countries, we only have at best data on budgets (in local currencies) of specialized AR institutes and occasionally information on research budgets of advanced higher education institutions. It was thus often necessary to use personal estimates based on simple and thus debatable criteria that we do not have room to discuss here (5). Once all of the budgets were totalled (except for that of Turkey, for which there was no information) it was necessary to convert them into dollars. This presented more problems because of the fluctuations of this currency and the often artificially low or high exchange rates used for national currencies. The results thus obtained are hardly satisfactory given the fact that national AR expenditures are strongly related to salary levels which (for equal qualifications) vary according to the country by one to ten for scientists and more than that for other staff categories. The financial efforts of the poorest countries also tend to be largely underestimated when international comparisons are made.

3. Comparison of national research efforts

Bearing in mind the limitations of the above estimates of AR human and financial resources, we went on to make a comparison between countries by calculating for each of them three ratios most frequently used for this kind of exercise:

A (%) = National Public AR Expenditure/Agricultural Gross Domestic Agricultural Product = NARE/AGDP

B (in RY) = total RY of public NARS/AGDP (in $$10^8$) = RY/AGDP

C (in RY) = RY/working population (in106 workers = RY/AWP.

The values of these ratios are shown in **Table 1** (lines eight to ten). They have also been included in **Figures 1-3** where they relate to GDP *per capita*, an indicator that is supposed to best represent the level of development or richness of a country.

The ratios A and B are similar. Ratio B pays special attention to the RY factor which constitutes one of the elements of expenditures in AR. They are worthy of several interesting comments.

In Figure 1, we can first note the existence of two groups of countries that are relatively similar according to their A ratio. The first includes the three most developed northern Mediterranean countries of the EEC, Greece, Spain and Italy which have A ratios between 0.8 and 1.2. The second includes the three Maghreb countries, Portugal and Yugoslavia, with A ratios of between 1.4 and 2.0. There are two countries that stand apart:

- Egypt with the lowest NARE in the Mediterranean region, notably because of its low salaries. But if the high level of foreign aid (notably from the United States) which represents nearly 20% of national expenditures is included, the A ratio would approach 1% (7).

- France, with a very high A ratio of 3.1 for which one should really compare the NARE not to the AGDP but to the GDP covering both the agricultural and agro-food sectors (AFGDP), in

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order to take into account the importance of research dealing with agro-food, a more accurate A ratio (A' = NARE/AFGDP) would be half of that noted above (8).

Finally, one can conclude that with the exception of Egypt, there are two distinct groups of Mediterranean countries: one of EEC countries (except for Portugal) with NARE/AFGDP ratios ranging from about 0.75 to 1.5% and the other consisting of the remaining countries with ratios between 1.4 to 2%. Generally speaking, it can be seen that contrary to what might be expected, **national AR efforts are not necessarily proportional to the wealth of the countries**. The poorest countries dedicate relatively more resources to AR but with lower efficiency, as we will see in Chapter III.

Figure 2 dealing with the RY/AGDP ratio shows the relative significance of the scientific human potential of Egypt and Yugoslavia, and the relative weakness of that of Algeria. By referring to **Figure 1** and the national reports, it also highlights the weakness of scientific working budgets. It is worth comparing here the average national, operating and equipment budget (Total budget minus Staff budget) per researcher in some countries (9).

From this point of view, Egypt is the worst off country. In 1985/86 at ARC, this average national budget was \$2,900 per year per researcher. This was far too little to ensure full time employment for these researchers, although the situation was slightly improved by strong foreign aid (more than \$1,700 per year per researcher) (10). As a result, the Egyptian NARS could be qualified as a "giant with clay feet" according to the number, quality and modest working means of its researchers.

At the other extreme, for the same year in France, the annual operating and equipment budget was \$55,000 per researcher. It must be acknowledged, however, that France is working in research sectors that are much more developed and far more expensive: biotechnology, animal production and agro-food technologies.

In Tunisia, which is in an intermediate situation, these average national operating, equipment budget reached about \$30,000 per researcher in 1985 or about \$42,000 if foreign aid is included. Despite these relatively high amounts, however, the working tools that these researchers have direct access to ("basic support services to researchers") remain very limited because a large part of the budgets of the institutions concerned is absorbed by the maintenance of an over-extended network of research centres and stations (50 sites totalling 7,500 ha for the 240 RY of the Ministry of Agriculture) resulting from the over fragmentation of the NARS. We point out here that the assessment of AR human and financial resources available in different countries must take into consideration the structural and organizational factors of national systems that affect the efficient use of these resources. We will come back to this in Chapter III.

Finally, Figure 3 shows that the ratio C (RY/agricultural workers) increases with the level of wealth of the countries. This fits in with the two factors which generally accompany economic development: the reduction of the agricultural working farming population and the increase in services from which it benefits.

We have so far not made reference to the evolution over time of the human and financial AR resources. Few of the reports dealt with this in any detail. We do learn that in constant currency. public AR expenditures in Italy increased by an average annual rate of 10.3% during the 1975-1983 period, and that the budget of INRA in France (which represents 59% of the French total RY) grew by 52% between 1980-1986. In Tunisia, the budget in current dinars of all institutions specialized in AR followed the inflation rate. In Portugal, because of budgetary restrictions, the recruitment of researchers at INIA (58% of the national RY in 1986) had been suspended for the last six years. Finally, in Egypt in 1982-1987 the main AR institute (ARC, with 57% of the Egyptian RY in 1986) was able to increase its scientific personnel but its operating budget in constant currency was reduced by "at least half" (Shehata). Finally, it would seem that during the years preceding the 1985-86 period that was used for this comparative analysis (years of relative economic stagnation for all Mediterranean countries) the richest countries were able to consolidate and improve their AR resources, but this was not the case for the other countries.

4. Some complementary observations on research resources

These observations will deal successively with the human, physical and financial resources of NARS.

To begin with the scientists, we note that their status and career development are similar among specialized researchers and teachers of higher education establishments in most countries. This similarity is a necessary but insufficient factor in itself for their good collaboration. In three countries, Algeria, Greece and Tunisia, status and salary conditions that are much more favourable to teachers in higher education has meant that this sector attracts the better students and also many good researchers from AR specialized institutes. This has partly turned such institutes into training and selection structures that serve the schools and faculties of agriculture. Fortunately, Tunisia has recently (August 1987) resolved this problem.

The other personnel categories warrant few observations except to say that some reports or other sources note that there is a quantitative or qualitative inadequacy of technical personnel (Greece and Lebanon) and a surplus of unskilled qualified labourers (Algeria, Egypt, Morocco).

As for physical resources, one notes more or less important gaps in equipment and documentation services in the poorer countries as well as in Greece and Yugoslavia. This contrasts with the surplus of land areas observed in southern Mediterranean NARS (which have been sharply reduced in Morocco since 1985).

