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REPORT AND RECOMMENDATION OF THE PRESIDENT

TO THE EXECUTIVE BOARD ON A PROPOSED

TECHNICAL ASSISTANCE GRANT

TO THE

ARAB CENTER FOR THE STUDIES OF ARID ZONES AND DRY LANDS

FOR THE

APPLIED RESEARCH PROGRAMME FOR THE UTILIZATION OF BRACKISH/SALINE WATER IN NORTH AFRICA

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I sbmit the following Report and Recommendation on a proposed technical assistance (TA) grant to the Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD) to support the Applied Research Programme for the Utilization of Brackish/Saline Water in North Africa, in the amount of USD 0.4 million for a four-year period.

I. BACKGROUND

1. In the arid areas of North Africa, where annual rainfall rarely exceeds 200 mm, no sustainable agricultural production is possible without irrigation. In these areas, groundwater is the major source of water supply. Over the past two decades, an increasing water demand for agriculture, industry and domestic uses has led to the overexploitation of groundwater resources. Currently, the rate of water extraction far exceeds the rate of water recharge, resulting in the gradual depletion of the aquifers and to seawater intrusion in coastal zones. In these areas, resource-poor farmers who have built their livelihoods on a reliable supply of freshwater are now faced with a critical shortage of this vital resource, and this impinges on all aspects of their relationship with the environment. As freshwater becomes more scarce, the pressures grow on farmers to use brackish and even saline water.

2. Saline groundwater exists in relatively large quantities in North Africa. In the coastal zones of Libya and Tunisia, such as the Jefara Plain strip, and in the southern regions of Oued-Righ, Ouargla and Ziban in Algeria, reliance on saline water and slightly saline water is the only viable alternative for irrigated agriculture. Given the dependence of agriculture on irrigation in these arid areas, the question is not whether to use brackish/saline water to irrigate, but how best to use this "technology" in a sustainable manner and with as little detrimental effect as possible on the natural resource base.

3. Over the past two decades, research has been increasing on the potential effects of the use of saline water in irrigated agriculture. The main thrust of this research has been on the investigation of opportunities to improve agricultural productivity through the efficient employment of brackish water resources. Although this research effort needs to be strengthened, major achievements in all three countries have already been accomplished, including (i) the identification of salt-tolerant crops; (ii) the identification of the water requirements of forage crops, cereals and vegetables under date-palm plantation and in open fields; (iii) the application of saline and freshwater (mixing and alternate) according to the tolerance of phonological stages and salt balance; (iv) the dosage and frequency of irrigation in line with the requirements of the methods used (drip, surface and sprinkling) and the crops; and (v) the application of leaching management and consideration of the effect of rainfall on leaching.

II. RATIONALE AND OBJECTIVES

4. The promising research findings, most of which have been obtained through the observation of on-station needs, must be validated on farm fields before dissemination. Clearly, raising the productivity of such a scarce resource as water is central to boosting the household food security of the smallholders living in these arid areas who depend, to a great extent, on agriculture for their livelihoods. To meet this challenge will require a greater effort in technology transfer activities.

5. The justification for this TA grant is founded precisely on the need to provide support to the three countries in their attempts to reduce rural poverty in arid areas through the validation and dissemination of available growth-enhancing technologies based on the appropriate and efficient use of brackish water. To this end, the proposed research/technology transfer programme has been developed. The programme focuses on technologies that are consistent with the socio-economic conditions of smallholders (that is, technologies that do not rely on massive injections of external inputs) and that will ensure self-reliance beyond the end of the programme. The proposed programme is in line with the Agricultural Research and Transfer Strategy for the Near East and North Africa (NENA) region that has identified the development of technologies for the safe use of marginal water as a priority area.

6. The programme outcomes are also expected to benefit resource-poor water users in past and ongoing IFAD project sites in Algeria and Tunisia. In Tunisia, four ongoing projects (TN 348, TN 394, TN 298 and TN 499) and two completed project site areas (Mellegue Watershed) will directly link to the programme. In Algeria a completed project-site area (Mellegue Watershed and Sidi Bouzid Irrigation) and potential IFAD projects in the south will link to the programme. The national research, technology transfer and extension programmes involved in the project will benefit from training and the participatory framework that promotes and facilitates a multidisciplinary/institutional approach. Finally, the programme outputs will help in the design of national strategies in irrigated agriculture for a more effective employment of alternatives to the scarce freshwater resource.

