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***Roundtable on Land &
Water Management***

***Table ronde sur la
gestion de l'eau et des
terres***

**Proceedings
Actes**

**Cairo/Le Caire
13-15 dec. 1993**

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(Editor/Éditeur)**



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FOREWORD

This document contains the *Proceedings of the Roundtable on Land & Water Management* organized by the Regional Office for North Africa and the Middle East (MERO) of the International Development Research Centre (IDRC). Held at the Cairo Sheraton Hotel from 13 to 15 December 1993, the roundtable counted on the participation of 11 IDRC-supported projects in North Africa and the Middle East and served to:

- i) highlight the projects' commonalities, strengths and weaknesses;
- ii) strengthen their execution by facilitating linkages;
- iii) plan and design future activities and mechanisms for:
 - a) resource sharing, technical assistance, South- South technology transfer
 - b) improved communications and dissemination of results
 - c) joint research
 - d) coordination
- iv) facilitate their contributions to the evolution of the programs of IDRC Regional Office for North Africa and the Middle East (MERO).

The invited projects all concern research activities in the areas of integrated management of natural resources, environmental studies and environmental policies, and illustrate well MERO's current program priority. They included (from West to East):

- 1- Développement d'un système d'information géographique pour la mise en valeur agricole (SIGMA); Maroc/IAV Hassan II, Canada/U. de Sherbrooke (completing in 1994).
- 2- SIG pour la gestion de l'activité pastorale dans la steppe algérienne; Algérie/CNTS (to start in 1994).
- 3- Système d'information à référence spatiale (SIRS) basé sur les données de télédétection pour la conservation des eaux et des sols; Tunisie/ENIT, Canada/U. Laval (completing in 1994).
- 4- Geographic Information System for Water Resources Management; Egypt/SRI, Canada/GIS Division-EMR (completing in 1994).
- 5- Water/Land Management; Egypt/U. of Alexandria, Canada/UBC/Guelph (completing in 1995).
- 6- Environmental Policy-Making; Egypt/AUC (completing in 1994).
- 7- Irrigation Efficiency; Egypt/Desert Development Centre, AUC (starting in 1994)
- 8- Irrigation Management; West Bank/ARIJ (completing in 1996).
- 9- Water Harvesting; Canada/U. of Concordia, Jordan/ U. of Jordan, ICARDA (completing in 1996).
- 10- Agro-Ecological Characterization; Regional/ICARDA (completing in 1994).
- 11- Terrace (Dryland Resource Management Project Phase II); Yemen/AREA, ICARDA (starting in 1994).

(Another initially scheduled project, Integrated Watershed Management -Syria-, could not be represented at the meeting)

The program for the meeting consisted of 2 days of presentations on project concepts (issues

covered, disciplines involved, objectives, methodologies, technical and organizational problems). Participating project leaders were requested to prepare a 30-minute presentation (jointly in the case of multi-component projects) allowing a 15-minute question period between each.

The next day was used **(1)** to present a synthesis of commonalities, strengths and weaknesses; **(2)** to propose and discuss innovative activities and mechanisms relating to objectives (ii), (iii) and (iv) above; and **(3)** to discuss potential follow-up activities by MERO staff and the projects.

These *Proceedings* include the speeches of the participating MERO staff members, followed by the texts made available by the invited project leaders on their projects. The compilation of commonalties, challenges and recommendations was made possible thanks to the assistance of *rapporteurs* selected among the participants. We are particularly thankful to Robert Valantin, Ferdinand Bonn, Mike Jones, John FitzSimons and Seeman Sarraf for their assistance in this matter.