Finally, the reports provide little precise information on financial procedures. It was recognized in conversations that these are often too heavy and bureaucratic, to the point in certain countries of constituting real obstacles to the effective mobilization of resources allocated and to take up too much time of the national AR scientists and administrators.

III - Structures of the NARS

The following analysis of the structures of NARS has been done at two levels. The first deals with scientific institutions: their number and relative size enables one to appreciate the degree of fragmentation or concentration of NARS. The second deals with the national AR governing organizations and their capacity to assume integrated management of the overall scientific institutes, and to promote their coordination at both the national and regional levels. These two levels are obviously linked: their observation will lead to the proposal of an organizational and structural typology of NARS.

1. Analysis at the level of scientific institutions: the degree of fragmentation-concentration of NARS

A NARS is all the more more fragmented if it consists of a larger number of small, independent institutions (both number and size must, of course, be considered relative to the size of the system itself). But the inventory of these independent institutions which can use their resources with a certain degree of liberty, is not always easy and often requires a close working knowledge of the NARS. We will give three significant examples.

In Egypt, the ARC consists of 14 institutes coordinated through its board composed of its director general and the institute directors. One might expect that this would be a major decisionmaking body and thus one single institution. But if in reality there is a much more decentralized management, would it be unreasonable to consider that there are really 14 independent institutions?

In Italy, the National Research Council (CNR), which reports to the Ministry of Scientific and Technological Research, coordinates 17 institutes specialized in AR and 25 AR centres linked to the universities. In the decentralization tradition of this country, it is likely that these 42 research units have considerable independence, especially at the universities. But we consider here, perhaps wrongly, that the CNR constitutes a single independent institution because of the apparently very active role played by its own "Advisory Council on Agrarian Sciences" in the financing and orientation of research. But the 27 specialized AR institutes responsible to the Ministry of Agriculture and the 28 agricultural and veterinary faculties are considered as independent institutions (they each have their own board and their own budgets) despite the existence of the National Committee for Experimentation of the Ministry of Agriculture and the Advisory Committee for Agrarian Sciences of the Ministry of Public Instruction.

The situation in Spain is more complicated as AR is mostly done through INIA which reports to the national Ministry of Agriculture, and the 17 "AR Services" (SIAs) which report to the independent regional governments. It seems that when they were created in 1984 by dividing up INIA's facilities outside Madrid, the SIAs became

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somewhat jealous of their prerogatives, resulting in 18 independent institutions. Recently, however, they have come to appreciate the value of close national coordination between them and INIA so that they are now beginning to function more as one body. Considerable attention is still paid, however, to the sensitive issues of decentralization and regionalization by the Board of Directors which makes the most important decisions for the 18 bodies concerned.

After having located the independent institutions of each NARS (with the legitimate concerns that this could raise) we measured the degree of fragmentation or concentration of each NARS by referring to two criteria related to "significant" scientific institutions, defined as those that have at least 10% of the total RY.

The first is the relative size of the largest significant institution (**Table 2**, line 2.1). We note that only four countries (Egypt, France, Lebanon and Portugal) have one AR institution that dominates all others with 57-79% of the human scientific potential recorded. These NARS are far from being fragmented, even when they regroup many other institutions.

At the other extreme, Turkey and Yugoslavia have NARS that are very fragmented with, respectively, a little less and a little more than a hundred institutions involved in AR, R&D and teaching. All of these are of a "non-significant" size. Algeria, Greece, Italy and Tunisia also belong to this category as they have only one or two significant institutions that constitute no more than 28% of the total RY of their NARS.

Morocco and Spain are in an intermediary category with NARS that are only somewhat fragmented. One might include Spain in the more or less unfragmented category if INIA and the SIAs are considered to be a single body.

This initial classification would hardly enable one to make a categoric judgement on the quality and functioning of the different NARS. Generally speaking, a fragmented NARS has many disadvantages: national control is difficult because of internal competition; the national allocation of human, physical and financial resources is less than ideal because of overlapping or gaps in research programs; relative isolation of researchers, etc. But a country with strong supervision and efficient communicationinformation services could overcome these obstacles and exploit the acknowledged benefits of small institutions: easy management, greater dynamism, proximity to users when the scientific institution has a specific regional or commodity mandate. We will see below that this is not the case throughout the Mediterranean.

2. Responsible authorities and relations between scientific institutions: Degrees of national and regional integration of NARS

To appreciate the level of integration of NARS, we first made a quick inventory of the governing authorities in each country, observing the consistency of their policies by examining the liaisons that exist between the independent scientific institutions placed under their responsibility.

Responsible authorities for AR at the national and regional levels

The information contained in the national reports on these authorities has been reprinted in lines four to six of **Table 2**.

The "national AR authority" criterion refers to the existence in all countries of an institution that is officially responsible for the direction of national AR policy and to coordinate the action of different ministries that directly supervise their own scientific institutions. Today, this role has been given to:

- a specialized body for scientific and technological research in most countries: the Ministry in Italy, Secretary of State in Portugal, Interministerial Committee in Spain and Turkey, High Commission in Algeria, Academy in Egypt, etc.

- the Ministry of Higher Education and Research (MESR) in France and Tunisia.

This political-administrative situation, however, often fluctuates according to the changes of government and ministerial appointments. It is thus important to determine the real power of these national authorities.

Only France can claim to have a strong agency at this level. The MESR manages all public national resources dedicated to (non-military) research, examines the budgets of all of the institutions concerned, and tries to improve their coordination

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Notes:

a) Institutions with less than 10% of the RY of the NARS.

F = poor, M = moderate, B = good, e = high; for significance of lower/upper cases, see chapter 3.2.

- Included are the largest authorities; * and ** refer to the existence of a small or large number of other significant authorities (** = regions in Italy; regional governments in Spain). <u>a</u> ত
 - 1 = single authority for the main AR institutions and advanced agricultural education (ESA), # = different ministerial authorities.

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Table 2: Classification of NARS in Mediterranean countries

by using a special budget allocated for interinstitutional research programs.

Three other countries (Spain, Lebanon and Portugal) also have agencies at this highest level (respectively, the Interministerial Committee for Science and Technology, the National Scientific Research Centre, and the Secretary of State for Scientific and Technological Research) which have a more moderate power over the scientific institutions that are administratively and financially directly responsible to other ministries. The first two achieve this through the use of a complementary budget reserved for the financing of research programs that are generally pluri institutional. The third uses its political capacity to impose minimum coordination between the two ministries of Education and Agriculture.

In all of the other countries, the national authorities responsible for AR have neither the financial resources nor sufficient political power for the implementation of their official functions. This means that each ministry retains direct responsibility for its own scientific institutions involved in AR. Such a situation is particularly detrimental in countries where these responsible ministries (line 5) are more or less numerous and/or each represent a significant proportion of the RY. This is the case in Algeria, Tunisia, Yugoslavia and Italy. It is less so in Turkey and Greece where the Ministries of Agriculture represent 83% and 69% of the RY, in Egypt (with the ARC), and also in Morocco where all AR is done under the responsibility of the Ministry of Agriculture but without an internal coordinating body.

