

# THE NATIONAL AGRICULTURAL RESEARCH SYSTEM OF LIBYA<sup>1</sup>

## 1. HISTORICAL BACKGROUND

Agricultural Research (AR) in Libya dates back to the early part of this century during the colonial era, where the “Centro Sperimentale Agrario E Zootecnico della Libia” at Sidi El Masri near Tripoli was established to serve the Italian agricultural settlers.

In the early 1950s to the late 1960s, the Ministry of Agriculture was initiated and AR became affiliated to the Directorate of Plant and Animal Production, with major changes in goals and organization.

In 1969, the Marine Biology Research Center (MBRC, currently affiliated to the Secretariat of Marine Wealth: SMW) was created. The next year (1970) the Agricultural Research Center (ARC) was established by the Ministry of Agriculture (then called the Secretariat of Agriculture: SA) to serve as an umbrella and authorized organization for the implementation of AR in the country with an adopted national AR work plan. Four regional research branches were initiated according to altitude, climatic factors, rainfall, and agricultural activities.

In 1981, the General People’s Committee (Minister’s Cabinet) initiated the National Authority for Scientific Research (NASR) to formulate and supervise the national research policy, fill in gaps in research not tackled by any existing research institutes and centers, and technically coordinate research carried out at research centers. New research centers were established under the umbrella of NASR, including the Environmental Protection Research Center (EPRC, 1985), the Industrial Research Center (IRC), and the Oil Research Center (ORC).

In 1995, the Secretariat of Agriculture was split into the Secretariat of Agriculture (SA) and the Secretariat of Animal Wealth (SAW), which created in 1996 the Animal Wealth Research Center (AWRC, now called ASRC: Animal Studies and Research Center) to be responsible for research on livestock and wildlife.

Agricultural higher education (AHE) founded its roots with the establishment of the Faculty of Agriculture of Al-Fateh University of Tripoli in 1966. During the period 1975–97, six other faculties of agricultural sciences were created<sup>2</sup>: four faculties of agriculture (FA) at Omar Al-Muktar University (Al-Beida, 1975), Sebha University (Sebha, 1987), Al-Tahadi University (Sirte, 1992), and Al-Jabel Al-Gharbi (Zentan, 1997)<sup>3</sup>; and two faculties of veterinary medicine at Al-Fateh University of Tripoli (1988) and Al-Muktar University (Al-Beida, 1995).

Other institutions partly involved in AR were also created, among them are the Nuclear Research Center (NRC, established in 1975) and the Libyan Center for Remote Sensing and Space Science (LCRSSS, 1989), both under the Secretariat of Training and Habilitation (STH); and the Economic Studies Research Center (ESRC, 1985), directly affiliated to NASR.

## 2. THE CURRENT NARS

### 2.1 Overview

The NARS of Libya currently (1998) includes three sets of scientific institutes (see [Table 1](#)):

- The scientific institutes mainly involved in AR: the Agricultural Research Center (ARC), the Animal Studies and Research Center (ASRC), and the Marine Biology Research Center (MBRC), affiliated to SA, SAW, and SMW, respectively; together they account for around 50% of the potential research years (pRYs: equivalent full-time researchers) and 73% of the total financial resources of the NARS. They are presented in Section 2.2.

- The seven faculties of agriculture and veterinary medicine, under the Secretariat of Education and Scientific Research (SESR), with limited involvement in AR. They meet 38% of pRYs and only 9% of the total financial resources of the NARS (see Section 2.3).

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<sup>2</sup> In addition, Libya has 13 middle institutes for veterinary medicine and agriculture, the first ones established as early as 1952 at Al-Gheran and Al-Marj.

<sup>3</sup> The FA of Al-Jabel Al-Gharbi (Zentan) was called the Higher Institute for Veterinary Medicine and Rainfed Agriculture, which was created in 1988.

- The "other scientific institutions" mentioned above, affiliated to other secretariats, which allocate some resources to AR (around 12% of the pRYs and 18% of the total financial resources); they will be briefly seen in Section 2.4.