AVANT-PROPOS

Ce document contient les *Actes de la Table ronde sur la Gestion de l'eau et des terres* organisée par le Bureau régional pour l'Afrique du Nord et le Moyen-Orient (BREMO) du Centre de recherches pour le développement international (CRDI). Tenue à l'hôtel Cairo Sheraton du 13 au 15 décembre 1993, la table ronde a compté sur la participation de 11 projets appuyés par le CRDI en Afrique du Nord et au Moyen-Orient et a servi à:

- i) illustrer les points communs des projets, leur force et leurs faiblesses;
- ii) renforcer leurs opérations en favorisant des liens entre eux;
- iii) planifier et formuler des activités et mécanismes futurs pour:
 - a) le partage des ressources, l'assistance technique, la coopération Sud-Sud en transfert de technologies
 - b) une amélioration des communications et de la diffusion des résultats de la recherche
 - c) la recherche conjointe
 - d) la coordination;
- iv) faciliter leurs contributions à l'évolution des programmes d'intervention du Bureau régional du CRDI pour l'Afrique du Nord et le Moyen-Orient (BREMO).

Les projets invités traitent d'activités de recherche dans les domaines de la gestion intégrée des ressources naturelles, des études environnementales et des politiques environnementales. Ils illustrent bien les priorités actuelles du programme du BREMO. Ils ont compris (d'Ouest en Est):

- 1- Développement d'un système d'information géographique pour la mise en valeur agricole (SIGMA); Maroc/IAV Hassan II, Canada/U. de Sherbrooke (terminant en 1994).
- 2- SIG pour la gestion de l'activité pastorale dans la steppe algérienne; Algérie/CNTS (commençant en 1994).
- 3- Système d'information à référence spatiale (SIRS) basé sur les données de télédétection pour la conservation des eaux et des sols; Tunisie/ENIT, Canada/U. Laval (terminant en 1994).
- 4- Geographic Information System for Water Resources Management; Egypt/SRI, Canada/GIS Division-EMR (terminant en 1994).
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- 9- Water Harvesting; Canada/U. of Concordia, Jordan/ U. of Jordan, ICARDA (terminant en 1996).
- 10- Agro-Ecological Characterization; Regional/ICARDA (terminant en 1994).
- 11- Terrace (Dryland Resource Management Project Phase II); Yemen/AREA, ICARDA (commençant en 1994).

(Un autre projet initialement au programme, Integrated Watershed Management -Syrie-, n'a pas pu être présenté)

Le programme de la réunion a consisté en 2 jours de présentations sur le concept de chaque projet (ses problématiques, les disciplines concernées, ses objectifs, sa méthodologie, ses problèmes techniques et organisationnels). Les chercheurs principaux participants devaient préparer une communication de 30 minutes sur leur projet. Une période de questions de 15 minutes a suivi chaque communication.

Le jour suivant a été utilisé pour (1) présenter une synthèse de leurs points communs, leur force et leurs faiblesses; (2) proposer et discuter des activités et mécanismes innovateurs en rapport aux objectifs (ii), (iii) et (iv) ci-haut; et (3) élaborer sur le suivi de la réunion par le personnel du BREMO et les projets.

Ces *Actes* rassemblent les discours prononcés par les membres du BREMO participants, suivi par les textes offerts par les chercheurs principaux sur leurs projets. Les points communs, les défis et les recommandations ont été compilés par des rapporteurs choisis parmi les participants. Nous tenons à remercier Robert Valantin, Ferdinand Bonn, Mike Jones, John FitzSimons et Seeman Sarraf pour leur assistance à cet effet.

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AGRO-ECOLOGICAL CHARACTERIZATION

(ICARDA/INRA[Morocco]/DMN[Morocco]/METEOROLOJI[Turkey])

Wolfgang Göbel, ICARDA

Introduction

The natural environment in North Africa and West Asia is characterized by high variability both in time and across space. The consequence is a high degree of uncertainty and risk for agricultural production. In such an environment it is difficult and time-consuming to conduct agricultural research, difficult to target research, difficult to provide sound advice to farmers how they can minimize their risk while at the same time maximizing their income, difficult to plan and allocate resources optimally, both at the farm and at the national level. There is a need to complement research on the ground by modelling and simulation, there is a need for effective tools to characterize quantitatively the environment and its variability.