In this analysis of the real power of national authorities or responsible ministries for AR, it would be simplistic to consider their relations with the scientific institutions as hierarchical, especially when some of these institutions are very large and benefit from a legal status as an autonomous public agency. In this case, it seems that the direct authorities have no other choice than to have confidence in their institutions: they give them their budgets and leave them considerable decision-making freedom in exchange for respecting a few overall directions, constraints and formalities. These large scientific institutions are thus of determining interest in the real definition of national AR policies. We can now turn our attention to regional AR policies (**Table 2**, line 11). Among the countries with more or less weak national scientific capacity, Italy and Yugoslavia are the only ones to have strong regional coordination agencies for all the scientific institutions. This consist of, respectively, Regional Committees for Research and Experimentation (which provide nearly 20% of the public AR budgets) and the Republican Associations of Self-managed Communities for Research.

In Algeria and Tunisia, however, there is a strong concentration of national scientific potential around two capitals. The regionalization of AR is indispensable for good relations with development programs, and certainly will demand considerable time to be implemented.

In the other countries, the regionalization of AR is characterized primarily by the presence of regional research centres reporting to a large or dominating institution where it exists (Spain, Morocco, Egypt, Portugal and France), or by an effort at coordination or specialization that concerns only the institutions that report to a single ministry (Greece and Turkey).

Relations between the NARS institutions

An examination of these relations, which enables a real measurement of the degree of integration of a NARS, deals successively with those maintained between research institutes (including R&D institutes), between higher education institutions, and finally between these two major types of institutions.

The assessment of relations between research or R&D institutes (Table 2, line 8) is important only for those NARS where these institutes are relatively numerous (which is not the case in Lebanon) and represents a high proportion of RY. For these countries, one can observe:

- good relations in Greece and in Turkey, with notable efforts for regional collaboration in the former, and regional and sectorial (research by commodity) in the latter;

- average relations in Italy and Yugoslavia where the good regional relations do not compensate for the inadequate relations at the national level;

- poor national and regional relations in Algeria and Tunisia.

For the other countries characterized by the presence of a dominating AR institute, they have poor relations with other research or R&D institutes in Egypt, Spain and Morocco; average relations in France through mutual involvement in boards or other supervisory bodies, through "scientific interest groups", common laboratories and research programs.

Relations between higher education institutions (Table 2, line 8) warrant some attention (restricting ourselves to AR) especially for the countries where the RY are shared in a more or less equitable way by these institutions (11). These are:

- good, in Italy thanks to the Advisory Committee on Agrarian Sciences of the Ministry of Public Instruction which plays an important role in the AR budgets allocated to the 28 agricultural and veterinary faculties (30% of the public budget), and in Portugal where the National Institute for Scientific Research finances and coordinates the AR activities of the universities and agricultural schools;

- average, in Greece where the National Academy of Sciences of the Ministry of Education tries to coordinate AR in the Agricultural University of Athens and the Agrarian Division of the University of Thessalonika;

- poor, in Algeria and Tunisia.

Among the other countries, one can note the existence in Egypt of the Senior Council of Universities whose role in AR was initiated by the implementation of a "university liaison project" financially supported by USAID.

We then undertook a classification similar to the relations between research institutes and higher education establishments, especially agricultural (Table 2, line nine). For this we noted the good, average and poor qualifications with an upper or lower case according to which establishments mobilized or not a high proportion of total RY (see Table 2, line four). We observed:

- good relations where these two types of institutions have common laboratories with the participation of scientists in research and teaching, and in management bodies combining researchers and teachers. That is the case in France, Italy and apparently Yugoslavia; - average relations in Greece, revealed especially by the joint research programs and various exchanges of resources;

- poor relations in all the other countries, including Morocco despite the same authority of the Ministry of Agriculture.

Finally, often insufficient national and regional integration

The above observations on the responsible authorities and on the liaisons between institutions led to the classification of the different NARS according to their levels of national and regional integration (see **Table 2**, lines 10 and 11).

We will note two "average" levels of integration applicable to all the NARS that are somewhat fragmented (with good national integration in France) where the dominant institutions play a central role in the national research programs.

For Italy and Morocco, we judged their NARS to be poorly integrated at the national level because of the co-existence of sub-systems of similar sizes (NRC, Ministry of Agriculture and Ministry of Public Instruction; INRA-IAV) but also strongly compartmentalized.

3. An attempted typology of NARS

The classification proposed in **Table 3** applies to the situation of NARS such as it has been described in the reports and results from our previous analysis. It warrants a few brief additional comments by country or group of countries.

a) Algeria and Tunisia: their NARS are relatively highly fragmented and poorly integrated at the national and regional level. These negative characteristics certainly explain part of the reforms that are planned or underway for the AR sub-systems under the authority of the Ministries of Agriculture. These reforms aim for better coordination, if not a more or less major fusion of AR and R&D institutes involved, for the beginning of research regionalization which still remains very weak. In both cases, this would be only the first step towards better national integration that should occur through closer relations with higher education establishments. The recent reform of researcher status in Tunisia should facilitate such relations.

Country	Fragmentation	National integration	Regional integration	Evolution
ALG		WEĄK		ALG: AR reform planned by Ministry of Agriculture (48% RY)
TUN	HIGH	Few liaisons between ISA or hetween grouns	WEAK	TUN: AR reform underway by Ministry of Agriculture (53% RY)
YUG	Relatively high number	of ISA responsible to		
ITA	institutions (ISA), no	active national active national	GUUD	ITA: reinforcement of national programs underway
TUR	ISA dominates	coordination body		TUR: moderate national integration (research coordination by product within the Ministry of Acrianityme)
GRE			, ,	GRE: Dec. 1986: reform uniting AR resnonsible to the Ministern of
	MODERATE			Agriculture (67% RY)
MOR	Small number of ISA,		MODERATE	MOR: reform of INRA underway (44% RY)
SPA	dominates	MODERATE		SPA: reinforcement of INIA-SIA and national coordination
LEB	MOT	As for low, but small number of ISA and one	Through regional ISA centres that tend to dominate	LEB: NARS not capable of operating
EGY	One ISA	ISA dominates		EGY: high level of foreign aid
POR	dominates			
Ĩ	,	GOOD: one strong ministry for research		FRA : INRA (59% RY): recent regional reinforcement
FKA				

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b) Yugoslavia and Italy: the NARS in these countries are very fragmented, and poorly integrated at the national level but better integrated at the regional level. This greatly facilitates their relations with their users and a quite high financial involvement of them in research budgets - two important advantages.