Accordingly, the NARS is relatively highly fragmented among a large number of scientific institutions and secretariats. The National Authority for Scientific Research (NASR) is supposed to formulate and supervise the national research policy, but its actual role in AR is rather limited, and currently no institution is actually responsible for coordinating the NARS.

## 2.2 The AR Institutes

### **The Agricultural Research Center (ARC)**

Mandate and Organization - ARC is the major institution of the Libyan NARS (42% of the pRYs, and 60% of the financial resources). It is directed (like the two other AR institutes) by a Board of Directors headed by a Director General. Its research activities are coordinated by 8 central departments: soil and water, field crops, horticulture, plant protection, animal production forestry and range, agricultural mechanics, and agricultural economics. ARC researchers allocate around 90% their time to research and 10% to extension and consultancies.

Human, Physical and Financial Resources - ARC has (December 1997) 447 national permanent full-time staff, 136 of whom are research scientists, 218 technicians, and 93 other support staff (clerks, unskilled staff: drivers, laborers, etc.).

Out of the 136 research scientists (10 PhD, 30 MS, 96 BS), 124 are on duty and represent 112 pRYs<sup>1</sup>; 9 researchers are on study leaves (5 preparing MS in Libya and 4 preparing MS abroad), and 3 others are on secondment. The scientists' academic level is considered insufficient, but it is improving over the years.

The Center has four "Regional AR Centers" (RARC), supported by 13 experimental stations. The RARCs are responsible for carrying out the research programs.

- The RARC for the western area (which encompasses the largest part of agriculture and of the population), was established in 1971 at Tajura, 20 km east of Tripoli. It covers the areas from the Tunisian borders to Khomes region (6 research stations and 3 experimental sites), and employs 85 researchers who focus mainly on fully irrigated and supplementary-irrigated crops such as vegetables, cereals, fruits, and forages, with some emphasis on rainfed agriculture as well as agro-economics, animal production, and biotechnology.
- The RARC for the eastern area, established in 1972 at Al-Marj, 1100 km east of Tripoli, covers the areas from Sirte to the Egyptian borders (4 stations). It has 30 researchers mainly in rainfed agriculture (cereals, legumes, fruits), forestry, and range.
- The RARC for the central area, located in Musrata, 200 km east of Tripoli, covers the areas from Khomes to Sirte (2 stations). Its 10 researchers are working mainly on salinity research.
- The RARC located at Sebha (700 km south of Tripoli) covers the southern area of the country (1 station); 11 researchers work in the areas of hot/dry climate and fully irrigated crops (cereals, legumes, forages, palm trees).

Land resources are adequate; the other physical resources (buildings; scientific, computer, transport, and communication equipment) are adequate in some stations; others have financial problems which affect maintenance. Many buildings need rehabilitation, and a large part of the equipment is now outdated or insufficient, especially in the remote research stations.

ARC's current financial resources, totally funded by the Government (very little self-generated income: sales of the production of the stations, services to the public, consultancies), summed up to 3 million Libyan dinars in 1997 (US\$ 8.3 million), of which 65% (US\$ 5.4 million) were for salaries/allowances, 5% for training, and 30% for operation and capital costs (OCC). The current OCC (US\$ 2.5 million) amounts to around US\$ 20,200 per scientist on duty, which is not sufficient to ensure optimal work conditions (see Section 3.3).

Research Activities and Linkages – Currently, ARC has 10 researchers in soil sciences, 3 in supplementary irrigation, 8 in the use of saline water in agriculture, 17 in cereal crops, 15 in horticulture, 5 in vegetables, 8 in food legumes, 6 in feed legumes, 5 in seaweed as animal food, 5 in tissue culture, 5 in entomology, 5 in range management, 6 in goats, 6 in animal nutrition, 3 in agricultural machinery, and 10 in agricultural economics.

A priority-setting exercise based on the analysis of the challenges facing agricultural development in the country, experience, and available information has taken place recently and has identified 17 major research projects.

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<sup>1</sup> pRYs = Number of researchers on duty × 90% (percentage of the graduate staff's time devoted to AR, mentioned above).

