

Egypt Country Report

CASE STUDY

National Agricultural Research Information Management System (NARIMS)

EXECUTIVE SUMMARY

The National Agricultural Research Information Management System (NARIMS) is an integrated, bilingual (Arabic/English) web-based system that aims to capture and disseminate information about research institutes, researchers working in those institutes, publications issued by those researchers, completed or currently active projects, and the national plan on agricultural and veterinary research in Egypt. The system was developed for the Agricultural Research Center (ARC) by the Central Laboratory for Agricultural Expert Systems (CLAES), building on existing FAO tools and methodologies, and working in cooperation with FAO staff. This case study describes NARIMS, and highlights the lessons learned during its development and deployment.

1. BACKGROUND

Reason for establishment

The Agricultural Research Center (ARC) of the Ministry of Agriculture and Land Reclamation (MALR) is the principal agency responsible for technology generation and transfer to Egyptian agriculture. ARC manages 18 national agriculture research programmes, which are interdisciplinary and inter-institutional. The lack of adequate information management and communication between researchers in the various research sectors was a significant weakness, preventing the national agricultural research system from properly addressing issues of agricultural development.

Specific indications were:

- Lack of coordination, resulting in unnecessary competition and overlap of research;
- Time-consuming and inefficient planning of research activities and monitoring of results;
- Inefficient utilization of human resources, because of time and effort required to identify the right person for a specific task;
- Difficulty in disseminating research results in printed form to interested parties, such as researchers, extension personnel and farmers.

The MALR decided to establish NARIMS as a means of meeting the imperative challenge of building capacity in agricultural information management, a priority area in its agricultural development policies.

Key organizer

The key player in establishing NARIMS has been the Central Laboratory for Agricultural Expert Systems (CLAES), which is part of the ARC and is a centre of excellence

specialized in agricultural software development and human capacity building. The development, implementation and evaluation of expert systems are part of a larger framework through which CLAES contributes to increasing food production and aiding rural development. In cooperation with FAO, CLAES developed the Virtual Extension and Research Network (VERCON) and is currently implementing the Rural Development Communication Network (RADCON). CLAES has its own local area network and has been connected to the Internet since 1994. It has significant computer networking system facilities and infrastructure suitable for staff computer training, meetings and conferences. CLAES has demonstrated technical and managerial capacities enabling NARIMS stakeholders to be fully involved in project planning, implementation and monitoring.

Capacity-building activities in the management of documents were conducted in close cooperation with the existing AGRIS/CARIS¹ centre at the Egyptian Documentation and Information Centre for Agriculture (EDICA), and the Egypt National Agricultural Library.

Summary of funding sources

From July 2004 to July 2006, the development of NARIMS was supported by a Technical Cooperation Programme project (TCP/EGY/3001) sponsored by FAO, with a total budget of US\$217,000.

Prior to the start of the TCP project, the required infrastructure was developed with funding from the Egyptian government (LE 1,418,820 « US\$250,000). These funds were used to design and implement a wide area network (WAN) for the ARC campuses in Cairo and Giza and to connect to the Internet with adequate bandwidth. Later on, the Egyptian government funded the development of a WAN in the largest ARC research station in Sakha, Kafr El Sheikh Governorate (LE 330,000 « US\$58,000). In the next five-year plan for CLAES (2007-2012), further government support is foreseen in the amount of LE 1,800,000 (« US\$313,000).

Marketing and promotional strategy

While the system was still under development, awareness about NARIMS was raised through various workshops at ARC research institutions, and at a later stage also at universities. Once the system became operational, a NARIMS poster and brochure were produced for distribution during all relevant events and meetings. Articles and news items about NARIMS are sent to Agriculture Magazine, which is published by Dar Al-Taawun.

Summary time path

NARIMS activities, in particular system development, started in February 2004, well before the official launching workshop of the TCP project, which took place on 27-28 July 2004. During the workshop a first prototype was demonstrated, which served to focus discussions on the information needs of stakeholder institutions and the formulation

¹ AGRIS: International Information System for the Agricultural Sciences and Technology
CARIS: Current Agricultural Research Information System

of recommendations for the implementation of the system.

