

**8. MONOGRAPHS OF THE NATIONAL AGRICULTURAL RESEARCH
SYSTEMS OF THE ARABIAN PENINSULA**

BAHRAIN

UNITED ARAB EMIRATES

YEMEN

THE NATIONAL AGRICULTURAL RESEARCH SYSTEM OF BAHRAIN¹

1. HISTORICAL BACKGROUND

Agricultural research (AR) in Bahrain started in the mid-1930s under the British Protectorate. The location of the activities was along the northwest coast of the main island, in Budaiya, where the current Experimental Station is situated. During the 1960s, these activities developed into the Department of Municipality and Agriculture, which became the Ministry of Municipality and Agriculture in 1971, at the time of independence. After reorganizing the ministries in 1975, agriculture was joined to the Ministry of Commerce and Agriculture (MCA) and was overseen by the Directorate of Agriculture, later (1985) transformed into the Agricultural Affairs, consisting of several directorates and a section for research. In 1991, the Research Section was upgraded into the Agricultural Research Directorate (ARD), affiliated to MCA, then, in 1995, to the Ministry of Works and Agriculture (MWA).

The Fisheries Directorate was founded in 1979 by MCA for assessing and reviewing specific aspects of Bahraini fisheries.

Most of the other institutions which currently conduct AR activities as a minor part of their mandate have been created during the 1980s: (i) Al-Areen Wildlife Park (AWP), created during 1976–1979, now affiliated to the Ministry of Cabinet Affairs and Information; (ii) the Environmental Affairs (1981), now under the Ministry of Housing, Municipalities and Environment; (iii) the Bahrain Center for Studies and Research (BCSR, 1981), for coordinating scientific efforts at the national level and for conducting or supporting research in some domains (mainly in economics); (iv) the College of Applied Sciences of the Arabian Gulf University (1986), through its Program for Desert and Arid Zones Sciences; and (v) the Department of Biology (1986) of the College of Science of the University of Bahrain, under the Ministry of Education.

2. THE CURRENT NARS

2.1 Overview (see Table 1)

The current NARS is made up of two sets of institutions:

- The institutions mainly involved in AR: the Agricultural Research Directorate and the Fisheries Directorate, both affiliated to MWA; together they account for about 66% 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 other institutions that currently conduct AR activities as a minor part of their mandate (listed above): they mobilize the remaining resources of the NARS and are presented in Section 2.3.

There is no body responsible for the national AR policy. However, the Bahrain Center for Studies and Research (BCSR) is mandated with coordinating scientific efforts at the national level.

2.2 The Agricultural Research Institutions

The Agricultural Research Directorate (ARD)

ARD, a directorate within MWA, is by far the largest and most active AR institution in the NARS (34% of the pRYs and 47% of the total financial resources). Its main mandate (which mobilizes around 75% of the time of its graduate staff) is on applied research in plant production, date palm and ornamentals, soil and water, animal and fodder, and economics/statistics. Other activities cover technology transfer (expertise and support for extension) and services (production of seeds and seedlings; soil, water, food and feed analysis).

ARD employs 15 graduate staff members, of whom 7 are nationals (3 MS, 4 BS) and 8 expatriates, who represent around 11 pRYs². It also has 25 permanent national technicians and 85 other support staff (clerks, laborers, etc.).

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² pRYs = Number of graduate staff members x 75% (average percentage of their time allocated to AR).

ARD physical facilities consist mainly of

- Laboratories at Budaiya that are equipped with most of the required equipment and chemicals, including the soil and water laboratory which carries out a range of analyses on both soil and plant material, and the laboratory and growing facilities devoted to micro-propagation.
- Two experiment stations: one at Budaiya (20 ha), including plastic tunnels and a nursery to produce healthy seedlings for open field and protected vegetables, and fruit and ornamental trees; and one at Hamala (45 ha) for livestock (emphasis on testing/crossing breeds of sheep, goats and cattle suitable for the Bahraini climate and needs), endowed with a fully mechanized fodder production unit with modern agricultural machines.

The current ARD financial resources (1996) amount to about Bahraini dinars (BD) 630,000 (US\$ 1.67 million), coming from allocations from the national budget; 77% cover staff costs, the remaining to operating and capital costs (OCC), which means an average of US\$ 25,600 per graduate staff member.