ARC has few collaborative research projects with other NARS institutions. A number of ARC junior research staff members prepare their MS degrees at the FAs, under joint supervision of ARC senior staff and university professors. Their research topics originate from ARC research plan and priorities.

Linkages with other NARSs are very limited (IRESA and INRAT of Tunisia, ARC of Egypt), but those with regional and international institutions are satisfactory (ACSAD, AOAD, FAO, ICARDA, IFAD).

### **The Animal Studies and Research Center (ASRC)**

Mandate - ASRC (headquarters in Tripoli) carries out research on camels, cattle, poultry, sheep and goats, and veterinary medicine, as well as on farming systems, animal nutrition, rangelands, socioeconomics, and wildlife. Sixty percent of the Center's mission is on applied research, 20% on teaching and training, and 20% on consultancies.

Resources - ASRC has 30 research scientists, 41 technicians and 42 other support staff. Out of the 30 scientists, 22 (5 PhD, 8 MSc, 9 BSc) are on duty and represent 13 pRYs and 8 researchers are on study leaves (4 preparing MS in Libya and 4 preparing MS abroad). Four other scientists (all PhD holders) are on secondment.

ASRC has three research stations (2 for camels, 1 for livestock). Its financial resources are estimated at US\$ 1.2 million, 90% of which are government-funded and 10% self-generated funds. Sixty percent of these resources are allocated to salaries and wages, 10% to training, and 30% to OCC. The OCC (US\$ 0.36 million) represents around US\$ 15,000 per scientist on duty.

Research Activities - Researchers are distributed as follow: 2 for camels, 6 for cattle, 6 for poultry, 9 for sheep and goats, 4 for animal nutrition, 4 for rangeland management, and 2 for wildlife. Due to a considerable shortage of researchers, laboratories and equipment, a great deal of the planned research work cannot be carried out.

### **The Marine Biology Research Center (MBRC)**

Mandate - MBRC is located at Tajura, 20 km east of Tripoli. It conducts mainly applied research which focuses on freshwater and marine fishers, aquaculture fish processing and utilization, pollution, and marine environment protection. Eighty percent of the time of the researchers on duty is devoted to research and 20% to community services (mainly directed to helping small fishers).

Resources - MBRC has 8 research scientists on duty, who represent around 6 pRYs, 8 researchers on study leave and 6 researchers on secondment. It also has 19 technical diploma holders and 60 other support staff.

MBRC has three research stations, two located at Tajura (for aquaculture and for marine fish research) and one at Benghazi (marine fish research). Its financial resources, all funded by the Government, amount to US\$ 0.8 million (rough estimate), of which 40% go to salaries and wages, 15% to training costs, and 45% to OCC (US\$ 0.36 million, which means US\$ 45,000 per researcher on duty).

Research Activities - Research programs in aquaculture/freshwater fish and marine fish were identified based on priorities and challenges facing resource development and improvement. MBRC has extended relations with the Universities of Tripoli and Al-Beida through education activities. It has almost no collaborative research projects with other NARS institutions, and linkages with international institutions are confined only to IFAD and FAO through "trust fund projects."

## **2.3 The Faculties of Agricultural Sciences (FASs)**

Overview - The seven FASs include five faculties of agriculture (FAs, at the Universities of Tripoli, Al-Beida, Sebha, Sirte, Zentan) and two faculties of veterinary medicine (FVMs, at the Universities of Tripoli and Al-Beida). They all provide undergraduate education, and only the FAs of Tripoli and Al-Beida offer postgraduate education (MS). Teaching is their main mandate; research, extension, and consultancy activities are generally limited. According to the survey, academic staff members allocate 60% of their time to teaching and training, 20% to research, and 20% to development (extension, consultancies, community services).

The FAs are involved in sciences related to soils, water, plant and animal production, fisheries, agricultural economics, and food science; the FVMs are specialized in animal health sciences<sup>1</sup>.