c) Turkey: its NARS is very fragmented and only moderately integrated at both the national and regional levels. The system described results from a recent reform that led to a sharp reduction (from 105 to 67) in the number of specialized AR institutes reporting to the Ministry of Agriculture which is by far the main national AR authority (with 83% of the RY). It is contemplated to continue this move towards concentration.

d) Greece: the NARS described was very fragmented, and poorly integrated at the national level although moderately integrated at the regional level. With the creation in December 1986 of a National Institute of AR combining all the AR activities of the Ministry of Agriculture, the current NARS will be quite close to the French and Portuguese "types".

e) Morocco: its NARS was judged to be moderately fragmented and poorly integrated at the national level because of the poor relations between its two main components, INRA and the Hassan II Agricultural and Veterinary Institute. This situation is all the more unfortunate given the fact that these institutes report to the same Ministry of Agriculture. The moderate integration at the regional level is justified perhaps less by the current state of AR than by the on-going reinforcement of INRA's regional centres.

f) Lebanon, Egypt and Portugal: these three NARS are only a little fragmented and moderately integrated at the national and regional level. This is due essentially to the leadership given in each country by an AR institute that more or less dominates. The situation is a little better in Portugal because of the good national integration of the research activities of the higher education institutions. One will note, unfortunately, that the Lebanon NARS is not able to function.

g) France: its NARS is built around two major decision-making poles: a ministry that has real responsibility for national scientific policy, supported by a large AR institute that generally has good relations with its scientific partners and which recently increased the powers of its regional research centres.

IV - Conclusions

This analysis was designed to highlight the best contributions of the papers prepared for the seminars in Istanbul and Rabat. An attempt was made to use them as much and as accurately as possible, while at the same time trying to make them more accessible through some simplification and classification work that inevitably resulted in resorting to a few estimates and personal judgements. The analytical factsheets of the NARS and the comparative presentation of their resources and organizational structure are, of course, open to some criticisms or questions (12). But this risk was worth taking in order to continue this debate, to enable each country to better understand the special features of its AR as well as those of its Mediterranean neighbours, and to facilitate future exchanges as that was the main objective of the two seminars.

Despite their proximity and the size of their centres of common interest, until now NARS of Mediterranean countries have had relatively little in the way of exchange programs. The bilateral relations that have been most developed have involved primarily either neighbouring countries in the North or both Northern and Southern countries that have historical links. But even these have remained quite limited and sometimes even less developed than those with non-Mediterranean countries. Multilateral relations initiated by international organizations such as the FAO, ICAMAS, ICARDA, etc, are still the exception to the rule. As a result, Mediterranean NARS are poorly known to each other.

If they are now somewhat better known to each other, much remains to be done. Most national papers emphasized the major potential role of ICAMAS to catalyse exchanges between countries. For information exchanges, we know relatively little on research programs, their size by discipline or by product, on relations between research and development, on the diffusion of innovative research results. Scientific exchanges themselves should enable one to make better use of research program, to encourage synergies, complementarities, and to support the less favoured countries. It is up to the countries and

their scientific institutions to show their interest in these fields!

Notes

(1) By AR we mean all research activities concerning rural areas and agricultural production: plant and animal production, forestry, inland fisheries, agro-food industries, physical and human environment, etc.

(2) We do not include here full time researchers located in higher education institutions but reporting to specialized research institutes (notably France and Italy). Algeria and Yugoslavia were the only countries that mentioned the presence of specialized researchers directly employed by universities.

(3) See the ISNAR report on Tunisia.

(4) Many research institutes in the most developed countries recruit their young researchers only among those who have a doctorate; this is far from being the case in all Mediterranean countries.

(5) In Egypt, for example, we used the average cost per researcher calculated for the main AR institute (ARC = Agricultural Research Centre) to evaluate the financial resources of other institutions of the NARS; in Yugoslavia we estimated total AR expenditures by multiplying the number of RY by the average cost per researcher estimated at the national level for the entire scientific research system (with the major inconvenience that there were only 1979 data for this country).

(7) By taking into consideration such foreign aid, the A ratio increased by about 10% for Tunisia and Morocco, a little less for Algeria and Turkey.

(8) The A' ratio = NARE/AFGDP would be preferable to the A ratio for comparisons between countries with very different structures and development levels, as is the case in the Mediterranean region. It would be a little lower than A for the poorest countries where the food industries are poorly developed, and much lower for the most industrialized countries with, for example, Italy having an A' ratio of nearly 1%. But such ratios would be difficult to calculate for all countries due to the lack of international data available on AFGDP. It should also be remembered that in the industrialized countries, a more or less high proportion of research on food technology is done by private companies and as a result the best ratio possible would bring the total public, private national AR expenditures to the AFGDP.

(9) We will note that a more or less reduced proportion (10-30%) of these expenses go to "basic support to researchers" (direct working expenses), with the rest going to "general expenses", fixed asset costs of the institute, etc.

(10) Data based on Shehata (1987) who indicates that of the 2,500 ARC researchers, 655 have earned a Ph.D during the 1982-87 period.

(11) This is not the case in Morocco where the IAV represents 175 RY and the Meknes ENA 15, and where the examination of their relations is of little interest here.

(12) Please send us your contributions through the Secretary General of ICAMAS!

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Annex

Analytical factsheets on the NARS

These factsheets (12) are primarily based on the information contained in the national reports presented at the ICAMAS seminars in Istanbul (AI) and Rabat (BR) with some supplementary information for some countries cited in the above bibliography.

The following acronyms have been used:

 $\mathbf{R} = \mathbf{Research}$ institute with a general scientific mandate

 $\mathbf{R}\mathbf{A}$ = institute specialized in AR

 $\mathbf{ES} =$ non specialized higher education establishment

ESA = higher education establishment for agricultural and/or veterinary studies

 $\mathbf{D} = \operatorname{agricultural development institute}$

 $\mathbf{ET} =$ consulting company

The first acronym used refers to the main mandate of the institution, the second its second mandate (without brackets) or secondary mandate (with brackets). "All" = all AR areas

*: estimates of national reports or of the author

°: rounded off estimates

- : no data available

ALGERIA I - Main public institutions of the NARS (1986)

