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SUMMARY

After a brief record of some basic data on the economy and agriculture of the West Asia and North Africa countries, which stresses on the strategic potential role of agricultural research for solving the difficult food challenges facing these countries at present and in the long term, the publication presents the methodology followed in the study. It then presents the monographs of the national agricultural research systems of the 18 participating countries: Algeria, Libya, Morocco, and Tunisia in North Africa; Egypt, Eritrea, Ethiopia, and Sudan in the Nile Valley and Red Sea sub-region; Cyprus, Iraq, Jordan, Lebanon, and Syria in West Asia; Iran and Turkey in the Highlands; and Bahrain, the United Arab Emirates, and Yemen in the Arabian Peninsula.

These monographs, prepared in 1998/99 by small, highly qualified national teams according to precise guidelines, have provided the background for a global and cross-country analysis, which demonstrated the large diversity of the national agricultural research systems, their structure, human and financial resources, research activities, and relations with development.

EXECUTIVE SUMMARY

After a brief introduction to the study (Chapter 1), the publication presents a record of some basic data on the economy and agriculture of the West Asia and North Africa (WANA) countries, which stresses on the strategic potential role of agricultural research (AR) for solving the difficult food challenges facing these countries at present and in the long term (Chapter 2). The following chapters include the methodology used in preparing the monographs (Chapter 3) and then the monographs of the national AR systems (NARSs) of the 18 participating countries (Algeria, Libya, Morocco, and Tunisia in North Africa; Egypt, Eritrea, Ethiopia, and Sudan in the Nile Valley and Red Sea sub-region; Cyprus, Iraq, Jordan, Lebanon, and Syria in West Asia; Iran and Turkey in the Highlands; and Bahrain, the United Arab Emirates, and Yemen in the Arabian Peninsula) (Chapters 4 to 8).

These monographs, prepared in 1998/99 by small, highly qualified national teams according to precise guidelines, have provided the background for a comparative analysis of the NARSs, which covers their structure, human and financial resources, research activities, and relations with development (Chapter 9).

Structure of the NARSs

The analysis of the NARS structure showed the following:

- The major role of the AR institutes (ARIs), which mobilize around 62% of the total potential research years (pRYs or equivalent full-time researchers) and 78% of the total financial resources; the relative importance of the scientific potential of the faculties of agriculture and veterinary sciences (FASs) (23% of the total pRYs) and their limited financial capacity (7% of the total financial resources); and the weak contribution of the other institutions ("general" research institutes, faculties of biology, agricultural development/service organizations, etc.).
- The rather high degree of concentration of the NARSs; the two largest institutions of each country gather 60% of the pRYs and 72% of the financial resources of all the NARS (the latter percentage ranges from more than 88% in Cyprus, Ethiopia, and Lebanon to only 15% in Algeria).
- The moderate degree of national integration of the NARSs, which refers to the lack in many countries of a political and administrative authority able to coordinate the NARS institutions and to define/implement a national AR policy adapted to the social demands/needs and to the national and external resources available.
- The uneven territorial coverage by the NARS in a country of the country's large agroecological/administrative zones; this coverage is satisfactory in Eritrea, Ethiopia, Iraq, Syria, and Turkey; rather convenient in Iran, Libya, and Morocco; and highly unbalanced in Algeria, Egypt, Sudan, Tunisia, and Yemen, where large proportions of scientists and physical resources are concentrated in and around the capital and in the most favored agricultural zones.

This structural analysis leads to a tentative typology of the NARSs according to their size and structure (see Chapter 9, Table 3), which shows the large diversity of the NARSs in the WANA region, each country having a specific structural profile with only few similarities among the different countries.

Human and Financial Resources

Human Resources

More than 38,000 graduate staff members (gsm), including 99% nationals and 1% expatriates, are engaged in AR activities. They represent about 18,000 pRYs, of which around 6,700 (37%) are in Egypt, 3600 (20%) in Iran, 2300 (13%) in Turkey, and 5,400 (30%) in the other countries.