Resources - The seven FASs have 364 permanent academic staff members, including 223 nationals (167 PhD and 56 MS) and 141 expatriates, and around 40 BS holders considered as technical staff. The total graduate staff represents

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<sup>1</sup> The FA of Tripoli has 11 departments (soil and water, crop production, horticulture, range and forestry, agricultural engineering, food science, agricultural economics, home economics, plant protection, fisheries, and animal production). The FA of Al-Beida has 9 departments (animal production, agricultural economics, food sciences, soil and water, plant protection, horticulture, crops, natural resources, and agricultural extension). The FVM of Tripoli has 10 departments in different veterinary sciences.

around 101 pRYs<sup>1</sup>. The old FAs (Tripoli and Al-Beida) and the FVM of Tripoli have a large body of permanent academic staff, while the new FAs in Sirte, Sebha, and Zentan are endowed with very few permanent staff members.

Almost 78% of this staff is concentrated in Tripoli and El-Beida. Technicians and support staff (laborers, clerks) are very few and involved mainly in assisting in teaching activities, particularly in labs and farms. Physical facilities (buildings, labs, equipment, computer facilities, libraries, farmland, machinery, vehicles, etc.) are generally inadequate in quantity and quality, particularly in the last 10 years (poor maintenance, no replacement).

The financial resources of the FASs are important (total estimated at US\$ 11.6 million) and are all government-funded. They are allocated mainly to salaries (around 75%); OCC amounts to about US\$ 2.9 million, i.e., less than US\$ 8,000 per academic staff member for all the training, research and development activities, which is very insufficient.

Collaboration between the FAs and FVMs of the different universities is fair and generally developing on an individual basis. Linkages with the national agricultural research and extension services seem moderate and informal. External (regional and international) relations are rather poor.

Research Activities - Generally, AR in the faculties suffers from a number of obstacles, mainly:

- Lack of research policy; lack of AR resources (few support staff<sup>2</sup>, very low OCC available for research);
- Due to low salaries, staff members tend to prefer consultancies and extension services to increase their income;
- Heavy teaching load for the staff members due to the high student-to-teacher ratio (25:1).

AR at the faculties is currently carried out mainly by young staff members and graduate students, with very limited direct involvement of the senior academic staff. AR activities/projects are conducted on an individual basis and not decided with reference to the national AR policy and the National Development Plan of the country.

Accordingly, the academic staff members may actually allocate only around an average of 10% of their time to AR, which means that they represent around 40 actual RYs. Financial resources allocated to AR (including salaries) may represent also roughly 10% of the total resources.

## **2.4 The Other Institutions of the NARS**<sup>3</sup>

### **The Nuclear Research Center (NRC)**

NRC, now affiliated with the Secretariat of Training and Habilitation (STH), has in its Directorate of Applied Research an "Agriculture Section" devoted to AR activities. This Section has 17 national researchers (3 PhD, 5 MS, 9 BS) and 5 technicians working mainly in the control of spoilage and deterioration of stored fruits, and use of isotopes in producing and selecting mutant barley varieties with high yield. Current physical and financial resources are much lower than some years ago.

### **The Libyan Center for Remote Sensing and Space Sciences (LCRSSS)**

AR-related activities utilize around 30% of the resources of the Center<sup>4</sup>. They are implemented within the Department of Remote Sensing, based in Tripoli, by 15 national researchers (1 PhD, 4 MS, 10 BS), who allocate around 50% of their time to research (8 pRYs) in geo-botanical mapping (3 researchers), water harvesting and water erosion studies (4 res.), land-use planning (3 res.), desertification monitoring (2 res.), and rangeland mapping (3 res.).

This Department enjoys rather good physical facilities (fully equipped with computers and software, and the necessary facilities) and financial resources. Financial resources allocated to AR roughly amounted to US\$ 0.6 million in 1998.

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<sup>1</sup> Taking into account the normative rate of 25% of the academic staff members' time allocated to AR activities adopted for the analysis of all the WANA NARS (see methodology of the study).

<sup>2</sup> 0.32 technician per academic staff member.