			Voca	tion	Scien	tists	Budget
	Responsible ministries	Institutions	Type	AR	Number	RY	AR 106\$
ø	Agriculture and Fisheries (MAP)	INRAA	RA	See note	40	40	*00
q		9 technical institutes	D-RA	:	280	*06)
с v	-	BNEDER	ET-RA	=	*06	25*	
q		ITA, ITAS	ESA(RA)	:		20*	
9	Irrigation and Forestry	INRF	D-RA	Forestry		ı	
ب س	=	ANRH, ANPE	D-RA	See note	30*	15*	
þű	Higher Education and Advanced Research (MESRS)	INA Alger	ESA-RA	All	160	50*	
ч	5	3 INES (A)	ESA(RA)	All	50*	1	
	=	ENV Alger	ESA (RA)	Veter.	20*	10*	
. . .	=	2 INES (V)	ESA (RA)	Veter.	1	1	
뵈	=	Université Alger	ES-R	See note	60*	20*	
÷		5 other universities	ES-R		200^{*}	+02	
ម	=	CREAD	R(RA)	Economics	110*	10*	
	Sources:		Researchers		50	50	
	Kellou(AI), Ait Belkacem (BR)		Teachers		600°	170*	
	Commissariat à la RST (1986)		Others		ι	130*	
	FAO report (1984)		Total			350*	40*
		II - Notes					
a) Nat	ional Agronomic Research Institute of Algeria, involved until 1987 in the fields of geneti	ic resources, soils and Sahelian agronomy					
b) Incl	uding six institutes specialized by commodity, two for crop protection and animal health	1, one for soils, irrigation and drainage.					
c) Nat	ional Office for Rural Development, specialized in studies on rural development.						

teachers with a higher training who benefit from a more favourable status but have limited research means. The High Commission for Research reports to the President of the Republic. Recently changed, it does The Algerian NARS consists essentially of two very dispersed networks that report to the MAP and MESRS. The first includes few specialized researchers. The second consists of research units animated by

III - Comments

h.j) Agronomic and veterinarian branches (4 yrs) of National Higher Education Institutes; number of INES (A) and INES (V) passed in 1987/88 respectively was 5 and 4.

g) National Agronomic Institute of Alger-El Harrach (programs: 5 yrs + two post graduations of 2 and 5 yrs).

k) With three large research units: terrestial biology, basic and applied biology, and arid zones.

Universities of Oran, Tlemcen, Tizi-Ouzou, Constantine, Annaba.

Human and financial resources: totals are approximate due to information gaps.

f) National Agencies for Irrigation Resources (ANRH) and for Environmental Protection (ANPE).

e) National Forest Research Institute.

d) Agricultural Technology Institute (Mostaganem) and Sahelian Agronomic Technology Institute (Ouargla).

m) Research Centre on Applied Development Economics (10 full time in Alger and a hundred university teachers throughout the country, on average one-third time).

not have the budget to implement its official functions. At the MAP, the Training, Research and Extension Directorate plays an essential administrative role, without any coordination or animation role. A

eform of the AR system of MAP is currently being studied by FAO.

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EGYPT I - Main public institutions of the NARS (1986)

	Raenoneihla ministriae	Tratitutions	Vocati	ion	Scien	tists	Budget
		STIDT D TO STIT	Type	AR	Number	RY	106\$
в	Agriculture	Agricultural Research Centre (ARC)	RA (D)	All	2,500	2,500	24
م	Acad. Scien. & Technol. Res. (ASRT)	National Res. Centre (NRC): agro-food div.	R-RA	See note	600	600	
ပ	Irrigation	Water Research Centre (WRC)	R(RA)	Irrigation	100*	100*	
5	Land clearing	Desert Research Institute (DRI)	RA		175	175	
e	Education	22 agric. and veterinary faculties	ESA-RA		4,300*	1,075*	
.	Sources:		Researchers		3,375	3,375	
	El-Sharkawy (Al), Abdelsalam (BR),		Teachers		4,300	1,075	
	Shehata (1987)	· · ·	Others				
			Total			4,450	40

II - Notes

a) ARC consists of 14 institutes working by commodity (4 for plants, 1 for animals), by disciplines (7), by production factors (2: soils-water, machinery) and three central laboratories. Since 1983, it also has a mandate for development (seed production, research on extension activities). It has 28,000 employees, including 7,700 technicians.

b) ASRT consists of 10 independent R institutions including 2 involved in AR: NRC (with two divisions: agricultural and biological R, agro-food and milk products) and a remote sensing centre. c) WRC consists of 11 R institutes including 2 involved in AR, specialized in the "distribution of irrigation water" and drainage.

e) Including 16 agricultural faculties (total of 3,500 teachers, including 540 at Cairo-Giza) and 7 veterinary faculties (800 teachers) to which can be added 16 engineering faculties partly involved in water resources.

Financial resources: to the national resources can be added those of foreign aid (mainly from the USA) which averaged about \$20 million per year for the last 5 years.

III - Comments

The Egyptian NARS is dominated by two major poles: ARC, which reports to the Ministry of Agricultural Development (more than 600 Ph.Ds) and the universities (almost all of the teachers have a Ph.D). A large proportion of national resources is spent on salaries; foreign aid contributes in particular to operating and equipment costs.

The Agro-food Council of the Academy for Scientific and Technological Research is responsible at the national level for research orientation and tries with its limited authority to encourage coordination between the different components of the NARS. FRANCE I - Main public institutions of the NARS (1986)

	Resnonsihle ministries	Institutions	Vocat	ion	Scien	tists	Budget A P
		2110 YA DA 19 CTT	Type	AR	Number	RY	106 \$
രഹ	Higher Education and Research (MESR) Agriculture (MA)	INRA Crmacref	RA RA D	Cf. notes	2,720 410	2,720 970	370 97
<u>ຼ</u> ບ		17 technical institutes of ACTA	RA-D	Ξ	006	*009	65
q		16 technical institutes of ACTIA	RA-D	:	160	110	24
ب ہ	Agriculture	8 ENSA and ENV (public) + 4 ENS (applied public)	ESA-RA ESA(RA)	= =	\$ 700	\$ 350*	24*
60	MESR	3 ENSA (public)	ESA	z			
4	MESR	CNRS	R(RA)	ŧ	12,400	300*	47*
• ==1	MESR	Universities	ES-R	2	ı	250*	40*
•	MESR and Development	CIRAD	RA-D	Tropical	006	700	135
4		ORSTOM	R-RA	=	760	250*	40*
	Sources : Conesa, Casas (AI), Petit, Tisserand (BR) (\$ = 6.3 FF)	Domestic NARS	Researchers Teachers Others Total			3,020 600* 980 4,600*	600*
		Overseas research				810*	175*
		II - Notes					

a) INRA: National Agronomic Research Institute, organized by disciplinary departments and (regional) research centres, it finances a large part of the research activities of the ENSAs and ENVs (e). b) CEMAGREF: National Centre for Agricultural Machinery, Rural Engineering and Water and Forests.

c,d) Agricultural Technology Coordination Association (ACTA) and the Agro-industrial Technical Coordination (ACTIA), financed partly by the agricultural and agro-industrial professions.

e) National Advanced Agronomic Schools of the former ones (INA Paris-Grignon, ENSA Rennes and Montpellier, ENSIA Paris) and Veterinarian (Paris, Lyon, Nantes, Toulouse). f) Applied or specialized schools see above (ENGREF, ENSSAA, CNEARC, ENSH).

g) These schools have very limited AR activities.

h,i) Numerous university research activities are conducted in associated university - National Scientific Research Centre (CNRS) laboratories .