Research efforts focus mainly on open field and protected vegetables, new cash crops, and fish production. Date palm and permanent fruit crops are insufficiently covered. Forage crops, livestock, and rural socioeconomics require more effort and support.

ARD has good relations with other national institutions (BCSR; DB/CS). International linkages are rather well developed, especially with ICARDA (cereals, legumes and more recently through the Arabian Peninsula Program protected agriculture and natural resource management), Japan (animal husbandry), and AOAD.

The Fisheries Directorate (FD)

FD is responsible for the assessment and management of the marine resources in Bahrain. Its objectives are to develop the sector, protect fish and marine resources, and introduce commercial mariculture to Bahrain. The Directorate also conducts surveys and produces statistical reports which reflect the status of the Bahraini fisheries. As such, it is involved in a diverse range of activities. Research mobilizes around 70% of the time of its graduate staff.

It has 15 scientists, of whom are 12 nationals (2 PhD, 3 MS, 7BS) and 3 expatriates, who represent 10 pRYs. Its financial resources (1996) amount to about BD 370,000 (US\$ 0.98 million) coming from the national budget; 83% go to staff costs and 17% to OCC (US\$ 11,100 per graduate staff member).

Research activities cover mariculture as well as marine environmental issues. They involve collaboration with Japan which provides some expatriates and training for nationals.

2.3 The Other NARS Institutions

The Other NARS Scientific Institutions

The Biology Department, College of Science (Bahrain University) - This unit, which is one of the major departments of the College of Science, offers BS courses (lasting 4 years) and other degree courses to a relatively small number of students. It is engaged in education and research in different fields related with plant, animal, and marine biological, microbial, genetic and environmental sciences. It has 9 academic staff members (2 professors, 3 associate professors, 4 assistant professors), of whom 6 are national. They account for around 3 pRYs.

The Program for Desert and Arid Zones Sciences (DAZ), College of Applied Sciences (Arabian Gulf University) - This unit is mainly involved in postgraduate studies leading to a Diploma/MS¹. Research projects prepared by the students cover areas of utmost interest to the region: desert resources, desert agriculture, resource management and its impacts on desert environment and groundwater resources in the Gulf region, pollution of the Arabian Gulf environment, desert architecture and energy. DAZ stresses the use of modern technologies, including geographic information systems, remote sensing and networking, as important tools for assessment, monitoring and planning of development and conservation of desert resources. DAZ has 8 highly qualified academic staff: 4 nationals and 4 expatriates, 2 of them concerned with AR (2 pRYs).

¹ 40 students have been awarded MS degrees during the last decade, including a large number of students coming from different Gulf and other Arab countries.

The Bahrain Center for Studies and Research (BCSR)¹ - Within its Economic and Social Research Department, 2 scientists (1 national and 1 expatriate) are directly engaged in AR (in rural socioeconomics). It is worth mentioning that BCSR has recently set up (i) geographic information and computer systems departments to provide the latest know-how services with respect to geographic information systems to various government institutions and the private sector, and (ii) a very good documentation service (subscribing to AGRIS).

The Other NARS "Technical" Institutions

The Environmental Affairs (EA) - This planning and regulating agency has two major directorates partially engaged in agricultural development and research. The Environmental Control Directorate (5 national scientists, of whom 2 have PhD degrees) has activities on pollution control, chemical analysis and waste management. The Environmental Assessment and Planning Directorate (7 nationals, of whom 2 have PhD degrees) is involved in the assessment of development projects and their impact, monitoring of the environment, and information management. The 12 graduate staff members represent around 3 pRYs.

Al-Areen Wildlife Park (AWP) - AWP is responsible for conservation of the flora and wildlife of Bahrain. It has 7 graduate staff members (6 nationals), partly involved in research activities (equivalent to 2 pRYs) conducted in the park (8 km²) and in other regions.

3. AR RESOURCES (see Table 1)

3.1 Human Resources

The Bahraini NARS currently (1997) involves around 52 graduate staff members (34 nationals and 18 expatriates coming mainly from developing countries), who represent around 32 pRYs (20 of which are provided by nationals).

The academic level of the present national research staff is low, especially at ARD. Despite recent improvements in their status, the national scientists at the AR institutes (ARD, FD) are considered government officials, and their salaries are well below those of university professors and senior staff in large state companies, which explains the difficulties the AR institutes have in attracting, motivating, keeping and training researchers.