<sup>3</sup> The Environmental Protection Research Center (EPRC, established in 1985), now affiliated with the Secretariat of Municipalities (SM), and the Solar Energy Research Center (SERC, 1989), under the Secretariat of Training and Habilitation (STH), are partly involved in AR activities, but precise information on these activities and the corresponding resources is not available.

<sup>4</sup> LCRSSS, created in 1989 and now affiliated to STH, has two other departments specialized in seismography (at Gherian) and astronomy (at Benghazi). It has 90 full-time employees (38 of whom are researchers and 33 are technicians). Its researchers allocate around 50% of their time to research and 50% to consultancies and training. Its budget, funded totally by the Government, amounted to US\$ 2 million in 1997; 50% allocated to salaries and 50% to OCC.

### **The Economic Studies Research Center (ESRC)**

ESRC, based at Benghazi, is affiliated with the National Authority for Scientific Research. Among its 17 graduate staff members involved in research and studies on economic policies, 7 scientists are specialized in agricultural economics and work in cooperation with the Faculty of Economics of Gar Yunis University of El-Beida.

## **3. AR RESOURCES**

### **3.1 Human Resources** (see [Table 1](#))

The NARS employs around 620 scientists (including 141 foreigners), 29% of whom are employed at the AR institutes, 65% at the FASs, and 6% at the other scientific institutions. This scientific potential is highly concentrated around Tripoli (80%). It currently represents around 264 pRYs, without taking into account the scientists on study leave and on secondment, who are numerous at the AR institutes.

These scientists have a rather sound academic background especially at the FASs, which benefit from a higher proportion of PhD holders than at the AR institutes. However, strong efforts are being undertaken at these institutes to improve the qualification of their researchers.

ARC is the only NARS institution which employs a relatively good number of technicians (1.9 per researcher). ASRC and MRBRC are less endowed (1.3 and 0.9 technician per researcher, respectively). The FASs are facing a severe deficit. A similar situation is observed in terms of the other support staff (laborers/ clerks).

All wages and salaries in the Government follow one scale, with no private-sector equivalent in the country. The other incentives come mainly from extra academic teaching loads and supervision of graduate students (at the universities). Incentives at the other AR institutions come mainly from research allowances.

### **3.2 Physical Resources**

Land resources (research stations and farms) of the institutions cover most of the agroecological zones (northwestern, central, eastern and southern zones) and are certainly adequate (2,000 ha). The other physical resources (offices, farm buildings, labs, computers, transport, communication equipment) are insufficient and poorly maintained. The libraries of ARC, MBRC, and the FASs are satisfactory, although they lack up-to-date documents and some communication facilities (e-mail and Internet).

### **3.3 Financial Resources** (see [Table 1](#))

The total budget for AR was estimated at US\$ 13.1 in 1997, all coming from national sources, mainly from the state budget. Such resources represent around 0.67% of the AGDP (US\$ 2 billion in 1996/97), which is rather low for a country which is one of the richest in the WANA region and where food imports amount to around 50% of the AGDP.

Areas of expenditure vary considerably between the institutions. As seen above, OCC for AR per scientist are good at MBRC and LCRSSS, but are insufficient in most of the other NARS institutions. The corresponding OCC per pRY<sup>1</sup> (around US\$ 21,000 at ARC, 17,000 at ASRC, and certainly less than 3,000 at the FASs) is well under the "optimal" amount of US\$ 25,000–30,000 per RY used in the long-term plans drawn up by many countries in similar agroecological conditions. According to this last reference, the ratio of actual employment in AR of the scientists should amount to around 75% at ARC, 60% at ASRC, and 10% at the FASs. Therefore, the NARS has around 160 actual RYs (aRYs) (84 at ARC, 8 at ASRC, 6 at MBRC, 40 at the FASs, and 22 at the other institutions) instead of the 264 pRYs estimated above.

Regarding the allocation of these resources, it is worth mentioning the high percentage allocated to training activities at the AR institutes.

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<sup>1</sup> As the numbers of pRYs are lower than the numbers of graduate staff members (and part of the OCC is allocated to other activities than research), OCC per pRY is higher than OCC per staff member.