The qualifications of the NARS gsm are highly variable according to category of institutions and country. They are: (i) rather low at the ARIs (26, 24, and 50% of the national gsm are PhD, MS, and BS holders, respectively), with a wide range among the countries (from around 50% PhD holders in Cyprus and Egypt, to less than 9% PhD holders in Eritrea, Iran, Libya, Syria, and the United Arab Emirates); and (ii) rather high at the FASs (54, 29, and 17% of the national gsm are PhD, MS, and BS holders, respectively). If we consider—as most of the countries do—that research can be implemented efficiently only by the PhD holders and young MS holders preparing PhD degrees, it would be realistic to assume that only about 50% of the 18,000 pRYs of the WANA region are really able to undertake AR activities.

In almost all countries, differences of qualifications at the ARIs and FASs result from the much better career and salary schemes offered in the past—and still often prevailing (except in Egypt, Ethiopia, Lebanon, Morocco, Tunisia)—to academic staff members, which may reflect the higher priority given to university education than to research. Researchers' salaries are generally much lower than in the private sector. However, except in Syria and Turkey, they are relatively high compared with the average income per capita, especially in Eritrea, Ethiopia, Morocco, and Tunisia.

In all countries, AR institutes suffer a more or less strong imbalance in the numbers of support staff. Numbers of technicians are very insufficient in most countries (including some countries such as Egypt, Jordan, Libya, Syria, and Turkey, where BS holders are acting as technicians). Less-qualified support staff (clerks, laborers, drivers, etc.) are excessively numerous in most countries but exceptionally few in Libya and Morocco. Most of the ARIs also complain about the low quality of this support staff, especially technicians, mainly due to the very low salaries which discourage good candidates, the limited opportunities for upgrading, and the budget constraints. Highly qualified administrative staff is very scarce at most of the ARIs. At the FASs, the previous imbalances are generally more acute: technicians and other support staff are very few and are mobilized to support teaching activities.

Financial Resources

The total financial resources or expenditures (TE) allocated to AR in the 18 WANA countries amount to around US\$ 412 million for the year 1997/98, consisting of

- US\$ 376 million funded by the countries (91% of TE), mainly comprised of public/budgetary allocations from the government (with few self-generated resources coming from research contracts funded by national public and private organizations; seed production, soil analyses, socioeconomic studies, etc.);
- US\$ 17 million from loans, mainly provided by the World Bank, taken up by a few countries (Jordan, Morocco, Tunisia, Turkey, Yemen); and
- US\$ 19 million granted by national and international donors or agencies.

These resources amount to US\$ 110 million in Turkey, 99 in Iran, 68 in Egypt, 40 in Morocco, and 95 for all the other NARSs. A good number of NARSs rely only on national resources (Algeria, Bahrain, Iran, Iraq, Libya, the United Arab Emirates). Foreign grants are higher than the national contributions in Eritrea and Yemen; they are relatively significant in Egypt, Ethiopia, and Jordan; and marginal in Cyprus, Lebanon, Morocco, Syria, Tunisia, and Turkey.

Areas of expenditure vary according to country and institution. In most of the NARSs, ARIs allocate a large part of their financial resources to personnel expenses, and a small part to operational and capital costs (OCC), which are insufficient and often far from covering the research needs, resulting in a rather low rate of actual employment of the

researchers. In most of the countries, the FASs have very limited funds for research, however, in some countries (Egypt, Morocco, etc.), academic staff members are involved in AR activities funded directly by ARIs and other organizations or through personal contracts or relations.

Many ARIs complain about the difficulties faced in managing their financial resources (actual public budgets often much under the agreed upon budgets and unstable over the years; frequent delays in fund liquidation; etc.). Most of the FASs face an even harder situation, as they frequently do not have control of their financial resources.