Subsequently, two parallel activities were initiated: one pertaining to the further development of the system modules, and the other to capacity building at ARC institutions. Three staff members from each institution were trained during four consecutive rounds. During the first round, trainees were introduced to the use of modern information technology. This was followed immediately by a second round during which participants were trained in the use of specific system modules. The third round of training was conducted after the system had been revised, fixing any bugs that had been discovered and taking into consideration all feedback received from the trainees regarding its usability. During the fourth round, EDICA trained participants on the use of the Arabized AGRIS Application Profile, and on document indexing and cataloguing.

After all comments regarding the system modules had been addressed, two workshops were conducted. The first was held on 28 September 2005 to present the system to the researchers and obtain their feedback. The second workshop, during which the updated system was presented to the trainees, was held on 28 March 2006.

On 22 November 2005, the president of ARC issued a decree establishing the National Agriculture Research Information Center (NARIC) as part of the institutional development required for the sustainability and further development of NARIMS. NARIC staff consists of the NARIMS team (four persons) working at CLAES, ten trainers from EDICA, and three trained NARIC representatives in each research institution.

The inauguration of NARIMS was announced at two levels:

- On 31 May 2006, an internal workshop was held for all directors of ARC institutions, to ensure the cooperation of their staff in providing inputs to the system.
- On 11 July 2006, the public announcement was made during a workshop, invitations for which were sent to the Minister of Agriculture, deans of all faculties of agriculture and veterinary science, professors at the Academy of Science, research staff from Desert Research Center and Water Research Center, ARC top management personnel, and all directors of ARC institutions.

Geographic coverage

The ARC is composed of 37 independent bodies (16 institutes, 11 central laboratories, and 10 research stations) with a total of more than 5,000 researchers. The institutes and laboratories are spread over two campuses in Cairo and Giza. The research stations are scattered all over Egypt. All institutes have units in the research stations. NARIC is currently located within CLAES and has small units in all ARC institutions.

Relation to national policy on information and communication

Recognizing the importance of information and communication for development, the MALR started with their introduction in several initiatives, such as the VERCON and

RADCON, and the current NARIMS project. Prior to these projects, no formal information and communication policy existed. One of the expected outputs of the NARIMS project was a strategy for agricultural information management compliant with the National Agricultural Development Policy (2002-2007) and the National Information and Communication Technology Strategy. At the project's completion, a draft strategy was available for review and subsequent finalization.

2. OBJECTIVES

The overall objective of the NARIMS project was to strengthen the capacity of the ARC to manage relevant information in support of agricultural development and food security policies.

Specific objectives were to:

- Develop NARIMS as an integrated web-based system with modules for: research institutes, personnel, projects, publications and the five-year research plan, all accessible through the ARC website.
- Establish NARIC to provide advice and direction on information management issues, and act as focal point for user services and system / database maintenance.
- Train technical staff as well as decision makers, researchers and extension agents on the basics of information technology and the use of NARIMS.
- Formulate a national agricultural research information strategy.

3. STAKEHOLDERS

NARIMS' stakeholders can be grouped in the following categories:

▪ Managers/decision makers

Managers/decision makers at different levels in ARC research institutions, national or international research organizations, faculties of agriculture and veterinary science, or agro-industry have a direct interest in the information provided by the system. Easy access to this online information will allow them to optimize research outputs through proper planning, utilization of human resources and monitoring of activities.

▪ Researchers

Researchers are potentially involved in NARIMS both as users and producers of information. The first group contains researchers with any affiliation, while so far only researchers from ARC belong to the second. During the next phase of NARIMS, researchers in faculties of agriculture and other research centers in the agricultural sector are expected to become contributors. Researchers have an incentive to update their information so as to properly reflect their skills and performance in view of employment opportunities.

▪ Extension workers

Extension workers are secondary NARIMS stakeholders, in particular as users of the information in the "Publications" module.

- **Farmers**

Farmers may benefit from the system indirectly through the improved know-how of the extension workers and the improved research outputs resulting from enhanced collaboration and coordination between researchers.

Stakeholders involved in system development and provision of input are trained in the basics of information technology and the use of the different NARIMS modules. Potential users of the system receive training in how to access relevant information.

NARIMS is expected to enhance the cooperation between stakeholder groups. It is managed by a Steering Committee which, during the initial development phase, consisted mainly of representatives from ARC institutions. During the next phase, it will include representatives from other stakeholder organizations, such as the Desert Research Centre, Water Research Centre, National Research Centre, agricultural faculties, and extension and farmers' organizations.