7. The overall objective of this programme is the development of more productive and sustainable irrigated production systems through the appropriate and efficient reliance of resource-poor farmers on brackish water in the arid areas of the NENA region. The programme will be demonstrative in nature. It will rely on direct interaction between researchers and farmers through a participatory framework that ensures a better understanding of farmer needs, which is essential to the development and transfer of technology innovations tailored to the production and food-security goals of smallholders. Therefore, researchers, farmers, extension agents and non-governmental organizations will be involved at all stages (design, implementation and evaluation) of programme activities. In Algeria and Tunisia, the programme will cover sites of ongoing and recently closed IFAD projects.

III. PROGRAMME COMPONENTS: OUTPUTS AND ACTIVITIES[1]

Transfer of Adapted Management Practices

8. The specific objective will be the validation and transfer of socially and economically viable solutions in order to assist target communities to adopt performing and sustainable management practices for brackish water irrigation. The outputs will be (i) increased adoption by farmers of available performing management practices; and (ii) improved productivity and higher farmer incomes.

9. The related activities will be (i) to screen available and promising technology innovations, including salt-tolerant crops and better irrigation and water-management practices; (ii) with the full

[1] See logframe in Appendix II.

participation of farmers and extension agents, to establish farmer-managed demonstration trials to show the identified technology innovations to other farmers and validate the superiority of the innovative technologies over current practices; (iii) to monitor the adoption by farmers of the recommended technologies across the sites and across the three participating countries and, in collaboration with participating farmers, to identify potential impediments to the adoption process; (iv) to assess the potential economic and environmental impact of these technology innovations at the farm and community levels across sites and across the three participating countries; and (v) to foster the adoption by farmers of adapted technology innovations through the organization of field days, traveling workshops and periodic meetings involving as many smallholders as possible.

Development of Guidelines

10. The specific objective will be the establishment of guidelines for the safe use of brackish/saline water in irrigation. The outputs will be (i) the establishment of quality standards for irrigation water, with due consideration to specific soil and environmental conditions; and (ii) greater use of irrigation systems that are more adapted to brackish/saline water.

11. The key activities will be to (i) assess the quality (salt content) of the brackish water currently being used; (ii) conduct soil and plant analyses to determine "water-salt balance" and the field measurement of the spatial variability of soil salinity; (iii) monitor soil properties (ph, organic matter and nutrient leaching) during brackish/saline water irrigation and assess the drainage requirements and methods for such irrigation; (iv) assess the relative technical and economic potential of various irrigation techniques (flood, sprinkler and drip irrigation); (v) develop methods for the safe use of brackish/saline water (the frequency and dosage of irrigation, soil characteristics, crop stage and so on); and (vi) investigate the legislative and policy instruments that may be required for the widespread, safe employment of brackish/saline water in irrigation.

Additional Adaptive Research Work

12. The specific objective here will be the implementation of additional adaptive research on the potential uses in irrigation of water with a salt content of between 4 and 8 gr/l. The output will be an assessment of the effects of this low-quality irrigation water on crops.

13. The key activities will be to (i) establish research experiments on farmers' fields that reflect the spectrum of low-quality water (4-8 gr/l); and (ii) develop, verify and calibrate salt and water flow models.

Capacity-Building and Institutional Strengthening

14. The specific objective will be to strengthen institutional and human resource capacities and enhance technology transfer capacities in the three participating countries. The outputs will be (i) the improved research and technology transfer capability of the three participating national agricultural research systems (NARSs); and (ii) strengthened linkages among research, extension agents and farmers.

15. The key activities will be to (i) organize training courses and technical national/regional workshops; (ii) establish regional networks and relations with international centres of excellence; (iii) determine ways to involve scientists, extension agents and farmers in the identification and implementation of research and technology transfer activities; and (iv) produce technical booklets, leaflets, multimedia materials and so on, in collaboration with extension agents and farmers, so as to enhance communication flows and ensure the wide dissemination and adoption of the recommended practices.