Cross-Country Comparisons of the NARS Human and Financial Resources

These comparisons relied on some significant ratios. One ratio is the actual employment rate (AER) of the scientific potential, which represents the ratio of total actual RYs (roughly estimated by taking into account different criteria, especially the available amount of OCC per pRY) to total potential RYs ($AER = aRYs \div pRYs$). AER, which constitutes the most comprehensive yardstick of the degree of “quantitative efficiency” of the NARSs, is rather low (36%) for the whole region, with large variations among countries. It is satisfactory (higher than 70%) in countries (Bahrain, Cyprus, Eritrea, Lebanon, Libya, Morocco) where the main ARIs and the FASs enjoy good levels of OCC per pRY, through national and/or foreign funds. AER is very low (less than 30%) in other countries (Algeria, Egypt, Iran, Iraq, Sudan) where ARIs and FASs have very limited OCC and academic staff members are marginally committed to AR activities.

The ratio of AR expenditures (national expenditures: NE, or total expenditures: TE) to agricultural gross domestic product (AGDP) is by far the most used criterion for cross-country comparisons. For the entire WANA region, average $NE \div AGDP$ and $TE \div AGDP$ were estimated at 0.41 and 0.45%, respectively, ranging from less than 0.1% (Sudan) to 6.4% (Bahrain), with intermediate values for other countries ($NE \div AGDP =$ around 0.20% in Lebanon and Yemen, 0.25% in Algeria, 0.28% in Syria, 0.36% in Turkey, 0.50% in Egypt and Iran, 0.68% in Morocco, etc.) (see Chapter 9, Table 10). Statistical analysis showed that there is no clear relation between the values of these ratios and the wealth (GDP per capita) or the size/population of the countries, which is unexpected since most of the similar previous studies related to other regions in the world revealed a strong positive correlation between AR expenditures and wealth of a country, on the one hand, and a negative correlation between expenditures and size/population of the country, on the other.

These ratios are much under the 1% or even 2% ratios recommended for developing countries by some international organizations (World Bank, European Union, IFPRI, etc.). However, these recommended ratios are questionable for several reasons exposed in the study and are undoubtedly too high and unrealistic for the WANA countries with middle and low incomes per capita.

Research Activities

Research Management Processes

Few countries (Eritrea, Iraq, Jordan, Lebanon, Tunisia, Yemen) have prepared formal AR national long- and/or medium-term plans, including priority-setting exercises and allocation of resources by research domains or programs. In most of the other countries, AR national plans have been included as brief components of national economic development plans. Among these other countries, the largest national ARIs (INRA/Morocco, ARC/Egypt, GDAR and GDRS/Turkey, etc.) have often designed master plans or implemented programming processes in order to guide strategic decisions on research programs and resource allocation. Few FASs (Eritrea, Turkey) have started to establish research priority areas.

In most countries, monitoring and evaluation processes have been more or less efficient. However, many national AR plans, master plans and programming/priority-setting exercises have often induced only limited changes in research programs and resource allocation.

Research Programs

Information related with the characteristics of the research programs and their scientific dissemination is rather fragmented and uneven in many NARSs. Small NARSs and the Algerian NARS (as a medium-size, very fragmented, and weakly integrated NARS) face difficulties in organizing programs endowed with the essential resources required for achieving significant results; in these countries, as well in most of the FASs of the WANA region, research programs are mainly conducted on an individual basis. In the medium and large NARSs (except Ethiopia),

overlapping of research programs is frequent (more frequent in the highly fragmented and moderately or weakly integrated NARSs: Algeria, Egypt, Iran, Iraq, Morocco, Syria, Tunisia, Turkey).

In many monographs, some characteristics are also mentioned for the main ARIs.

- Priority is given to applied and adaptive research. Only a few NARSs (mainly Egypt, Morocco, Turkey) are currently involved in modern sciences with wide use of biotechnology, isotopes, remote sensing, expert systems, and computers.
- Frequently, there is secondary emphasis on forestry, animal production, food technology, and economy. Research programs on crops and natural resources are generally the most established and better covered.
- Permanent research teams on farming systems are few; however, significant efforts in that field have been made in some countries (Eritrea, Jordan, Morocco, Tunisia) and initiated in others (Algeria, Egypt, Iraq, Sudan, Syria, Turkey). However, in countries (mainly Algeria, Iran, Libya, Sudan) with ARIs covering crops, animal production, and natural resources separately, implementation of farming systems research remains difficult.