4. PRODUCTS AND SERVICES

The following five structurally linked NARIMS modules are accessible through the bilingual (English/Arabic) ARC website (<http://www.arc.sci.eg/>):

- **Institutes and laboratories**

This module contains Arabic/English web pages for ARC institutes, laboratories and research stations so as to make them more recognizable at the national and international levels and to facilitate establishing international scientific cooperation and coordination with other institutions. An institution's web page is integrated with the relevant content generated by other system modules, such as information about projects, researchers and publications related to the institution.

- **Researchers**

This module allows the user to identify the right specialist for a specific task, and browse a researcher's web-based curriculum vitae (CV). It is also possible to view his/her publications, view projects and visit the web page of his/her institute, all retrieved from the relevant modules.

- **Projects**

This module enables users to learn about the research goals of a particular institute through its past and current projects. A visitor of a project's web page can view the CVs of researchers working on that project and all publications related to the project, and visit participating institutes' web pages through the appropriate links.

- **Publications**

This module provides access to indexed references of publications (technical reports,

theses, conference papers, journal articles) authored by Egyptian researchers, with links to the full-text original documents whenever possible. The module includes nearly 40,000 AGRIS records indexed by EDICA, which previously were available only through the database interface of FAO's AGRIS Network.

- **Five-Year Plan**

This module (available in Arabic only) enables the dissemination and monitoring of activities carried out in research, extension and training programmes under the Five-Year Plan. Each programme in the module is linked to the institute(s) responsible for conducting the related activities.

5. TECHNOLOGY AND SYSTEMS

The ARC has two campus networks, located in the Dokki and Giza regions. The first consists of a backbone network located in CLAES and ten remote sites distributed in the Dokki region, in addition to six remote sites connected to CLAES through Frame Relay connection. The second consists of a backbone network located in the Sugar Crops Research Institute and 17 remote sites distributed in the Giza region. Both campus networks are connected to the Internet.

NARIMS is implemented using ASP.NET and Microsoft SQL. Data are centrally stored on a dedicated web server which runs Microsoft Windows 2003 server and IIS web server.

Each NARIMS module has an administrative interface for data entry and a user interface that enables browsing or searching of contents. Both are accessible through the Internet. The administrative interface has security levels controlling data access and manipulation, and a username and password are required to access the modules.

The "Publications" module is a fully XML-enabled system that allows both the import and export of data using the AGRIS AP (Application Profile) XML metadata exchange format, ensuring complete interoperability amongst data providers. The underlying XML layer that structures the NARIMS data also facilitates the use of protocols such as OAI-PMH for open access publishing.

6. FINANCIAL ASPECTS

Financial support for initial NARIMS systems development and training activities was provided under FAO project TCP/EGY/3001, which was implemented from July 2004 to July 2006 with a total budget of US\$217,000. The government contributed the equivalent of more than US\$300,000 in local currency for the development of the necessary infrastructure.

So far, the sustainability of the system is guaranteed through the continuing commitment of the government to fund equipment maintenance and Internet connectivity. In the next five-year plan for CLAES (2007-2012), support for NARIC in this respect is foreseen in

the amount of LE 1,800,000 (« US\$313,000).

A project proposal for the expansion of NARIMS in the framework of a national agricultural research knowledge and information network (NARKIN) has been formulated and submitted to funding agencies. NARKIN would include the ARC institutions and the other stakeholders of 16 faculties of agriculture, 6 faculties of veterinary, private sector organizations, non-governmental organizations, farmers' organizations, the Water Research Centre, the Desert Research Centre, the National Research Centre, the Academy of Science and other agriculture-related organizations.

7. KEY ISSUES AND CONCLUSIONS

Benefits and challenges

NARIMS was designed as an integrated information management system that aims to strengthen research through the sharing of information. It enables agricultural researchers and scientists to carry out research more effectively by creating access to research information from Egypt and elsewhere. It is expected that its full implementation will lead to efficient utilization of human, material and financial resources. The system shall also prevent duplication of research, enhance coordination among various agricultural research personnel, and assist research directors in monitoring the achievements of current research plans as well as in formulating new ones.

Now that the system has been launched, the major challenge for the ARC is to enforce institutional development introduced during the project and to ensure that the stakeholders will actually start reaping the above-mentioned potential benefits, and will be able to continue to do so in the future. Another challenge will be to expand NARIMS so as to include relevant research institutions from outside the ARC, and thus turn it into a truly national system.