IV. IMPLEMENTATION ARRANGEMENTS

16. The programme will be implemented through a partnership arrangement involving ACSAD and lead national research/development institutions in the participating countries: the Technical Institute for the Development of Saharan Agriculture (ITDAS) in Algeria, the Agricultural Research Centre in Libya and the National Institute for Research in Rural Engineering, Water and Forests (INRGREF) in Tunisia. ACSAD will provide the necessary technical backstopping and be responsible for managing and coordinating the programme, including responsibility for financial management and reporting to IFAD. A programme steering committee will be formed to promote and ensure the integration of national and regional research/technology transfer efforts. It will be composed of one senior policy-maker from each participating country, the three national coordinators, the programme coordinator (ACSAD) and the donor representative (IFAD). The steering committee will meet once a year to review annual workplans and budgets, monitor progress and provide overall guidance for the programme.

Cost and Financing

17. The total cost of the four-year programme is estimated at USD 2.1 million. As shown in Table 1, the contribution in kind of the three benefiting countries will account for USD 1.03 million (49% of the total cost); ACSAD will contribute USD 0.14 million (6.5% of the total cost) and IFAD will contribute USD 0.4 million (20%). Discussions are under way with the Arab Fund for Economic and Social Development, the Islamic Development Bank and the Arab Authority for Agriculture Investment and Development to provide cofinancing for USD 0.537 million (24.5%).

Total Programme Costs and Finance

Item	PY 1	PY 2	PY 3	PY 4	Total	Contribution			
						NARS	ACSAD	IFAD	Cofinanciers
Investment costs									
Personnel	175	175	175	171	696	452	100	144	-
Operational costs	123	84	84	84	375	211	20	144	-
Travel	45	45	45	45	180	78	0	72	30
Capacity-building	81	96	96	87	360	102	18	-	240
Capital equipment	327	39	24	6	396	182	0	-	214
Subtotal	**751**	**439**	**424**	**393**	**2007**	**1 025**	**138**	**360**	**484**
Backstopping (11% of IFAD and cofinanciers)	-	-	-	-	93	-	-	40	53
Grand total	**751**	**439**	**424**	**393**	**2 100**	**1 025**	**138**	**400**	**537**

V. RECOMMENDATION

18. I recommend that the Executive Board approve the proposed technical assistance grant in terms of the following resolution:

> RESOLVED: that the Fund, in order to finance, in part, the Applied Research Programme for the Utilization of Brackish/Saline Water in North Africa, for four years, shall make a grant not exceeding four hundred thousand United States dollars (USD 400 000) to the Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD) upon such terms and conditions as shall be substantially in accordance with the terms and conditions presented to the Executive Board in this Report and Recommendation of the President.