From the monographs, it is difficult to form a reasonable judgment of the scientific productivity (quantity and quality) of the NARSs. The low rates of actual employment of the human scientific potential and the insufficient weight given to scientific achievements in terms of their influence on the researchers' careers in many countries suggest that this scientific productivity is, in general, rather modest given the large numbers of agricultural scientists in the WANA region. This statement is consistent with the fact that publication policies (scientific papers, journals, books, bulletins) seem rather active and sustained only in very few countries (Egypt, Morocco, Tunisia, Turkey).

International Scientific Linkages

Scientific collaboration with national institutions of developed countries and international organizations is active and diversified in Egypt, Eritrea, Jordan, and Yemen, which are countries that benefit from rather large external financial support (grants and loans). It is also rather well developed in Ethiopia and Morocco, but remains moderate or limited in Bahrain, Lebanon, Syria, Tunisia, Turkey, and the United Arab Emirates, and poor in Algeria, Iran, Libya, and Sudan. In those latter countries, relatively isolated for political or internal reasons, international AR centers (particularly ICARDA) are basically the only windows to the international scientific community.

Scientific cooperation between the WANA NARSs is rather limited and mainly active through networks managed or funded by international/regional organizations (mainly CIHEAM, FAO and ICARDA) and financial agencies (IFAD, the World Bank, etc.).

Relations with Development

Channels for relationships between NARS institutions and development organizations vary from country to another and are relatively numerous and diversified (participation of representatives of public and private development organizations in the management and research committees; research contracts with these development organizations; services such as soil/water analysis, soil mapping; on-farm research; workshops; training courses; information packages for extension services and farmers; etc.). These channels seem rather well organized or have largely improved over the last years in the main ARIs of Egypt, Iran, Iraq, Jordan, Lebanon, Morocco, Syria, Tunisia, Turkey, and Yemen. In most of the FASs, there is no formal institutional relationship with extension services or farmers and no mechanism for technology transfer, except in Egypt and Morocco.

In any case, whatever their degree of organization, the actual efficiency of these relationships depends on other objective factors related to the NARS features (structure; human, physical and financial resources; etc.) and to the national development/extension organizations. Actual linkages can only be globally weak in countries where NARS and/or development/extension organizations have acute weaknesses, i.e.:

- where NARSs (essentially their main ARIs) are highly fragmented and moderately or inadequately integrated (Algeria, Libya, Sudan); employing researchers with low qualifications (only few PhD holders) (Algeria, Bahrain, Eritrea, Iran, Libya, Syria, the United Arab Emirates); suffering strong unbalanced territorial allocation of resources, leaving large parts of the country without permanent significant human and physical resources (Algeria, Egypt, Sudan, Tunisia, Yemen); and mobilizing very limited financial resources (Algeria, Ethiopia, Sudan, Yemen);

- where development/extension organizations are poorly structured and/or have very limited qualified human resources and very low financial resources: this situation prevails in most countries except Jordan, Morocco, Tunisia, and Turkey.

Information provided in the monographs on the impact of the NARSs on agricultural production and development is rather limited. To date, there have been no formal studies related to the impact of the NARSs on agricultural production at the national level; a very limited number of studies conducted on some commodities in a few countries have generally demonstrated the high profitability of AR programs, but most of these studies have underestimated the research costs and overestimated the benefits and the AR profitability.