Key lessons

The following are some of the key lessons learned during the development phase of NARIMS:

▪ Institutional support

Support from senior management is crucial for the success of a cooperative system such as NARIMS. The National Project Coordinator played a vital role as the project's champion, thoroughly understanding the need for the proposed system and able to articulate it to other senior management staff in ARC and other potential stakeholders. The development of NARIMS relied on a solid organizational basis of existing institutions. The organizational restructuring needed to ensure its efficient functioning and sustainability was approved and implemented.

▪ Locally adapted content and context

NARIMS contains agricultural research information produced in Egypt. The content of each module is mapped to the relevant ARC institutions. Personnel from each institution are responsible for data entry and verification, in order to guarantee commitment and

quality of content. The records in the "Publications" module are reviewed by personnel from EDICA to ensure they are correct and conform to standards.

- **Building on existing systems**

When developing NARIMS, significant savings in time, effort and money were made by adopting and/or adapting tools and methodologies developed by FAO. The Electronic Information Management System software tool was customized and subsequently integrated in the "Publications" module. The AGRIS AP was translated into Arabic and chosen as the metadata standard for the description, exchange and subsequent retrieval of information. The AGROVOC thesaurus (available both in English and Arabic versions) was adopted for the indexing of information objects.

- **Capacity building**

A significant effort has been made to strengthen the capacity of institutions and people to provide the right content and to access relevant information. Fifty specialized staff have been trained in the use of the Arabic version of the AGRIS AP for the cataloguing of resources. A total of 111 decision makers and researchers (three from each institution) have been introduced to the use of modern information technologies and trained in using NARIMS modules as a means of accessing relevant information.

- **Strengthening partnerships and participation**

One of the main goals of NARIMS is cooperation and coordination between researchers, whether they are within the same institute or in different institutes or organizations. The establishment of a Steering Committee provided an enabling policy environment for the management of NARIMS.

Initially only ARC institutions were included in project activities, but during the final stages of the project, awareness was created and training provided to a number of agricultural faculties. Increased dialogue with stakeholders outside the ARC will be necessary to cultivate a sense of ownership and convince them to participate fully in the system.

- **Realistic approach to technologies**

Since commercially available software was already installed in CLAES before the start of the project, this has been used as the basis for system development. It is intended at a later stage to adapt NARIMS' functionality to open source technology, as appropriate.

- **Costs and financial sustainability**

NARIMS has been developed with government and donor funding. Government financial support for its maintenance has already been committed to NARIC within the regular annual budget. CLAES has established a special unit which, under government regulations, is allowed to provide training in information and communication technologies and management, and web-based software applications development services to the ARC institutes and various MALR departments and offices on a cost-recovery basis.

External funding is being sought for the expansion of the system so as to include universities and other research organizations. A project proposal has been submitted to donor agencies.

Ultimately, the system is expected to be maintained fully through the contributions of participating organizations and NARIC.

URL of the service: <http://www.arc.sci.eg>

8. RECOMMENDATIONS:

Institutional arrangements

Following the official launch of NARIMS, the major challenge for ARC is to enforce the institutional development introduced during the project and to ensure that stakeholders reap its potential benefits now and in the future. The next challenge will be to expand NARIMS to include relevant research institutions from outside ARC and turn it into a truly national system.

It is recommended that the membership of the NARIMS steering committee be widened by including representatives from stakeholder organizations outside ARC, such as DRC, WRC, NRC, agricultural faculties, extension and farmers' organizations.

Training and facilities

In view of the rapid changes taking place in the information environment, it is essential to maintain a high level of skill for staff at NARIC and NARIMS stakeholder organizations and to perfect the training received under the project. Relevant training opportunities in information technology in Egypt and the region should be actively pursued.

Continuing government commitment will be required to fund equipment maintenance and Internet connectivity.

Product and services development

Timely, targeted products and services will convince decision-makers and researchers of the value of information and secure continuing support for NARIMS. The Web site and modules developed under the project should be constantly enriched with relevant, up-to-date information. It is of the utmost importance to ensure that any records entered in the system are correct and of good quality.

An immediate task will be to complete digitizing the documents for which records were submitted to the AGRIS database during the past five years (approximately 7 500 titles) so that users will have access to the full text of relevant publications.

As commercially available software was already installed in CLAES before the start of the project, this was used as the basis for system development. It is suggested that NARIMS functionality be adapted to open source technology when appropriate.