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i) Centre for International Cooperation in Agronomic Research for Development.

k) French Institute of Scientific Research for Development (formerly Office for Scientific and Technical Research Overseas; ORSTOM),

III - Comments

In the NARS of France, one notes the importance of:

- the authority of the MESR which controls the "research envelope" allocated to all scientific bodies, and tries to encourage synergies between them;

- INRA which accounts for 59% of the RY and budget of domestic AR, and which has strong relations with most other national scientific institutions, notably public higher education institutions for - efforts on tropical AR for relations with developing countries, in which most institutions participate (albeit weakly), except of course CIRAD and ORSTOM. agronomy and veterinary studies reporting to the MA;

Private AR is relatively well developed: in 1985 it spent \$270 million (\$100 million from the State) or 45% of the budget of domestic institutions.

I - Main public institutions of the NARS (1985) GREECE

		Incitive	Vocati	on	Scien	tists	Budget AR
	responsible municules	SUDDUDU	Type	AR	Number	RY	106\$
Agriculture (AR	service)	24 institutes	RA	Cf. note	400	400	30*
Agr. (forestry)		2 institutes	RA	Forestry	50	50	3,5
Agr. (animal hea	(lth)	20 institutes and laboratories	D-RA	Cf. note	120	20*	•
Agr. (misc.)		Tobacco institute	RA	Tobacco	ı	3	
=		Sugar research service	RA	Sugar	ı	3	
4		Cotton committee	RA	Cotton	3	,	·
=		Inst. Phytopat. Bénaki	RA	Phyto	,	,	•
Education		Agr.University of Athens	ESA-RA	Cf. note	210	105	1 5*
2		Agr.Div. Univ. Thessalonica	ESA -RA	٤	180	90) 10
Sources :			Researchers			480*	
Liacos, Papanastisis	, Sficas (AI)		Teachers		390	200	
Olympios (BR)			Others			20*	1
$(1 \ \$ = 70 \ D)$			Total			*002	55*
	-	-					

II - Notes

177 1) These institutes are involved (most by commodity) in all AR areas except for forestry, animal health, fisheries and rural economics and sociology. Their coordination in the field is ensured by 5 AR centres for the 5 najor regions of the country (North/Thessalonica, Centre/Larissa, Athens, Peloponnese, Epire/Patras, Crete-Islands/Chania).

o) Forestry R institutes of Athens and Thessalonica.

:) These institutes and laboratories are involved in disease diagnosis, quality control of food of animal origin, production of vaccines, seeds and serums, and research (for 10-20% of the staff time).

3,1) 2 faculties at Athens, (ag. production, ag. development), 3 at Thessalonica (agriculture, forestry, veterinary studies). We find here the only (30) specialists in rural economics and sociology in Greece. The eachers benefit from a social status that is higher than that of researchers (and thus attracted by the universities).

III - Comments

The Greek NARS essentially consists of one group of institutions reporting to the Ministry of Agriculture, and another belonging to the two universities mentioned (a third, with the Faculty of Agriculture that was pened in 1984 in Volos, Thessaly). There are good relations between them.

A recent reform (December 1986) of the AR system of the Ministry of Agriculture is designed to establish a single national institute bringing under one authority all the decentralized AR activities of the institutions tited in lines a, b and c.

At the Ministry of Education, the National Academy of Sciences and Education encourages R in the universities which benefit from its programs and also those of other ministries, particularly the Ministry of griculture for AR.

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I - Main public institutions of the NARS (1986)

	Remonsible ministries	Insti	tutions	Vocati	uo	Scien	tists	Budget
		Independent	Dependent	Type	AR	Number	RY	AN 106\$
Ø	Agriculture and forestry (MAP)	23 R institutes 7RD institutes		RA RA (D)	All Misc	540	540	48
q	Sc. Tech. Research (MRST)	National Research Council	17 institutes	RA (D)	All	230	230	C
		R (CNR)	23 centres in universities	RA (ESA)	Misc.	200*	200*	32
ల	Public instruction (MIP)	20 universités	18 agricultural faculties	ESA -RA).	Agro.	800	550*	02
			10 veterinary faculties	±	Veter.	500	350*	2
q	Regions	34 misc. institutes		D(RA)			~	~
e	Ind., Commerce & Artisanat	6 experimental stations		RA			290 [∗]	*01 \
		Radio-agro. Lab., ENEA		RA				
بم	Foreign Affairs	Overseas Agr. Institute		ESA-RA	Tropical	•	r	•
		(Florence)		,				
	Sources:			Researchers	-	1,250	1,250	
	Fideghelli (Al), Lorenzetti (BR)			Teachers		1,300	*006	
				Total			2,150*	230

II - Notes

a) These institutes each have a board and their activities are supervised by the National Experimentation Committee of the MAF.

b) The CNR has a general scientific mandate; in the AR field, its "Advisory Committee for Agrarian Sciences" directly administers the 17 specialized institutes belonging to the CNR and the 23 AR centres associated with the universities (directed by professors).

c) The 28 faculties have administrative independence; their research activities are financed and coordinated by the Advisory Committee for Agrarian Sciences of the MIP.

d) Each region has its own Regional Committee for Research and Experimentation which finances and coordinates part of the AR activities of the institutions located in its region.

III - Comments

The Italian NARS consists primarily of the 3 R networks of the Ministry of Agriculture, the CNR and the universities. The first one is very fragmented, and the two others are partly associated under the CNR through its 23 centres located in the universities (with a little more attention paid to the CNR's own centres). One should note the role of the regions in research funding (nearly 20%, with the Mezzogiorno Office) and in the coordination and animation through regional committees for R and experimentation.

At the national level, the major AR directions are defined by the Inter-ministerial Committee on Agro-food Policy (CIPAA) and the Ministry of Scientific and Technological Research. Each ministry concerned, however, seems to keep considerable autonomy for the financing of its institutions.

In 1984, private AR (including that in State-involved companies) employed nearly 700 researchers; it benefited from \$10 million of public grants in 1984.

LEBANON I - Main public institutions of the NARS (1985)

	Resnonsible ministries	Institutions	Vocat	ion	Scien	tists	Budget AR
			Type	RA	Number	RY	106\$
ы	Agriculture	IRAL	RA	All	55	55	5
ą	National Education	Faculty of Agriculture of the	ESA(RA)	=	9	ę	I
໌ ບ		Fac. Agro. and Food Science (FAFS) of the American University	ESA(RA)	=	21	12	1
q		Advanced School for Ag. Eng.(ESIAM) of the <i>Université</i> St Joseph	ESA		۰.	0	- I
	Sources : Haidar (AI), Hamze (BR) 1\$ = 4 L.L.		Chercheurs Enseignants Total	· ·	37	55 15 70	•

II - Notes

a) Agronomic Research Institute of Lebanon

b) Training of agronomic engineers in 5 yrs.; 6 permanent teachers and 20 on contract.
c) Training of agronomic engineers (4 yrs.) and Masters; 21 permanent teachers and 15 on contract.
d) Training of agronomic engineers in 5 yrs.; all teaching done by staff on contract.