It is worth mentioning that over the period 1980–1996, no obvious relationship was found between the features of the NARSs and the research–development linkages (as described above) on the one hand, and the performance of national agriculture estimated through the FAO agricultural production growth indices (total or per capita) (index = 100 in 1980) on the other:

- Some countries with NARSs that have (or have had) numerous and acute deficiencies have registered rather good agricultural growth; among them are Iran (indices: total = 221; per cap. = 128), Algeria (FAO indices in 1996: total = 196, per capita = 126), and Lebanon (indices in 1996: total = 196, per cap. = 169).
- Other countries with better-structured and endowed NARSs have had lower performance: Egypt (FAO indices in 1996: total = 181, per cap. = 123), Turkey (indices: total = 140, per cap. = 100), Ethiopia (indices: total = 138, per cap. = 88), Cyprus (indices: total = 105, per cap. = 83), and Eritrea (indices: total = 103, per cap. = 88).

In most countries, NARSs may have actually achieved, until present, only a modest impact on national agricultural development due to their above-mentioned shortcomings and constraints, and to the weaknesses of the national development organizations and farmers' conditions and socioeconomic environment (agricultural policies, communications, etc.), which do not provide favorable circumstances for agricultural development and dissemination of innovations.

Conclusion

The above analysis has shown the diversity of the NARS profiles in terms of structure, resources, research activities, and productivity, which reflects the diversity of the countries themselves. Despite this diversity, some common issues have been outlined, which deserve further attention within a historic perspective.

Most of the NARSs are relatively young, have experienced very rapid growth, and have suffered unstable political and institutional changes in their environment over the years. In the past, and until present for some NARSs, the ARIs and their researchers suffered discrimination compared to the FASs and their academic staff members, as priority was given to educating graduate staff members who were a rare resource in the past. But the situation has changed in most countries where most of the public agricultural institutions are now (or are starting to be) endowed with sufficient numbers of graduates. Therefore, the allocation of scientists at the ARIs is no more a sensitive issue, except when career and salary schemes are still much less favorable than at the FASs and some other public institutions, and may discourage recruitment and stability of the best researchers.

The unbalanced allocation of human and physical resources is a major issue in many NARSs. The lack or scarcity of permanent scientific and technical staff in vast regions of most countries, which are often the less favorable agroecological zones and farming systems, results in unbalanced research activities and poor relations with development organizations in those regions. This situation reflects the national socioeconomic development policies which have generally paid more attention to urban development and to rural areas close to the capitals and large cities. Things are also improving in this domain, albeit rather slowly. Now, within the framework of political and economic decentralization processes which would allow more balanced regional development, and through the preparation of national AR strategic plans, NARSs should improve the territorial allocation of their resources.

Insufficient financial resources, especially those allocated to operation and capital costs, are often considered as the most limiting factor to research efficiency. However, using the same available funds, research productivity could be improved through reducing the number of scientists (currently underemployed) and lower-qualified support staff, and reducing and rationalizing the networks of research centers and stations of the NARSs.

Research activities are still frequently subject to many deficiencies (rather low qualifications of the scientists at the ARIs, unbalanced coverage of scientific domains and regions, lack of monitoring and assessment, limited

international scientific cooperation). The main ARIs are aware of these weaknesses and are progressively overcoming them through intensive training efforts, preparation of national strategic AR plans or ARI master plans, and dynamic relations with international AR centers and organizations.

Linkages with public and private development organizations are also concerns of the main ARIs, which have already set up diversified channels for intensifying them and increasing impact on agricultural production. Their improvement may rely on further changes within these organizations and in the national agricultural policies.

Finally, all these issues may be considered within a long-term perspective. Most of the NARSs have almost completed the stage of quantitative growth and are now entering into the era of consolidation. For the future, the major challenges to the NARSs will be the appropriate balance with their partner organizations—public agricultural administrations, public and private development organizations, and farmers' unions—which are facing more acute problems of management and resources. Countries certainly need well-organized and efficient NARSs, but such NARSs can not serve their purpose without partners having the same features. For reducing the gap, NARSs should pay higher attention to certain activities that could reinforce these partner organizations (such as training of their senior staff and leaders and temporary transfer of researchers to these organizations) and to some research domains which would help development and farmers' organizations to better understand their own situation and needs, such as research on farming systems and research on sociology of rural communities and organizations.