Sustainability and follow-up action

Financial support for the continuing maintenance of NARIMS has already been committed within the regular annual budget for NARIC. External funding should be sought for the expansion of the system to include faculties of agriculture and veterinary science, private-sector organizations, non-governmental organizations, farmers' organizations, WRC, DRC and NRC, as well as the National Academy of Science and other agriculture-related organizations. Substantial support from MALR to approach the potential funding agencies is essential for the expansion of NARIMS.

Information Management and Knowledge Exchange At the Agricultural Research Centre, Egypt

By Ahmed Rafea

Professor of Computer Science, American University of Cairo - and
Advisor, Central Laboratory for Agricultural Information Systems (CLAES)

Agricultural Research Centre (ARC)

- Mandates:
 - Conducting applied and basic research to generate a continuous flow of technologies
 - Transfer of new technologies to the farming community through extension service;
 - and monitoring their adoption by the end users;
 - Human capacity development
- 16 Institutes, 13 Central Labs, 10 regional stations, 36 specific research stations
- 5,000 Researchers

Role/Importance of IM & KE Initiatives

Period	Project	FAO Project
1989-1997	Use of Expert Systems for Improved Crop Management	EGY/88/024
2000-2002	VERCON : Virtual Extension and Research Communication Network	TCP/EGY/0065
2004-present	RADCON : Rural & Agricultural Development Communication Network	UTF/EGY/021
2004-2006	NARIMS : National Agricultural Research Information System	TCP/EGY/3001

Information & Knowledge Resources

VERCON/RADCON	NARIMS
- <u>Information Resources</u> : Extension Documents, Expert Systems, Statistical Data, NGO working in Rural Development, Small Project Knowledge Base, Woman Corner Knowledge Base, Environment Conservation Knowledge Base	- <u>Information Resources</u> : Institutional Data, Researcher Data, Projects Data, Publications Data, ARC Research Plan
- <u>Information and Knowledge Exchange</u> : Growers Problems Module, News- VERCON, Marketing Opportunities, Forum	

Knowledge exchange and information management processes

- Proper workflow designed for each type of information resource
- Stakeholders responsible for own information
- Standards and guidelines to ensure compatibility with other systems outside ARC (e.g. AGRIS)

Institutional Dimension/Scale

Sites	ARC	VERCON/ RADCON	NARIMS
Research Institute (RI)	16	7	16
Central Laboratory	13	1	13
Regional Research Station (RRS) Other locations	10	8	10
		216	
Total	39	232	39

Direction and Leadership (Champions)

- CLAES establishment: lead by the ARC President
- VERCON establishment: lead by Institute (CLAES and AERDRI) Directors
- RADCON establishment: lead by Institute (CLAES) Director
- NARIMS establishment: lead by National Project Coordinator of ARC Research Network

Policy-Related Issues

- Belief of the top management in ICT/M
- Awareness of types of information to be stored and disseminated
- Awareness of use ICT/M for information storage and dissemination instead of traditional media, for example: paper, audio, video
- Cost of using ICT/M

- Impact of using ICT/M for information storage, management, and retrieval

Improvements in Connectivity

- 2000: only one ARC location (CLAES) had an Internet connection (128KBS)
- 2006:
 - ARC institutes connected in Wide Area Network (1 GBS) and connected to Internet through two links (2 MBS each)
 - Plans to expand network to ARC Regional Research Stations
 - Villages have Internet access through dial-up connection, and DSL and ADSL now widely available

Human Resource Issues, including Skills Development

- Learning by doing approach for 40 software engineers in ARC-CLAES
- Training on VERCON/RADCON operation for 500 staff (researchers, extension officers, university faculties, NGO staff)
- Training for 150 communication facilitators in villages on using RADCON
- Training for 120 staff on NARIMS data entry, indexing, etc.

External Stakeholders

- Faculty from Universities
- Staff from NGO's
- Agricultural Credit Bank

Investments

Period	Project	Funding	
		External	Government Contribution.*
1989-1997	Expert System	\$ 1,566,799	\$ 340,000
2000-2004	VERCON	\$ 236,000	\$ 235,000
2004-present	RADCON	\$ 1,540,000	\$ 172,000
2004-2006	NARIMS	\$ 217,000	\$ 150,000

Legend: * Dollar equivalent