Fawzi H. Al-Sultan
President

APPENDIX I

DETAILED COST ESTIMATES AND FINANCING ARRANGEMENTS

ITEM	PY 1	PY 2	PY 3	PY 4	Total	Contribution			Cofinanciers
						NARS	ACSAD	IFAD	
Personnel									
Regional coordinator (international)	20	20	12	18	80	0	50	30	
National coordinators	21	21	21	21	84	60	0	24	
Saline water specialist (international)	12	12	12	12	48	0	27	21	
Irrigation specialists (national)	24	24	24	24	96	96	0	0	
Extension specialists (national)	21	21	21	21	84	84	0	0	
Agronomist (national for Libya only)	7	7	7	7	28	28	0	0	
Soil and crop science specialists (national)	21	21	21	21	84	84	0	0	
Civil engineers (national)	16	16	16	16	64	64	0	0	
Short-term consultants (international)	18	18	16	16	68	0	8	60	
General support staff	15	15	12	12	54	36	15	9	
Subtotal	**175**	**175**	**175**	**171**	**668**	**452**	**100**	**144**	**-**
Operational costs									
Research supplies	60	30	30	30	150	75	0	75	
Office supplies	18	15	15	15	63	43	8	12	
Vehicles (maintenance)	15	12	12	12	51	39	0	12	
Publications/multimedia	18	18	18	18	72	27	12	33	
Communications	12	9	9	9	39	27	0	12	
Subtotal	**123**	**84**	**84**	**84**	**375**	**211**	**20**	**144**	**-**
Travel									
International travel	21	21	21	21	84	24	0	30	30
Local travel (including travelling workshops for farmers)	24	24	24	24	96	54	0	42	
Subtotal	**45**	**45**	**45**	**45**	**180**	**78**	**0**	**72**	**30**
Capacity-building									
Grad students' research work	18	18	18	18	72	36	0		36
Training for farmers and technicians	15	30	30	21	96	21	0		75
Technology transfer (field demos, workshops, open days, etc.)	30	30	30	30	120	30	0		90
Saline water-use regional network	12	12	12	12	48	15	12		21
Steering committee	6	6	6	6	24	0	6		18
Subtotal	**81**	**96**	**96**	**87**	**360**	**102**	**18**	**-**	**240**
Capital equipment									
Research equipment	120	30	15	6	171	95	0		76
Computer and office equipment	27	9	9	0	45	27	0		18
Vehicles	180	0	0	0	180	60	0		120
Subtotal	**327**	**39**	**24**	**6**	**396**	**182**	**0**	**-**	**214**
Total	**751**	**439**	**424**	**393**	**2 007**	**1 025**	**138**	**360**	**484**
Backstopping (11% of IFAD and cofinanciers)					**93**			40	53
Grand total	**751**	**439**	**423**	**343**	**2 100**	**1 025**	**138**	**400**	**537**

LOGICAL FRAMEWORK

Factor	Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Goal	Established productive and sustainable irrigated production systems.	▪ Improved crop productivity and higher smallholder incomes. ▪ Improved water management.	▪ Reports by development agencies. ▪ Assessment by implementing agency.	▪ Favourable weather conditions and social and institutional infrastructure. ▪ Necessary government support through adapted legislation and policies.
Purpose	Dissemination of appropriate and efficient technologies for brackish/saline water utilization for irrigation in arid areas.	▪ Adoption rates of recommended technologies and management practices. ▪ Improved brackish/saline water-use efficiency.	▪ Baseline surveys. ▪ Progress and final reports. ▪ Impact studies.	▪ Effective collaboration among research, extension agents and farmers. ▪ Institutional support for the widespread dissemination of recommended technologies.
1. Transfer of Adapted Management Practices				
Outputs	1. Farmers' adoption of available performing management practices increased. 2. Farmer incomes improved.	▪ Assessment of adoption rates. ▪ Farm surveys. ▪ Feasibility studies.	▪ Progress reports. ▪ Project reports and specific studies. ▪ Project reports and specific studies.	▪ Adequate funding available. ▪ Personnel and logistic support provided by NARSs. ▪ Farmers willing to participate.
Activities	1.2 Screen available technologies (salt-tolerant crops and better irrigation and water management practices) which could significantly improve agricultural growth at the farm level and increase farmer revenue and income.	▪ Adapted technologies identified and transferred.	▪ Project progress reports. ▪ Annual national reports.	▪ Effective participation of farmers and extension agents. ▪ Institutional support.
	1.3 Establish farmer-managed demonstration trials of the identified technology innovations to show to other farmers in the community the superiority of the innovations.	▪ Demonstration sites identified and trials established. ▪ Demonstration days held.	▪ Project progress reports. ▪ Extension reports.	
	1.4 Monitor farmers' adoption of the recommended technologies across sites and across the three participating countries and identify, in collaboration with participating farmers, potential impediments to their adoption.	▪ Adoption rates recorded on different sites through on-farm surveys.	▪ Survey reports. ▪ Project progress reports.	
	1.5 Assess the potential economic and environmental impact of these technology innovations at the farm and community levels across sites and across the three participating countries.	▪ On-farm surveys of target farmers.	▪ Survey reports. ▪ Project progress reports.	
	1.6 Foster farmers' adoption of adapted technologies through field days, traveling workshops and periodic meetings involving as many smallholders as possible.	▪ Field days, traveling workshops, meetings.	▪ Project progress reports. ▪ Workshop/meeting proceedings.	