As far as support personnel are concerned, the AR institutes appear to pay little attention to technicians, who tend to be insufficiently qualified and too few (almost one per researcher), whereas the number of unskilled permanent workers appears to be reasonable (close to 4 per researcher).

3.2 Physical and Financial Resources

Due to the declining state revenues, all government expenditures had to be curtailed and AR was significantly affected. This meant a halt in recruitment, a cutback in equipment, physical and operational expenditures, etc. The remaining resources have to be concentrated on high-priority issues.

Physical resources at the AR institutes are still acceptable in most of the NARS institutions, except at FD where they are modest. Buildings have been relatively improved since 1996, but at the AR institutes most of the scientific and other equipment (including vehicles, photocopiers, documentation services, etc.) need to be renovated or reinforced.

In 1996, the total NARS financial resources amounted to around BD 1.2 million (US\$ 3.2 million), coming from allocations from the national budget, without any external contributions (grants or loans). These resources represent about 6.4% of the Agricultural Gross Domestic Product (AGDP, estimated at around US\$ 50 million in 1996). Such a high ratio, the highest in the WANA region, is inherent to the small size of the national agricultural sector; it amounts to around 0.9% of the total value of the AGDP and food imports.

¹ BCSR is a semiautonomous organization overseen by a Board of Trustees chaired by the Crown Prince. It has 19 graduate staff members, all PhD holders (18 national, 1 expatriate) who conduct research in two departments: the Scientific Research Department and the Economic and Social Research Department. It supports research implemented by other national scientific institutions, mainly in economics (it has supported agricultural and fisheries research topics during the last decade). It provides finance, literature, liaison and guidance, and organizes various economic and scientific conferences and symposia.

OCC per pRY is still relatively sufficient at ARD (around US\$ 30,000), but insufficient at FD (US\$ 13,500)¹ compared with the "optimal" amount of US\$ 25,000–30,000 per RY used in the long-term plans designed by many developing countries. According to this last reference and supposing that the OCCs per RY in the other NARSs are in an intermediate position between ARD and FD, the Bahraini NARS would have roughly around 24 actual RYs, instead of the 32 pRYs estimated above.

4. RESEARCH ACTIVITIES

4.1 Research Activities and Relations with Development

Research efforts on protected crops/vegetables, date palm, animal production, and fisheries do not match the current and prospective importance of these commodities in the AGDP. In the future, these research programs should be better balanced, and research on natural resources and rural socioeconomics should be reinforced.

The NARS profits from various scientific results, borrowing broadly from innovations made in other countries of the region. In general, relations with development have been effective with respect to the major vegetables. For other commodities, links between research and extension have been much less effective, and the financial limitations of the NARS institutions make it difficult to transfer technological improvements to farmers. However, demonstration trials (research liaison services) on farmers' fields, set up and developed since 1990, have been useful for the extension tasks as well as for providing feedback on the needs of AR users.

4.2 International Linkages

While international cooperation was previously very limited, it has now considerably extended towards other sources of bilateral assistance (USA, Japan, Taiwan), international AR centers (mainly ICARDA and ICRISAT) and agencies (AOAD, FAO).

5. CONCLUSION

The Bahraini NARS is still modest and inherently expensive due to the small size of the agriculture sector. Although considerable progress has been made recently with regard to its structure and general administration, there is still a great deal to be done with regard to human, material and financial resources and the imbalances between them as well as training and preparation of the medium- and long-term National Research Strategy Plan.

Its consolidation should be tenaciously pursued particularly with a view to: (i) improving the qualifications and salaries of the AR institutes' senior staff and technicians, bringing its research programs into better balance; and (ii) renovating infrastructures and equipment and promoting international relations, especially with neighboring countries.

Main Acronyms

MWA: Ministry of Works and Agriculture. **MCAI:** Ministry of Cabinet Affairs and Information. **MHME:** Ministry of Housing, Municipalities and Environment.

ARD: Agricultural Research Directorate. **AWP:** Al-Areen Wildlife Park. **BCSR:** Bahrain Center for Studies and Research. **DAZ:** Program for Desert and Arid Zones Sciences. **DB/CS:** Department of Biology, College of Science (Bahrain University). **EA:** Environmental Affairs. **FD:** Fisheries Directorate.