Building partly on already existing applications and experience, ICARDA developed a set of tools to address this task. They are:

- **SIMTAG** (M. Stapper / H. Harris),
a wheat model which simulates wheat growth based on daily data of rainfall, air temperature and solar radiation, soil profile data, genetic coefficients, and management information,
- **SWG** (W. Göbel),
a spatial weather generator which permits the stochastic generation of daily climatic series for all cells of a spatial grid; the synthetic series can be used to map the frequencies of climatic events or to drive crop or other models,
- **MULTISIM** (U. März / T. Nordblom),
a multivariate crop yield generator which maintains the correlations between the yields of different crops; its coefficients are derived from data obtained in farmer interviews or from historical yield statistics.

None of the modules itself represents an entirely novel approach. Innovative aspects are the addition of the spatial dimension which the SWG brings to weather generation and crop modelling or, from a different angle of view, the stochasticity dynamism which SWG and MULTISIM are able to add to otherwise static GIS approaches.

The Project

In order to validate these tools, ICARDA required the assistance and collaboration of national programmes, since the centre had neither the data nor the manpower to undertake this task entirely on its own. Therefore the current project was initiated with the following objectives:

- to validate and test the set of tools,
- to demonstrate their potential for solving problems identified by collaborating national

- programmes by executing a number of case studies,
- to train staff from national programmes in the use of the tools,
 - to document and publish the tools and the results of the case studies.

The activities to be executed by the project were to follow a logical sequence. After the selection of a project area and the training of the counterparts from the national programmes, the necessary data were to be collected (daily climatic data from all stations in the area for the compilation of the weather generator coefficient maps and the validation of the SWG, topographic data for the construction of a DEM, soils data to compile a digital soil map together with profile data, crop data to compute genetic coefficients and for crop model validation, yield and production statistics for validating MULTISIM). Only then, after the validation and, if necessary modification of the software, the case studies were to be undertaken and the results published.

The expertise required by the project is in the areas of agronomy/physiology/crop modelling, soil science and agricultural economics on one side as well as agroclimatology/climatology and GIS. Logical counterparts are therefore the national agricultural research services and the meteorological services. Between them, these two services also usually are the owners of most of the data required by the project.

Mainly because of their contrasting climates, Morocco and Turkey were the two countries from where national programs were invited to join ICARDA in the project.

The Turkish Experience

ICARDA approached the Ministry of Agriculture, Forestry and Rural Affairs which designated the national project coordinator. He in turn assigned scientists from two agricultural research institutes to the project and, together with ICARDA, approached the State Meteorological Service. ICARDA had no influence on the selection of the counterparts. Except in the collaboration with the meteorological service, the project made very little progress in more than three years and collaboration with the agricultural research institutes had to be abandoned eventually. Together with the meteorological service alone, it will only be possible to attempt a fraction of the envisaged objectives, in particular those relating to the validation of the SWG.

The likely reason for the partial failure of the project in Turkey is the top-down way in which collaboration was set up. Counterparts did not identify themselves with the project, they rather perceived it as an additional burden. The lesson to be drawn is not to start any collaborative project unless it is absolutely certain that there is a clearly positive attitude and an eagerness to work together at all levels, from the research scientists up to the decision makers. Projects need to be initiated in a bottom-up manner; collaborating institutions and their staff need to be convinced that it is in their own interest to execute the project, that indeed it is their own project. For that they need to be involved as equal partners in all stages of project formulation right from the beginning.

The Moroccan Experience

Although collaboration in Morocco was initiated in a similar top-down manner, it was fortunate that in the person of Dr El Mourid a very capable national project coordinator was designated who succeeded to bring together an enthusiastic team of collaborators in the Institut National de la Recherche Agronomique (Centre Aridoculture in Settat and Departement du Milieu Physique in Rabat) and the Direction de la Meteorologie Nationale (Centre National du Climat et de la Recherche Meteorologique in Casablanca).