## 4. RESEARCH ACTIVITIES

### 4.1 Research Orientation and National Linkages

The research agendas for ARC, MBRC and ASRC are, to a large extent, oriented according to the development plan of the country, and also according to medium-term research plans set by these institutions. AR at the FASs is largely developed on an individual basis.

Cooperation between the AR institutions themselves and between the AR institutes and universities is informal, unsatisfactory, and does not follow a clear pattern. However, there is some sort of cooperation between research institutes and universities, mainly through MS training of young researchers of the AR institutes.

To a large extent, AR in Libya plays a considerable role in adapting technologies to meet the needs of agricultural development. The research work plans are designed mainly to overcome challenges and bottlenecks facing the agricultural sector in the country.

### 4.2 International Relations

Most of the NARS institutions have very poor relations with international scientific institutes and funding organizations. ARC is an exception, with its moderate linkages with ICARDA, CIMMYT, ACSAD, CIHEAM, FAO, IFAD, AOAD, and UNDP, which supply ARC with some needed external knowledge and resources (such as germplasm), and provide appreciable collaboration in research and backstopping.

## 5. CONCLUSION

The AR institutes have attempted to set up research programs and undertake recruitment and training efforts in accordance with the country's agricultural potential and development plans. However, their strategy is hampered by:

- The limited collaboration with the FASs and other scientific institutes; active complementarity should be ensured for a better use of the national resources.
- The insufficient and unsustainable financial resources, particularly for operation and capital costs, which are not adequate to provide the needed spare parts, maintenance, new equipment and instruments.
- The lack of technicians and support staff.
- The restricted bilateral and international cooperation at present with other NARSs and organizations, indispensable for strengthening the national scientific capacity.

### Main Acronyms

**SA:** Secretariat (Sec.) of Agriculture. **SAAW:** Sec. of Agriculture and Animal Wealth. **SAW:** Sec. of Animal Wealth. **SESR:** Sec. of Education and Scientific Research. **SMW:** Sec. of Marine Wealth. **SM:** Sec. of Municipality. **STH:** Sec. of Training and Habilitation. **NASR:** National Authority for Scientific Research.

**ARC:** Agricultural Research Center. **ASRC:** Animal Studies and Research Center. **MBRC:** Marine Biology Research Center. **ESRC:** Economic Studies Research Center. **LCRSSS:** Libyan Center for Remote Sensing and Space Science. **NRC:** Nuclear Research Center.

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**Table 1 - The National Agricultural Research System (1998)**

*Italics:* Approximate data. °: Rounded numbers. ...: Data not available. \*: See footnotes.