III - Comments

The National Scientific Research Centre (CNRS) that reports to the Council of Ministers, coordinates the research activities of the country's different institutions and gives them some . financial support (budgets, training-recruitment of researchers).

Despite a good scientific potential (20 researchers in IRAL and 40 permanent teachers or contractual staff have doctorates), the Lebanese NARS is not currently able to operate.

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MOROCCO I - Main public institutions of the NARS (1986)

	Reconcible ministries	Tretitutione	Vocat	ion	Scient	figues	Budget
		CTION 0110	Type	AR	Number	RY	AR 106\$
a	Agriculture Reform	INRA	RA	All	200	220	23
	(MARA)						Ì
Q	1	IAV Rabat	ESA-RA	=	350	175	~
ບ	:	INA Meknes	ESA(RA)	:	30	15	*4
σ		Offices, Directions MARA	D(RA)	=	,	*06	ۍ ت
e	Universities		ES(R)		•	•	I
	Sources : Lazzaoui (AI) Firdawev (BR)		Researchers		220	220	
	ISNAR (1984)		Teachers		380*	190	
			Others			90	
			Total			500*	35*

II - Notes

a) National Agronomic Research Institute : a major reform has been underway since 1985; large cooperation with the USA.

b) Hassan II Agronomic and Veterinary Institute (Rabat, Salé, Agadir); engineering training programs (4 or 6 yrs.) and doctorates; research developed with national resources (contracts, grants from the Ministry of Agriculture since 1987) and foreign aid.

d) Regional Development Offices, Offices for Livestock and Forests, State companies.

e) The universities have to date been little involved in AR.

III - Comments

AR in Morocco takes place essentially under the responsibility of the MARA but without any real-coordination between the two main institutes: INRA and IAV. The first has major physical resources, while the second has better scientific potential (about 70 doctorates compared to about ten for INRA).

At the national level, the National Coordination Centre for Scientific and Technical Research, recently created, has not so far been involved in AR.

PORTUGAL I - Main public institutions of the NARS (1986)

	Reenoneihle minietriee	Tretitutions	Vocati	ion	Scienti	fiques	Budget AR
		6TT07575776TTT	Type	AR	Number	RY	106\$
B	Agric., Fisheries and Food. (MARA)	INIA	RA	See note	315	315	20
ھ		DG Livestock (DGP)	D(RA)	2	ı	40	,
ల	-	DG Irrigation and Rural Engin. (DGHEA)	D(RA)	=	1	15*	
q	Education	INIC coordinating R-RA in universities:				00	
e		Lisbon: ISA	ESA-RA	Agr.	190	1 20	•
ب ب		Lisbon: ESMV	ESA-RA	Veter.	70	_	
60		Vila Real	ESA(RA)	Agr.	06	120^{*}	•
<u>ب</u> ط		Evora	ESA(RA)	Agr.	80	_	-
•न		Açores	ESA(RA)	Agr.	40	_	
	-	and in 5 ESA	ESA(RA)	Agr.	120	20*	
ب ة	Catholic University of Porto	ES biotechnology	ES(RA)			5	٠
-	Education	Research Institute Tropical Science	R(RA)	Tropical	•	•	•
			Researchers			340	
	Sources:		Teachers			145	
	Portas, Cardoso (AI), Vaz, Lobo (BR)		Others			55	
			Total			540	30*

II - Notes

a) National Agronomic Research Institute; mandate for all AR activities except b and c.

b) With two AR units: National Lab. of Veterinary R (LNRV) and the National Station for Animal Selection and Breeding.

c) AR activities in irrigation, mechanization and agricultural buildings.

d) The National Scientific Research Institute (INIC) coordinates and finances the R activities of the university institutions; it directly manages two specialized R units in agrochimatology in Vila Real and in applied ecology at Evora.

e) Superior Agronomy Institute with 7 R "centres" (licence and masters programs in 5+2 yrs.).

f) Advanced School of Veterinary Medicine with two "centres" (same programs).

g,h,i) These three universities each have departments of agriculture, livestock and forestry; the University of Faro (not mentioned here) has only one department of horto-fruitculture.

)) The 5 (soon) Advanced Agricultural Schools have training program of 3 and 5 yrs. (except Santarem and Coimbra: 6 yrs) but do little R.

III - Commentaires

The Portuguese NARS is dominated by INIA which have good relations with the universities.

At the national level, the coordination of scientific and technological R is done by the Secretary of State for Scientific and Technological Research which is part of the Ministry of Planning and Territorial Development (SEIC). It includes a commission for agriculture, forestry and animal production which plays an important role.

Research in private companies (Bayer, Quimigal, ICl, etc) employs about 40 researchers.

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SPAIN 1 - Main public institutions of the NARS (1986)

Budget	106 \$		45	22		₹23*				*00
ıtists	RY	175	450	225		\$ 350		850	350	1,200
Scier	Number	175	450	225	540	880	ı	850	1,420*	
ion	AR	See note	2	E	=	Ξ	:			
Vocat	Type	RA	RA	R(RA)	ESA-RA	ESA(RA)	ES(R)	Researchers	Teachers	Total
Institutions		INIA) Coordinating council	17 SIA fof AR	CSIC	4 ETSIA	8 veterinary faculties	Faculties of biology, economics			
Responsible ministries		Agriculture (national level)	Agriculture departments of regional governments	Education and Science	-	2	2	Sources : Moreno (AI), Rallo - Galyez (BR)		
-		B	q	υ	q	e	f			

II - Notes

d,e) Advanced Agronomic Engineering Technical Schools (Madrid, Cordoue, Valence, Lerida) and veterinarian faculties with 6 year training programs; their AR activities are poorly developed because of a lack of a,b) As part of the regionalization program, the National Agronomic Research Institute (INIA) was broken up in 1984. It retained only those disciplinary departments and laboratories based in Madrid, with its research funds and of relations with INIA, SIAs, CSIC, and also because of the heavy teaching loads (respectively 8 to 15 students per professor in the ETSIA and the FVs). Weak AR activities in the Agricultural c) The High Council for Scientific Research (CSIC) includes several departments, institutes, centres and experimental stations involved in AR (soil science, water management, genetics, biochemistry, etc). other centres and stations forming the 17 AR Services (SIAs) managed by the Departments of Agriculture of the regional governments. An AR Coordination Council brings together INIA and the SIAs. Engineering Technology University Schools (3 year training programs, 665 teachers) not included in the table.