A sign of the keen interest of the Moroccan counterparts in the project is the large number of case studies which they are currently undertaking (the project area stretches approximately from the Atlantic coast to Fes in the North and Marrakech in the South):

- Climatic atlas,
- Soil map (compiled from all available published and unpublished sources),
- Drought risk during different development stages of wheat,
- Optimal planting time for wheat,
- Optimally adapted wheat varieties,
- Optimal strategy for supplemental irrigation in wheat,
- Analysis of the gap between yields achieved by farmers and potential yields,
- Land suitability for various crops (following the FAO methodology),
- Effect of increased precipitation through cloud seed seeding on rainfed crop production,
- Forest fire risk index map,
- Analysis of the applicability of the tools promoted by the project for national planning.

It is expected that all these case studies will be presented at a workshop planned for the last week of March 1994 at ICARDA headquarters in Aleppo. The workshop proceedings will later be published. Other ways in which the project is disseminating results and experience are:

- in-country training workshops in Morocco,
- the participation of staff from other Moroccan government agencies (from extension services, national planning and others) in some of the case studies listed above,
- a project demonstration day to be held in Morocco following the workshop in Aleppo,
- the publication of manuals and workshop proceedings.

In spite of all good will, there were also a few difficulties which the project had to overcome in Morocco. The most serious one being the slowness with which data became available. It took four years instead of two as had been planned until all climatic data from the project area was ready for use. As consequence, it was not possible to adhere to the project timetable. The project had to be extended twice for one year and the different activities could not be executed in an orderly sequential fashion as had been planned; model validation, execution of case studies and model documentation have to be done simultaneously as far as this is possible. Other data also were slow arriving, but this was of no consequence as not much could be done without the climatic data in any case.

It is quite clear that the size of the task of digitizing and quality-controlling the climatic data from several hundred meteorological stations has been greatly underestimated by all involved. There is a clear need for future projects to pay more attention to the question of data acquisition and preparation, for more realistic planning and resource allocation for this task.

It also turned out that the data quality of a substantial fraction of those stations which are not operated by the meteorological service itself is so poor or their series are so short that they are unusable. This makes it impossible to undertake the validation of the SWG with the Moroccan data set alone, since the remaining stations are not enough to examine the effect of different densities of the station network on the quality of the synthetic data produced by the generator. Fortunately the German meteorological service helped by supplying a very large test data set from Germany which is used to address this question.

In spite of these problems and the delays which they caused, it can be said that usage of the advanced techniques for agro-ecological characterization introduced by the project is firmly established within INRA and DMN and is spreading within Morocco as a consequence of the involvement of staff from other offices in the in-country training workshops and in some of the case studies. Usage of the methods will continue whether or not there will be a follow-up project. The project has also been a catalyst to intensifying the collaboration between INRA and DMN in agrometeorology and agroclimatology.

Outlook

The Moroccan counterparts and ICARDA would like to build and expand on the experience gained in the present project and follow it up with a second phase project with a country-wide scope. This project would have three major components:

- Database construction (weather generator coefficient maps, DEM, soil map, land use map, map layers showing hydrography, road network, administrative units and population distribution, genetic coefficients for various crops),
- Database usage (expanding case studies of the present project to cover the entire country, using yield gap analysis to help prioritize INRA's research, deriving practicable guidelines for agricultural extension from the case studies, e.g. on supplemental irrigation strategies or on recommended varieties),
- Research / tool refinement (development of a predictive model for crop yield forecasting based on SWG, crop models and medium-term weather forecast maps, linking the set of IBSNAT crop models to the SWG).

A proposal for a similar project with Ethiopia involving the Institute of Agricultural Research, the National Meteorological Services Agency and the Land Use Planning and Regulatory Department is under preparation. Great care is being taken in developing this proposal not to repeat the mistakes committed before. All three collaborating national institutes have been fully involved in the project planning and formulation right from the start. It is expected that the Moroccan counterparts will be able to bring in their experience into this project as partners.

ICARDA would be interested to undertake similar projects with national programmes in other countries which perceive a need this type of agro-ecological characterization. Due to the shortage of manpower at ICARDA, this would, however, require that additional staff can be funded through such projects. It also seems desirable, also in the interest of continuity, to enlist additional expert support from outside. Relevant expertise exists and interest has been expressed by the universities of Guelph and Hohenheim (crop modelling), Florence (geomatics) and others.