CIARD

Case Study: Institution-Based Information Systems, Egypt National Agricultural Research Information Management System (NARIMS)

EXECUTIVE SUMMARY

The National Agriculture Research Information Management System (NARIMS) is an integrated, bilingual (Arabic/English) web based system aimed at capturing and disseminating 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, managing 18 national agriculture research programs, which are interdisciplinary and inter-institutional. The lack of adequate information management and communication between researchers in the various research sectors represented a significant weakness, preventing the national agricultural research system to properly address the issues of agricultural development. Specific indications of this situation were:

- Lack of coordination resulting in unnecessary competition and overlap of research;
- Time-consuming and inefficient monitoring of research results and planning of research activities;
- 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 as 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/CARIS centre at the Egyptian Documentation and Information Centre for Agriculture (EDICA), and the Egypt National Agricultural Library (ENAL).

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 ≈ $250,000). These funds were specifically 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 also funded the development of a WAN in the largest ARC research station in Sakha, Kafr El Sheikh Governorate (LE 330,000 ≈ $58,000). In the next five year plan for CLAES (2007 – 2012), further government support is foreseen to the amount of LE 1,800,000 (≈ $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 the 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 July 27 - 28, 2004. During the workshop a first prototype was demonstrated, which served to focus discussions on the information needs of stakeholder institutions and the formulation 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 were discovered and taking into consideration all feedback received from the trainees regarding its usability. During the fourth round, participants were

trained by EDICA on the use of the Arabized AGRIS Application Profile, document indexing and cataloging.

After all comments regarding the system modules had been addressed, two workshops were conducted. The first was held on September 28, 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 March 28, 2006.

On 22 November 2005, the president of ARC issued a decree on the establishment of 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.
− The public announcement was made during a workshop held on 11 July, 2006, invitations for which were sent to the Minister of Agriculture, deans of all Faculties of Agriculture and Veterinary Science, professors in 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 Ministry of Agriculture and Land Reclamation started with their introduction in several initiatives, such as the VERCON and RADCON, and the current NARIMS project. Prior to these projects, no formal IC 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 ICT 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 Agricultural Research Centre (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 years research plan, all accessible through the ARC website.
- Establish a National Agricultural Research Information Centre (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 as well. 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 IT basics 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 is planned to include representatives from other stakeholder organizations, such as the Desert Research Centre (DRC), Water Research Centre (WRC), National Research Centre (NRC), agricultural faculties, 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 level 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). Furthermore, it is possible to view his/her publications, and 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, 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 programs under the Five Year Plan. Each program 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, respectively. The first consists of a backbone network located in the Central Laboratory for Expert Systems (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 (SCRI) and seventeen remote sites distributed in the Giza zone. Both campus networks are connected to the Internet.

NARIMS is implemented using ASP.NET and Microsoft SQL. Data is centrally stored on a dedicated web server which is running 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 for an amount of LE 1,800,000 ($\approx$ $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, NGOs, farmers' organizations, the Water Research Centre (WRC), Desert Research Centre (DRC), National Research Centre (NRC) as well as 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 aiming at strengthening 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 co-ordination 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 actually will start reaping the above-mentioned potential benefits, and will be able to continue to do so in the future. The next 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 learnt 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 conforming 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 (EIMS) software tool was customized and subsequently integrated in the "Publications" module. The AGRIS Application Profile (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 has 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 prior to 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 ICT/ICM training 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 relevant 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/