Factor	Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
	2. Development of Guidelines			
Outputs	3. Quality standards for irrigation water established.	▪ Analysis of policy and legislative instruments.	▪ Project progress reports, publication of guidelines.	▪ Personnel and logistic support provided by NARSs.
	4. Use of adapted irrigation systems increased.	▪ Feasibility studies of alternative irrigation systems.	▪ Feasibility reports.	▪ Farmers willing to participate.
Activities	2.1 Assess the quality (salt content) of the brackish water currently used.	▪ Documentation of water characteristics.	▪ Project reports.	▪ Effective participation of farmers and extension agents. ▪ Institutional support.
	2.2 Conduct soil and plant analyses to determine "water-salt balance" and field measurement of the spatial variability of soil salinity.	▪ Number of plant/soil analyses performed.	▪ Laboratory reports.	
	2.3 Monitoring soil properties (ph, organic matter and nutrient leaching) during brackish/saline water irrigation and assess drainage requirements and methods for such irrigation.	▪ Analysis of experiments.	▪ Publications, project reports.	
	2.4 Assess the relative technical and economic potential of various irrigation techniques (flood, sprinkler and drip irrigation) relying on brackish/saline water.	▪ Analysis of experiments and cost/benefit analysis.	▪ Project reports.	
	2.5 Develop methods for the safe use (frequency and dosage of irrigation, soil characteristics, crop stage, etc.) of brackish/saline water.	▪ Feasibility studies.	▪ Study reports, project progress reports.	
	2.6 Investigate legislative and policy instruments that may be required for widespread and safe utilization of brackish/saline water in irrigation as an alternative to freshwater.	▪ Guidelines published.	▪ Publications by NARSs.	
	3. Additional Adaptive Research Work			
Outputs	5. Effects of low-quality irrigation water (4-8 gr of salt/l) on crops assessed.	▪ Testing the effect of different salt concentrations.	▪ Project reports.	▪ Personnel and logistic support provided by NARSs. ▪ Farmers willing to participate.
Activities	3.1 Establish research experiments on farmer fields that reflect the spectrum of low-quality water (4-8 gr/l).	▪ Researcher-managed experiments.	▪ Experiment results.	▪ Effective participation of farmers and extension agents. ▪ Institutional support.
	3.2 Develop, verify and calibrate salt and water flow models.	▪ Model outputs.	▪ Simulation results and project reports.	

Factor	Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
	4. Capacity-building and Institutional Strengthening			
Outputs	6. Research and technology transfer capability of NARSs improved. 7. Research, extension agent and farmer linkages strengthened.	▪ Trained NARS staff. ▪ Extension and farmers involved in participatory research and technology transfer activities.	▪ Project reports. ▪ Publications by NARSs. ▪ Annual reports and project reports.	▪ Personnel and logistic support provided by NARSs. ▪ Farmers willing to participate.
Activities	4.1 Organize training courses and technical national/regional workshops. 4.2 Establish regional networks and relations with international centres of excellence. 4.3 Establish relations with local universities and encourage and facilitate involvement of graduate students in project activities. 4.4 Organize annual national meetings with all stakeholders to review project results and prepare workplans for the following year. 4.5 Identify options for involving scientists, extension agents and farmers in the identification and implementation of research and technology transfer activities. 4.6 Produce technical booklets, leaflets, multimedia materials, etc., in collaboration with extension agents and farmers, so as to enhance communication flows and ensure the wide dissemination and adoption of recommended practices.	▪ Training courses and workshops held. ▪ Information exchange, exchange visits. ▪ Number of graduate students conducting research in project sites; institutional collaboration. ▪ Annual planning meetings. ▪ Meetings involving research, extension agents and farmers; participatory approaches included in NARS programmes. ▪ Documentation and multimedia information produced.	▪ Training evaluation, workshop proceedings. ▪ Trip reports. ▪ Graduate theses. ▪ Reports of annual meetings. ▪ Annual reports, project progress reports. ▪ Publications and multimedia products.	▪ Effective participation of farmers and extension agents. ▪ Institutional support. ▪ Effective collaboration with universities.