III - Comments

It finances through its Consultative Scientific and Technical Commission (CAICTT) some AR programs (of limited amounts, 5% of its total budget, but only that dealing with operations and equipment) associated with public and private institutions. A national institution (INIA?) might soon be designated to assume the scientific coordination of this NARS. Private AR represents about 10% of the public investment (\$7.5 The Spanish NARS has two poles: the INIA-SIAs group and the "university" group dominated by the CSIC. At the national level, the Inter-ministerial Committee for Science and Technology was created in 1986. million).

CIHEAM - Options Mediterraneennes

TUNISIA I - Main public institutions of the NARS (1985)

	Rommeihlo minietries	Tacti titions	Vocati	on	Scien	tists	Budget AR
	Sat herititi antenndeant	CT10170710711	Type	RA	Number	RY	106\$
ø	Agriculture	INRAT	RA	All	70	70	
م,		CRGR, INRF, IRA, IO	RA	See note	70	70	
ల	=	IRVT, soil, water directorates	D-RA	z	+02	20*	
q	Higher Educ. and Sc. Res. (MESRS)	INAT Tunis	ESA-RA	All	80	40*	
e	+ Agriculture	ENMV + 6 ESA	ESA-RA	:	160		
دبسا	MESRS	Universities	ES(R)		ı	40*	
ය	Agriculture	Development offices	D(RA)		ı	•09	
	Sources:		Researchers			140	-
	Lasram(AI), Tahar El Mili (BR)		Teachers		240*	80	
	ISNAR (1986)		Others			80	
			Total			300	20*

II - Notes

a) National Agronomic Research Institute of Tunisia.

b) Research Centre for Rural Engineering, National Forest Research Institute, Institute for Arid Regions, Olive Institute.

c) Veterinary Research Institute, Soil Resource Directorate, Water Resource Directorate.

d) National Agronomic Institute, with training programs for engineers and doctorates.

e) National Veterinary Medicine School and six Advanced Agricultural Schools, with little AR.

f) Research activities in the universities are coordinated by the National Scientific and Technical Research Institute (INRST), with most teachers and a limited number of full time researchers working in certain fields (soils, water, biology) related to AR.

III - Commentaires

The Tunisian NARS is very fragmented, especially within the Ministry of Agriculture where a High Council for AR has never been able to exercise its coordination functions. Higher agronomic education has the best trained scientists, attracted by a more favourable status (until August 1987), but has practically no research budget. Thus of the 240 teachers concerned, there were only 25 RY in 1985 (ISNAR) instead of the 40 mentioned. The recent attachment of such education to the MESRS will not favour a better integration of the NARS, but a reform of AR within the Ministry of Agriculture is underway.

		, , , , , , , , , , , , , , , , , , ,	Vocati	uo	Scien	tists	Budget AR
	vesponsible ministrates	TIBULUTOTIS	Type	AR	Number	RY	106\$
രഹാ	Forestry, Rural Affairs (MAFRA)	11 R. institutes2 R institutes54 R institutes	RA RA RA	Water, soils Forestry Others	$\left. ight. ight. \left. ight. $	1,500	ŧ
q	Higher Education	12 agriculture faculties 7 veterinary faculties 2 forestry faculties 2 tobacco, agr. econ. faculties	ESA(RA) "	Agric. Veter. Forestry	860 340 120 70	\$ 350*	1
Ð	Industry and Commerce	Sugar Institute (Ankara) FertilizerInstitute (Kutahya)		Sugar Fertilizer			
τ pa	Finance and customs Council for Scientific and Tech. Research	Tea Institute (Rize) "Monopoles" R Institute (Istanbul) -		Tea Tobacco			
	Sources : Ergun(AI), Tunay (BR)		Researchers Teachers Total			1,650* 350* 2,000	

II - Notes

a) Institutes reporting to the Office of Rural Affairs of MAFRA.

b) Institute reporting to the Directorate General of Forestry of the MAFRA.

c) Institutes reporting directly to the Ministry of Agriculture, responsible for all AR areas other than those covered by the above institutes. Of these 54 institutes:

- 4 are National Research Centres responsible for the coordination of research on major crops, market gardening and fruit, livestock and animal health;

- 7 are regional centres responsible for the coordination of research at the level of each 7 major agro-ecological zones of the country;

- 43 are institutes specializing by commodity.

d) Training of engineers in 4 yrs. and veterinarians in 5 yrs. These faculties are spread around 22 universities.

e.f.g) No precise information is available on the research institutes (less than 10) responsible to these ministries. Financial resources: no information available; the MAFRA covers up to 80% of the national AR expenditures.

III - Comments

AR within the MAFRA, such as it is presented above, results from a recent reform that was designed to reduce the number of institutes (67 instead of 105), to redefine their mandates (sectorial and regional), and to create a Consultative Committee for AR Planning and Coordination.

At the national level, the High Council for Research and Development defines the science policy of the country. Private AR is in full expansion, notably through multinational companies (seeds, fertilizers, machines) and through the recruitment of researchers from the public sector.

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I - Main public institutions of the NARS (1979)

			Vocati	uo	Scien	tists	Budget
	Responsible ministries	Institutions	Type	AR	Number	An-RA	AK 106\$
p a	Selfmanaging R communities	61 specialized institutes? R+D institutes	RA RA-D	All "	1,240	1,240 1,260	
с	Republican assemblies (universities)	19 agriculture faculties 5 forestry faculties 5 veterinary faculties	ESA-RA "	Agr. Forestry Veter.	(2,900*)	$\left. \right\} 460$	
	Sources : Maticic (Al), Numic (BR) N.B. The most recent data for human and financial resources are for 1979		Researchers Teachers Others Total			1,240 460 1,260 2,960	75*

II - Notes

a) Institutions employing only specialized researchers. Among the 21 largest institutes, 6 are located at Belgrade (Serbia) and are specialized in disciplines and production factors; the others are located in the 5 other federal republics and 2 independent territories (Vojvodina and Kosmet) and are mostly specialized by commodity.

c) The faculties of agriculture and forestry have training programs of 4 yrs (licence) and 5 to 8 yrs (masters). The veterinary faculties have 5 yr. training programs. Doctoral theses are granted after R work is submitted to juries composed of researchers and professors. The faculties have full time teachers-researchers and also researchers. The total number of 2,900 teachers is the current number, while that for RY is for 1985.

Financial resources in 1979: in the absence of precise data, these have been estimated from unit costs of \$25,000 per year per researcher given for the entire Yugoslavian RST in 1979; the total of \$75 million should thus be considered a rough estimate.

III - Comments

including scientists and users (which provide a large proportion of their financial and equipment resources), particularly interested in applied research, and secondly self-managed communities At the level of each republic and territory, AR is directed and financed by the Republican Association for Scientific Research of Self-managed Communities. This involves first its communities The Yugoslavian NARS is particularly complex given the federal political structure of this country and its socialist form of self-management.

At the national level, the Federal Association of these communities tries to coordinate scientific policy of the country and to promote R programs of common interest.

specialized in R (composed only of scientists) interested in more basic R.