Main References

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¹ Estimates taking into account that: (i) the numbers of pRYs are lower than the numbers of graduate staff members, and (ii) part of the OCC is allocated to other activities that are generally less expensive than research (see [Table 1](#), note m).

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Table 1 - The National Agricultural Research System (1996/97)

Italics: Approximate data. ...: Data not available. *: See footnotes.

NARS Institutions				Graduate Scientific & Tech. Staff (Units)			Potential Research Years*			Total Budget* (1000 BD)	AR Expend./ Resources (E)* (1000 BD)		
No.	Name – Acronym Head Office - Year Established	Mandates AR Fields	Govern. Minist.	Nationals Total - (PhD , MS)	Exp.	Total	Nat.	Exp.	Total				
a	B	c	d	e	f	g	h	i	j	k	l	m	
1.1	Ag. Research Directorate Budaiya	ARD 1935, 91	AR (75%) - (AD) Crops, animal/forage...	MWA	7	0, 3	8	15	5	6	11	630	570
2.1	Fisheries Directorate Manama	FD 1979	AR (70%) - (AD) Fisheries	MWA	12	2, 3	3	15	8	2	10	370	310
1/2	Total AR Institutions				19	2, 7	11	30	13	8	21	1000	880
4.1	Department of Biology, College of Sciences Bahrain University, ...	DB/CS 1986	HE - R - (AR) Plant/anim./marine bio.	ME	6	2, 4	3	9	2	1°	3	...	180
4.2	Prog. Desert & Arid Zones Sc., College of Applied Sc.* Arab Gulf University (AGU)	DAZ/CAS 1986	HE - R - (AR) Desert res./agriculture	AGU*			2	2		1	1	...	
4.3	Bah. Center for Studies and Research* Awali	BCSR 1981	R - (AR) Rural socioeconomics	*	1	1, 0	1	2	1	1	2	...	
4	Total Other Scientific Institutions				7	3, 4	6	13	3	3	6	...	180
5.1	Environmental Affairs* Manama	EA 1981	AD - (AR) Environment	MHME	12	4, ...		12	3		3	...	150
5.2	Al-Areen Wildlife Park* Al-Zalag	AWP 1976-79	AD - AR Wildlife	MCAI	6	..., ...	1	7	2		2	...	
5	Total Other Technical/Admin. Institutions				18	..., ...	1	19	5		5	...	150
6	Total NARS				34	..., ...	18	52	21	11	32	...	1210
Exchange Rate: 1 Bahraini dirham (BD) = US\$ 2.65, US\$ 1 = 0.378 BD (1996 average rate)				Actual Research Years (aRY) (Estimate) →			24			AR Expendit. (million US\$) →		3.2	

MWA: Ministry of Works and Agriculture. **ME:** Min. of Education. **MHME:** Min. of Housing, Municipalities and Environment. **MCAI:** Min. of Cabinet Affairs and Information.

c: Mandates: **AR** (... %): Approximate average % of resources devoted to ag. research (AR); **R:** Research; **HE:** Higher education; **AD:** Ag. development/services (seed production, soil analysis, studies, etc.).

g: Expatriates come mainly from developing countries and are funded by the national institutions. **i, j, k** Potential research years (pRYs): equivalent full-time researcher. **l, m:** All financial resources are national; **m:** For the AR institutes, AR financial resources have been roughly estimated through the following formula: Total budget × [ω + 0.5(100% - ω)], ω being the % of time devoted to AR by the graduate staff.

***4.2, 4.3, 5.1, 5.2:** Data on human and financial resources are related only to AR resources. **4.2:** DAZ has a total of 8 academic staff members (4 nationals, 4 expatriates); AGU is in six other Arab countries. **4.3:** BCSR (19 PhD senior staff, of whom 18 nationals, 1 expatriate) is a semiautonomous organization responsible for coordinating the national scientific policy, overseen by a Board of Trustees chaired by the Crown Prince. **5.1:** EA has 2 directorates partially engaged in agricultural development and research: the Environmental Control Directorate (5 nationals, of whom 2 are PhD holders) and the Environmental Assessment and Planning Directorate (5 nationals, of whom 2 are PhD holders).

National/Total AR expenditures (NE/TE): **6.4%** of the Agricultural Gross Domestic Product (AGDP: around US\$ 50 million in 1996).