NARS Institutions				Scientific & Technical Graduate Staff (Units)				Potential Research Years *			Total Budget*	AR Expend./Res.*	
No.	Name - Acronym Head Office - Year Established	Mandates AR Fields	Gover. Minist.	Nationals Total - (PhD, MS)		Exp.	Total	Nat.	Ext	Total	(US\$ million)	(US\$ million)	
a	b	c	d	e	f	g	h	i	j	k	l	m	
1.1	Agricultural Research Center, Tripoli	ARC - 1971	AR (90%) - (AD) - All	SA	133*	10, 34	0	133	112		112	8.3	7.9
2.1	Animal Studies and Research Center, Tripoli	ASRC - 1996	AR (60%) - AD - Livestock	SAW	30*	5, 8	0	30	13		13	1.2	1°
2.2	Marine Biology Research Center, Tripoli	MBRC - 1969	AR (80%) - (AD) - Fisheries	SMW	16*	2, 4	0	16	6		6	0.8	0.7
<b>1/2</b>	<b>Total AR Institutes</b>				<b>179</b>	<b>17, 46</b>	<b>0</b>	<b>179</b>	<b>131</b>		<b>131</b>	<b>10.3</b>	<b>9.6</b>
3.1	Fac. of Ag., Un. El-Fateh, Tripoli	1966	AHE - (AR) - All*	SESR	...	134	12	...	66	35	101	11.6	1.2
3.2	Fac. of Ag., Un. Omar El Muhktar, El Beida	1975	AHE - (AR) - All*		...	52	34	...					
3.3	Fac. of Ag., Un. Atahadi, Sirte	1992	AHE - (AR) - All*		...	2	5	...					
3.4	Fac. of Ag., Un. Sebha, Sebha	1978	AHE - (AR) - All*		...	8	14	...					
3.5	Fac. of Vet. Medicine, Un. El-Fateh, Tripoli	1975	AHE - (AR) - Anim. health		...	21	30	...					
3.6	Fac. of Vet. Med., Un. Omar El Muh., El Beida	1988	AHE - (AR) - Anim. health		...	2	26	...					
3.7	Fac. of Vet. Med. & Rainfed Ag., Un.* , Zentan	1997	AHE - (AR) - All		...	4	20	...					
<b>3</b>	<b>Total Agricultural Sciences Faculties</b>				<b>263*</b>	<b>167, 56</b>	<b>141</b>	<b>404</b>	<b>66</b>	<b>35</b>	<b>101</b>	<b>11.6</b>	<b>1.2</b>
4.1	Ag. Section, Nuclear Research Center, Tajoura*	NCR - 1976	AR (100%)	STH	17	3, 5		17	17		17	1.2	1.2
4.2	Depart. for Remote Sensing, LCRSS, Benghazi*	LCRSS - 1990	AR (50%)	STH	15	1, 4		15	8		8	0.6	0.6
4.3	Ag. Section, Econ. Studies Res. Center, Tripoli*	ESRC - 1985	AR (100%)	SESR	7	1, 2		7	7		7	0.5	0.5
<b>4</b>	<b>Total Other Scientific Institutions</b>				<b>39</b>	<b>5, 11</b>	<b>0</b>	<b>39</b>	<b>32</b>		<b>32</b>	<b>2.3</b>	<b>2.3</b>
<b>5</b>	<b>Total NARS (approximate)</b>				<b>481</b>	<b>189, 113</b>	<b>141</b>	<b>622</b>	<b>229</b>	<b>35</b>	<b>264</b>	<b>24.2</b>	<b>13.1</b>
<b>Exchange Rate:</b> 1 Libyan dinar = US\$ 2.77 (1998 average official rate)				<b>Actual Research Years (aRYs)</b> (Estimate) →				<b>160</b>					

**SA:** Secretariat of Agriculture. **SAW:** Sec. of Animal Wealth. **SMW:** Sec. of Marine Wealth. **SESR:** Sec. of Education and Scientific Research. **SM:** Sec. of Municipalities. **STH:** Sec. of Training and Habilitation. **NASR:** National Authority for Scientific Research.

**c: Mandates: AR** (.. %): Approximate average % of human resources devoted to ag. research (AR); **R:** Research; **AHE:** Ag. higher education; **AD:** Ag. development/services (for AR and AHE institutes: seed production, soil and water analysis, extension, studies, etc.). **i, j, k** Potential research year (pRY) = equivalent full-time researcher; for the FASs, the pRYs have been estimated by multiplying the number of academic staff by 0.25. For the AR institutes, AR financial resources were roughly estimated through the following formula: Total budget × [(ω + 0.5(100% - ω))], where ω is the % of time devoted to AR by the graduate staff.

\* **Notes: l, m:** All financial resources are national. **1.1:** ARC: including 9 graduate staff members on study leave (5 MS and 4 BS). **2.1:** ASRC: including 8 graduate staff members on study leave (4 MS and 4 BS). **2.2:** MBRC: including 8 researchers on study leave. **3/e:** The FASs employ 263 national academic staff members, including 223 PhD and MS holders and around 40 BS holders who are considered as technicians. **4.1 to 4.3:** Only the graduate staff and financial resources allocated to AR are mentioned.

National/total AR expenditures (NE/TE): **0.67%** of the Agricultural Gross Domestic Product (AGDP: US\$ 2 billion in 1996/97).